Vectores con J23107-YFP

February 13, 2018

```
In [1]: import numpy as np
        import matplotlib
        import matplotlib.pyplot as plt
        %matplotlib inline
        from matplotlib import colors
        from scipy.interpolate import UnivariateSpline
        from scipy.optimize import curve_fit
        from scipy import stats
        import seaborn as sns

In [2]: tt=np.fromfile('t', sep=',')

        #arrays replicas glucosa
        cfp15231=np.fromfile('p1523gCFP1', sep=',')
        rfp15231=np.fromfile('p1523gRFP1', sep=',')
        yfp15231=np.fromfile('p1523gYFP1', sep=',')
        od15231=np.fromfile('p1523gOD1', sep=',')
        cfp15232=np.fromfile('p1523gCFP2', sep=',')
        rfp15232=np.fromfile('p1523gRFP2', sep=',')
        yfp15232=np.fromfile('p1523gYFP2', sep=',')
        od15232=np.fromfile('p1523gOD2', sep=',')
        cfp15233=np.fromfile('p1523gCFP3', sep=',')
        rfp15233=np.fromfile('p1523gRFP3', sep=',')
        yfp15233=np.fromfile('p1523gYFP3', sep=',')
        od15233=np.fromfile('p1523gOD3', sep=',')
        '''
        print(cfp15231.shape)
        print(rfp15231.shape)
        print(yfp15231.shape)
        print(od15231.shape)
        print(cfp15232.shape)
        print(rfp15232.shape)
        print(yfp15232.shape)
        print(od15232.shape)
        print(cfp15233.shape)
        print(rfp15233.shape)
        print(yfp15233.shape)
        print(od15233.shape)'''
```

```
cfp18231=np.fromfile('p1823gCFP1', sep=',')
rfp18231=np.fromfile('p1823gRFP1', sep=',')
yfp18231=np.fromfile('p1823gYFP1', sep=',')
od18231=np.fromfile('p1823gOD1', sep=',')
cfp18232=np.fromfile('p1823gCFP2', sep=',')
rfp18232=np.fromfile('p1823gRFP2', sep=',')
yfp18232=np.fromfile('p1823gYFP2', sep=',')
od18232=np.fromfile('p1823gOD2', sep=',')
cfp18233=np.fromfile('p1823gCFP3', sep=',')
rfp18233=np.fromfile('p1823gRFP3', sep=',')
yfp18233=np.fromfile('p1823gYFP3', sep=',')
od18233=np.fromfile('p1823gOD3', sep=',')

'''
print(cfp18231.shape)
print(rfp18231.shape)
print(yfp18231.shape)
print(od18231.shape)
print(cfp18232.shape)
print(rfp18232.shape)
print(yfp18232.shape)
print(od18232.shape)
print(cfp18233.shape)
print(rfp18233.shape)
print(yfp18233.shape)
print(od18233.shape)'''

cfp12231=np.fromfile('p1223gCFP1', sep=',')
rfp12231=np.fromfile('p1223gRFP1', sep=',')
yfp12231=np.fromfile('p1223gYFP1', sep=',')
od12231=np.fromfile('p1223gOD1', sep=',')
cfp12232=np.fromfile('p1223gCFP2', sep=',')
rfp12232=np.fromfile('p1223gRFP2', sep=',')
yfp12232=np.fromfile('p1223gYFP2', sep=',')
od12232=np.fromfile('p1223gOD2', sep=',')
cfp12233=np.fromfile('p1223gCFP3', sep=',')
rfp12233=np.fromfile('p1223gRFP3', sep=',')
yfp12233=np.fromfile('p1223gYFP3', sep=',')
od12233=np.fromfile('p1223gOD3', sep=',')

'''
print(cfp12231.shape)
print(rfp12231.shape)
print(yfp12231.shape)
print(od12231.shape)
print(cfp12232.shape)
```

```
print(rfp12232.shape)
print(yfp12232.shape)
print(od12232.shape)
print(cfp12233.shape)
print(rfp12233.shape)
print(yfp12233.shape)
print(od12233.shape)'''

#Controles
#Promedios controles glucosa
cfpcg151=np.fromfile('15pcgCFP1', sep=',')
rfpcg151=np.fromfile('15pcgRFP1', sep=',')
yfpcg151=np.fromfile('15pcgYFP1', sep=',')
odcg151=np.fromfile('15pcgOD1', sep=',')
cfpcg152=np.fromfile('15pcgCFP2', sep=',')
rfpcg152=np.fromfile('15pcgRFP2', sep=',')
yfpcg152=np.fromfile('15pcgYFP2', sep=',')
odcg152=np.fromfile ('15pcgOD2',sep=',')
cfpcg153=np.fromfile('15pcgCFP3', sep=',')
rfpcg153=np.fromfile('15pcgRFP3', sep=',')
yfpcg153=np.fromfile('15pcgYFP3', sep=',')
odcg153=np.fromfile('15pcgOD3', sep=',')

'''
print(cfpcg151.shape)
print(rfpcg151.shape)
print(yfpcg151.shape)
print(odcg151.shape)
print(cfpcg151.shape)
print(rfpcg151.shape)
print(yfpcg151.shape)
print(odcg151.shape)
print(cfpcg151.shape)
print(rfpcg151.shape)
print(yfpcg151.shape)
print(odcg151.shape)'''

cfpcg181=np.fromfile('18pcgCFP1', sep=',')
rfpcg181=np.fromfile('18pcgRFP1', sep=',')
yfpcg181=np.fromfile('18pcgYFP1', sep=',')
odcg181=np.fromfile('18pcgOD1', sep=',')
cfpcg182=np.fromfile('18pcgCFP2', sep=',')
rfpcg182=np.fromfile('18pcgRFP2', sep=',')
yfpcg182=np.fromfile('18pcgYFP2', sep=',')
odcg182=np.fromfile ('18pcgOD2',sep=',')
cfpcg183=np.fromfile('18pcgCFP3', sep=',')
rfpcg183=np.fromfile('18pcgRFP3', sep=',')
yfpcg183=np.fromfile('18pcgYFP3', sep=',')
```

```
odcg183=np.fromfile('18pcgOD3', sep=',')

'''
print(cfpcg181.shape)
print(rfpcg181.shape)
print(yfpcg181.shape)
print(odcg181.shape)
print(cfpcg181.shape)
print(rfpcg181.shape)
print(yfpcg181.shape)
print(odcg181.shape)
print(cfpcg181.shape)
print(rfpcg181.shape)
print(yfpcg181.shape)
print(odcg181.shape)'''

cfpcg121=np.fromfile('12pcgCFP1', sep=',')
rfpcg121=np.fromfile('12pcgRFP1', sep=',')
yfpcg121=np.fromfile('12pcgYFP1', sep=',')
odcg121=np.fromfile('12pcgOD1', sep=',')
cfpcg122=np.fromfile('12pcgCFP2', sep=',')
rfpcg122=np.fromfile('12pcgRFP2', sep=',')
yfpcg122=np.fromfile('12pcgYFP2', sep=',')
odcg122=np.fromfile ('12pcgOD2',sep=',')
cfpcg123=np.fromfile('12pcgCFP3', sep=',')
rfpcg123=np.fromfile('12pcgRFP3', sep=',')
yfpcg123=np.fromfile('12pcgYFP3', sep=',')
odcg123=np.fromfile('12pcgOD3', sep=',')
'''
print(cfpcg121.shape)
print(rfpcg121.shape)
print(yfpcg121.shape)
print(odcg121.shape)
print(cfpcg121.shape)
print(rfpcg121.shape)
print(yfpcg121.shape)
print(odcg121.shape)
print(cfpcg121.shape)
print(rfpcg121.shape)
print(yfpcg121.shape)
print(odcg121.shape)'''
```

Out [2]: '\nprint(cfpcg121.shape)\nprint(rfpcg121.shape)\nprint(yfpcg121.shape)\nprint(odcg121.sh

In [3]:
```
#Promedios glicerol
#arrays replicas glicerol
cfp1523g1=np.fromfile('p1523glCFP1', sep=',')
rfp1523g1=np.fromfile('p1523glRFP1', sep=',')
```

```
yfp1523g1=np.fromfile('p1523glYFP1', sep=',')
od1523g1=np.fromfile('p1523glOD1', sep=',')
cfp1523g2=np.fromfile('p1523glCFP2', sep=',')
rfp1523g2=np.fromfile('p1523glRFP2', sep=',')
yfp1523g2=np.fromfile('p1523glYFP2', sep=',')
od1523g2=np.fromfile('p1523glOD2', sep=',')
cfp1523g3=np.fromfile('p1523glCFP3', sep=',')
rfp1523g3=np.fromfile('p1523glRFP3', sep=',')
yfp1523g3=np.fromfile('p1523glYFP3', sep=',')
od1523g3=np.fromfile('p1523glOD3', sep=',')
'''
print(cfp1523g1.shape)
print(rfp1523g1.shape)
print(yfp1523g1.shape)
print(od1523g1.shape)
print(cfp1523g2.shape)
print(rfp1523g2.shape)
print(yfp1523g2.shape)
print(od1523g2.shape)
print(cfp1523g3.shape)
print(rfp1523g3.shape)
print(yfp1523g3.shape)
print(od1523g3.shape)'''

cfp1823g1=np.fromfile('p1823glCFP1', sep=',')
rfp1823g1=np.fromfile('p1823glRFP1', sep=',')
yfp1823g1=np.fromfile('p1823glYFP1', sep=',')
od1823g1=np.fromfile('p1823glOD1', sep=',')
cfp1823g2=np.fromfile('p1823glCFP2', sep=',')
rfp1823g2=np.fromfile('p1823glRFP2', sep=',')
yfp1823g2=np.fromfile('p1823glYFP2', sep=',')
od1823g2=np.fromfile('p1823glOD2', sep=',')
cfp1823g3=np.fromfile('p1823glCFP3', sep=',')
rfp1823g3=np.fromfile('p1823glRFP3', sep=',')
yfp1823g3=np.fromfile('p1823glYFP3', sep=',')
od1823g3=np.fromfile('p1823glOD3', sep=',')
'''
print(cfp1823g1.shape)
print(rfp1823g1.shape)
print(yfp1823g1.shape)
print(od1823g1.shape)
print(cfp1823g2.shape)
print(rfp1823g2.shape)
print(yfp1823g2.shape)
print(od1823g2.shape)
print(cfp1823g3.shape)
print(rfp1823g3.shape)
print(yfp1823g3.shape)
```

```
print(od1823g3.shape)'''

cfp1223g1=np.fromfile('p1223glCFP1', sep=',')
rfp1223g1=np.fromfile('p1223glRFP1', sep=',')
yfp1223g1=np.fromfile('p1223glYFP1', sep=',')
od1223g1=np.fromfile('p1223glOD1', sep=',')
cfp1223g2=np.fromfile('p1223glCFP2', sep=',')
rfp1223g2=np.fromfile('p1223glRFP2', sep=',')
yfp1223g2=np.fromfile('p1223glYFP2', sep=',')
od1223g2=np.fromfile('p1223glOD2', sep=',')
cfp1223g3=np.fromfile('p1223glCFP3', sep=',')
rfp1223g3=np.fromfile('p1223glRFP3', sep=',')
yfp1223g3=np.fromfile('p1223glYFP3', sep=',')
od1223g3=np.fromfile('p1223glOD3', sep=',')
'''
print(cfp1223g1.shape)
print(rfp1223g1.shape)
print(yfp1223g1.shape)
print(od1223g1.shape)
print(cfp1223g2.shape)
print(rfp1223g2.shape)
print(yfp1223g2.shape)
print(od1223g2.shape)
print(cfp1223g3.shape)
print(rfp1223g3.shape)
print(yfp1223g3.shape)
print(od1223g3.shape)'''

#Promedios controles glicerol
cfpcgl151=np.fromfile('15pcglCFP1', sep=',')
rfpcgl151=np.fromfile('15pcglRFP1', sep=',')
yfpcgl151=np.fromfile('15pcglYFP1', sep=',')
odcgl151=np.fromfile('15pcglOD1', sep=',')
cfpcgl152=np.fromfile('15pcglCFP2', sep=',')
rfpcgl152=np.fromfile('15pcglRFP2', sep=',')
yfpcgl152=np.fromfile('15pcglYFP2', sep=',')
odcgl152=np.fromfile('15pcglOD2', sep=',')
cfpcgl153=np.fromfile('15pcglCFP3', sep=',')
rfpcgl153=np.fromfile('15pcglRFP3', sep=',')
yfpcgl153=np.fromfile('15pcglYFP3', sep=',')
odcgl153=np.fromfile('15pcglOD3', sep=',')
'''
print(cfpcgl151.shape)
print(rfpcgl151.shape)
print(yfpcgl151.shape)
print(odcgl151.shape)
print(cfpcgl151.shape)
print(rfpcgl151.shape)
```

```
print(yfpcgl151.shape)
print(odcgl151.shape)
print(cfpcgl151.shape)
print(rfpcgl151.shape)
print(yfpcgl151.shape)
print(odcgl151.shape)'''

cfpcgl181=np.fromfile('18pcglCFP1', sep=',')
rfpcgl181=np.fromfile('18pcglRFP1', sep=',')
yfpcgl181=np.fromfile('18pcglYFP1', sep=',')
odcgl181=np.fromfile('18pcglOD1', sep=',')
cfpcgl182=np.fromfile('18pcglCFP2', sep=',')
rfpcgl182=np.fromfile('18pcglRFP2', sep=',')
yfpcgl182=np.fromfile('18pcglYFP2', sep=',')
odcgl182=np.fromfile('18pcglOD2', sep=',')
cfpcgl183=np.fromfile('18pcglCFP3', sep=',')
rfpcgl183=np.fromfile('18pcglRFP3', sep=',')
yfpcgl183=np.fromfile('18pcglYFP3', sep=',')
odcgl183=np.fromfile('18pcglOD3', sep=',')
'''
print(cfpcgl181.shape)
print(rfpcgl181.shape)
print(yfpcgl181.shape)
print(odcgl181.shape)
print(cfpcgl181.shape)
print(rfpcgl181.shape)
print(yfpcgl181.shape)
print(odcgl181.shape)
print(cfpcgl181.shape)
print(rfpcgl181.shape)
print(yfpcgl181.shape)
print(odcgl181.shape)'''

cfpcgl121=np.fromfile('12pcglCFP1', sep=',')
rfpcgl121=np.fromfile('12pcglRFP1', sep=',')
yfpcgl121=np.fromfile('12pcglYFP1', sep=',')
odcgl121=np.fromfile('12pcglOD1', sep=',')
cfpcgl122=np.fromfile('12pcglCFP2', sep=',')
rfpcgl122=np.fromfile('12pcglRFP2', sep=',')
yfpcgl122=np.fromfile('12pcglYFP2', sep=',')
odcgl122=np.fromfile('12pcglOD2', sep=',')
cfpcgl123=np.fromfile('12pcglCFP3', sep=',')
rfpcgl123=np.fromfile('12pcglRFP3', sep=',')
yfpcgl123=np.fromfile('12pcglYFP3', sep=',')
odcgl123=np.fromfile('12pcglOD3', sep=',')
'''
print(cfpcgl121.shape)
print(rfpcgl121.shape)
```

```
print(yfpcgl121.shape)
print(odcgl121.shape)
print(cfpcgl121.shape)
print(rfpcgl121.shape)
print(yfpcgl121.shape)
print(odcgl121.shape)
print(cfpcgl121.shape)
print(rfpcgl121.shape)
print(yfpcgl121.shape)
print(odcgl121.shape)'''
```

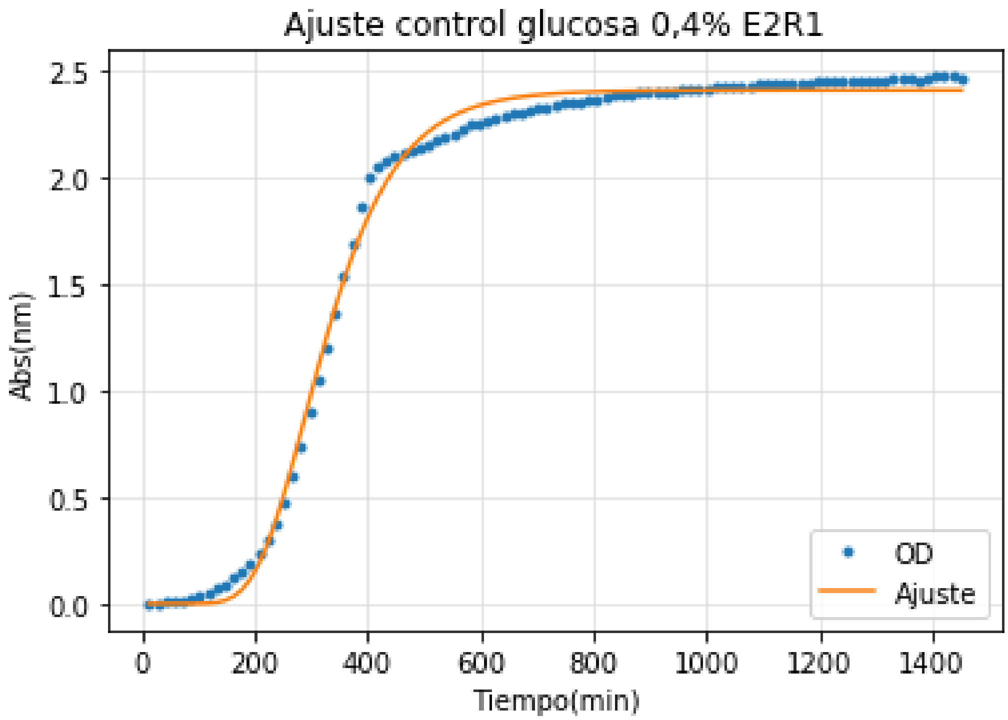
Out[3]: '\nprint(cfpcgl121.shape)\nprint(rfpcgl121.shape)\nprint(yfpcgl121.shape)\nprint(odcgl12

In [4]:
```
#Funciones para ajuste Gompertz
def F_sigma(t, A, um,l):
    return ((A*np.exp(-np.exp((((um*np.exp(1))/A)*(l-t))+1))))

def Function_fit(xdata,ydata,init,end,func=F_sigma,ParamBounds=([0,0,0],[3,1,300]), titl
        Y_fit={}

        z,_=curve_fit(func,xdata[init:end], ydata[init:end],bounds=ParamBounds)

        print(z)

        evalF=func(xdata,z[0],z[1],z[2])

        plt.figure()
        plt.plot(xdata, ydata, '.',label='OD')
        plt.plot(xdata, evalF, '-',label='Ajuste')
        plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
        plt.title(title)
        plt.ylabel('Abs(nm)')
        plt.xlabel('Tiempo(min)')
        lgd=plt.legend(loc='lower right')
        plt.show()

        Y_fit=evalF,z

        return(Y_fit)
```

In [5]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#control 15 glucosa rep 1
y1 = np.log(odcg151)-np.log(np.min(odcg151))
print('Min OD = %e'%((np.min(odcg151))))
evaly, params=Function_fit(tt,y1,0,-1,title = 'Ajuste control glucosa 0,4% E2R1')
A1 = params[0]
```

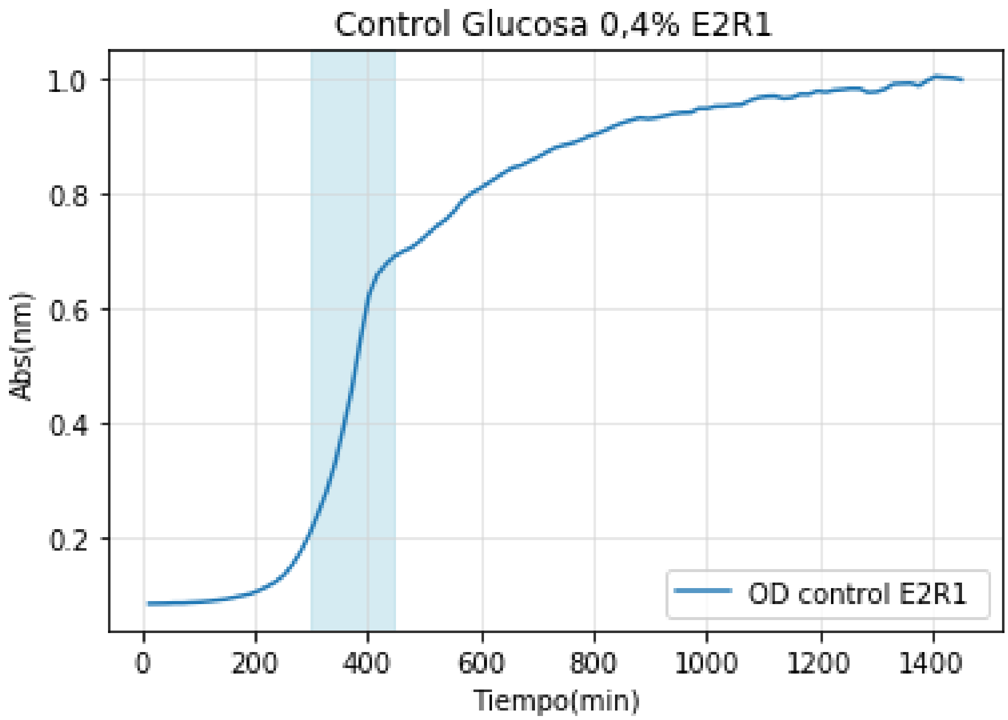
```python
um1=params[1]
l1=params[2]
print('A=%e'%(A1))
print('um=%e'%(um1))
print('l=%e'%(l1))

#Cálculo datos para determinar extensión de la fase exponencial
tm1=((A1/(np.exp(1)*um1))+l1)
print('Tm=%e'%(tm1))
t21=((np.log(2))/um1)
print('doubpe=%e'%(t21))
extdp1=2*t21
print('ext=%e'%extdp1)
ttot1=tm1+extdp1
print('Tfinal=%e'%ttot1)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[19]
y2=tt[29]
plt.figure()
plt.title('Control Glucosa 0,4% E2R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcg151,label='OD control E2R1 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E2R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[19:30],odcg151[19:30],label='OD control E2R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

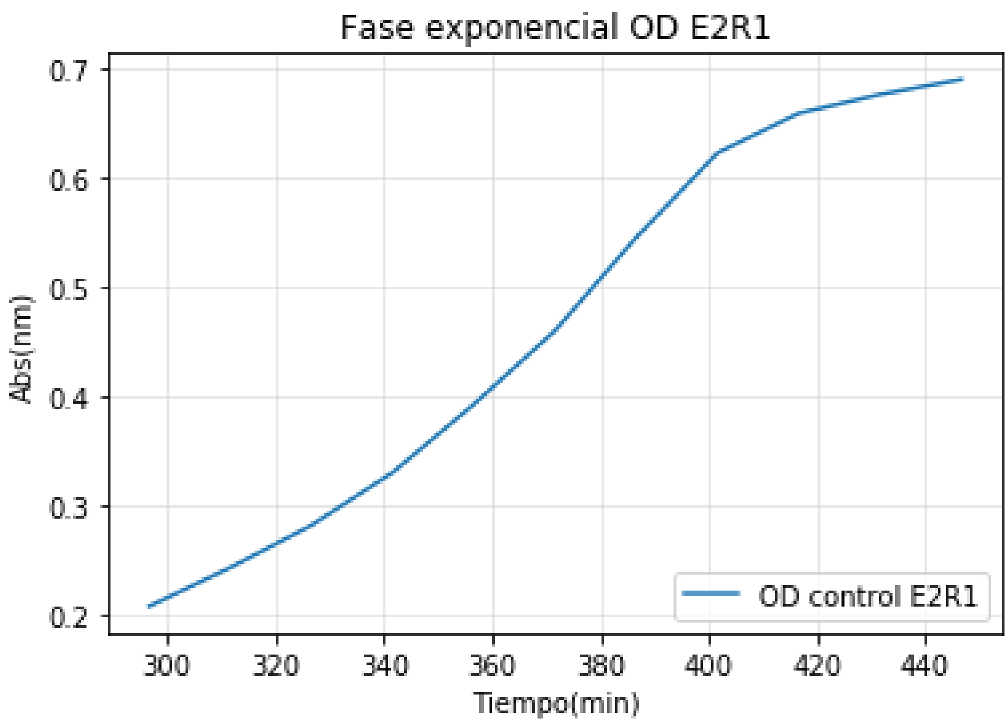
```
Min OD = 8.475000e-02
[  2.40766598e+00   1.00663667e-02   2.01163416e+02]
```




```
A=2.407666e+00
um=1.006637e-02
l=2.011634e+02
Tm=2.891525e+02
doubpe=6.885773e+01
ext=1.377155e+02
Tfinal=4.268680e+02
```

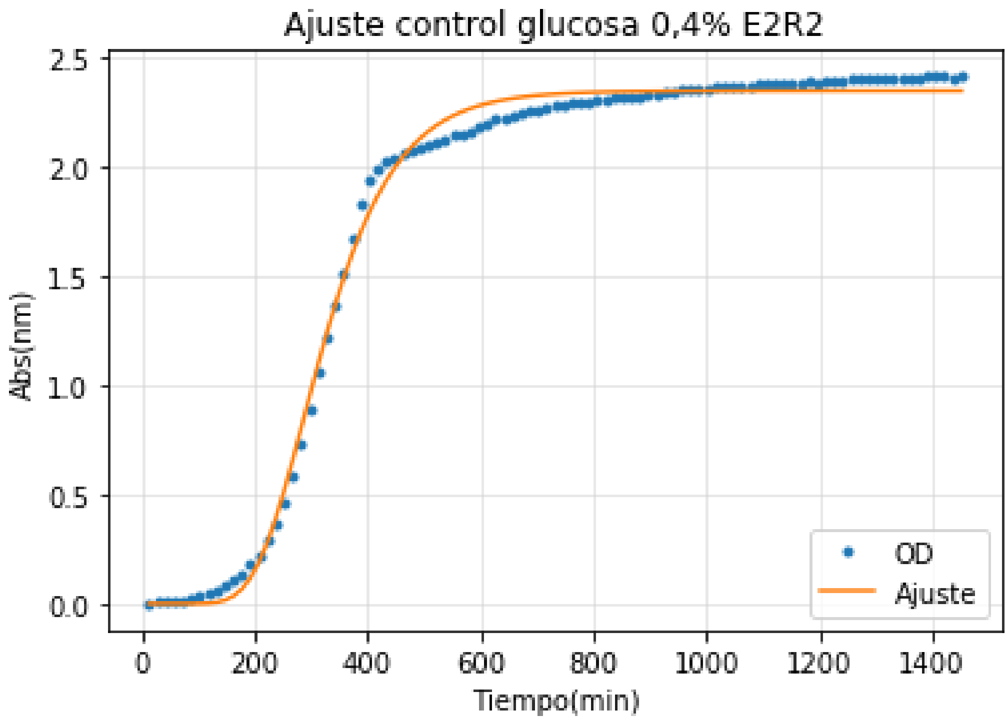
```
Out[5]: <matplotlib.legend.Legend at 0x236577b4f98>
```


Control Glucosa 0,4% E2R1
Abs(nm)
Tiempo(min)
OD control E2R1
1.0
0.8
0.6
0.4
0.2
0
200
400
600
800
1000
1200
1400


Fase exponencial OD E2R1
Abs(nm)
Tiempo(min)
OD control E2R1
0.7
0.6
0.5
0.4
0.3
0.2
300
320
340
360
380
400
420
440

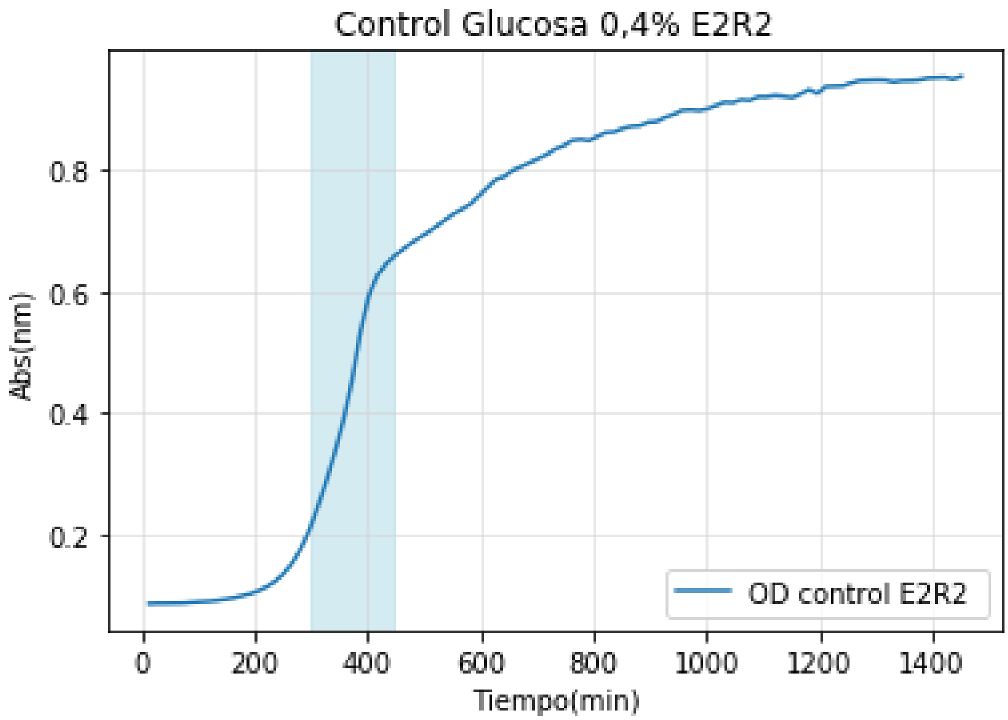
```
In [6]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
        #control glucosa rep 2
        y2= np.log(odcg152)-np.log(np.min(odcg152))
        print('Min OD = %e'%((np.min(odcg152))))
        evaly, params=Function_fit(tt,y2,0,-1, title = 'Ajuste control glucosa 0,4% E2R2')
        A2 = params[0]
        um2=params[1]
        l2=params[2]
        print('A=%e'%(A2))
        print('um=%e'%(um2))
        print('l=%e'%(l2))

        #Cálculo datos para determinar extensión de la fase exponencial
        tm2=((A2/(np.exp(1)*um2))+l2)
        print('Tm=%e'%(tm2))
        t22=((np.log(2))/um2)
        print('doubpe=%e'%(t22))
        extdp2=2*t22
        print('ext=%e'%extdp2)
        ttot2=tm2+extdp2
        print('Tfinal=%e'%ttot2)

        #Delimitación fase exponencial en grafico con OD/tiempo
        y1=tt[19]
        y2=tt[29]
        plt.figure()
        plt.title('Control Glucosa 0,4% E2R2')
        plt.xlabel('Tiempo(min)')
        plt.ylabel('Abs(nm)')
        plt.plot(tt,odcg152,label='OD control E2R2 ')
        plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
        plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
        plt.legend(loc='lower right')

        #Fase exponencial OD/tiempo
        plt.figure()
        plt.title('Fase exponencial OD E2R2')
        plt.xlabel('Tiempo(min)')
        plt.ylabel('Abs(nm)')
        plt.plot(tt[19:30],odcg152[19:30],label='OD control E2R2')
        plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
        plt.legend(loc='lower right')
```

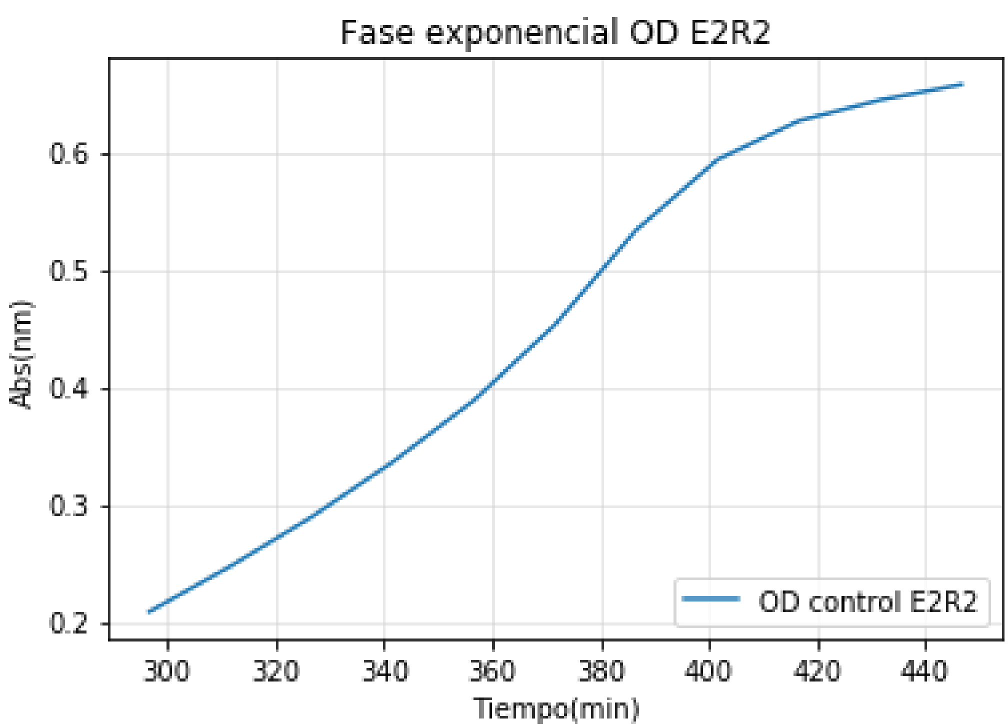
```
Min OD = 8.550000e-02
[  2.34701846e+00   9.83004768e-03   1.99784486e+02]
```




```
A=2.347018e+00
um=9.830048e-03
l=1.997845e+02
Tm=2.876192e+02
doubpe=7.051310e+01
ext=1.410262e+02
Tfinal=4.286455e+02
```

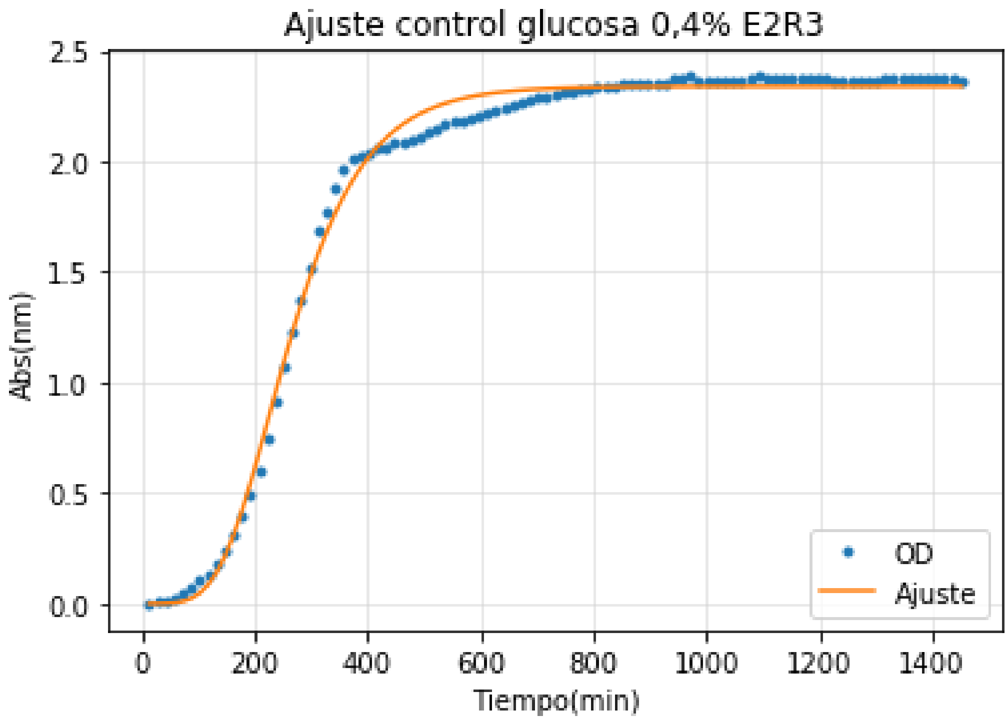
```
Out[6]: <matplotlib.legend.Legend at 0x23657970630>
```


Control Glucosa 0,4% E2R2
Abs(nm)
Tiempo(min)
OD control E2R2
0.2
0.4
0.6
0.8
0
200
400
600
800
1000
1200
1400


Fase exponencial OD E2R2
Abs(nm)
Tiempo(min)
OD control E2R2
0.2
0.3
0.4
0.5
0.6
300
320
340
360
380
400
420
440

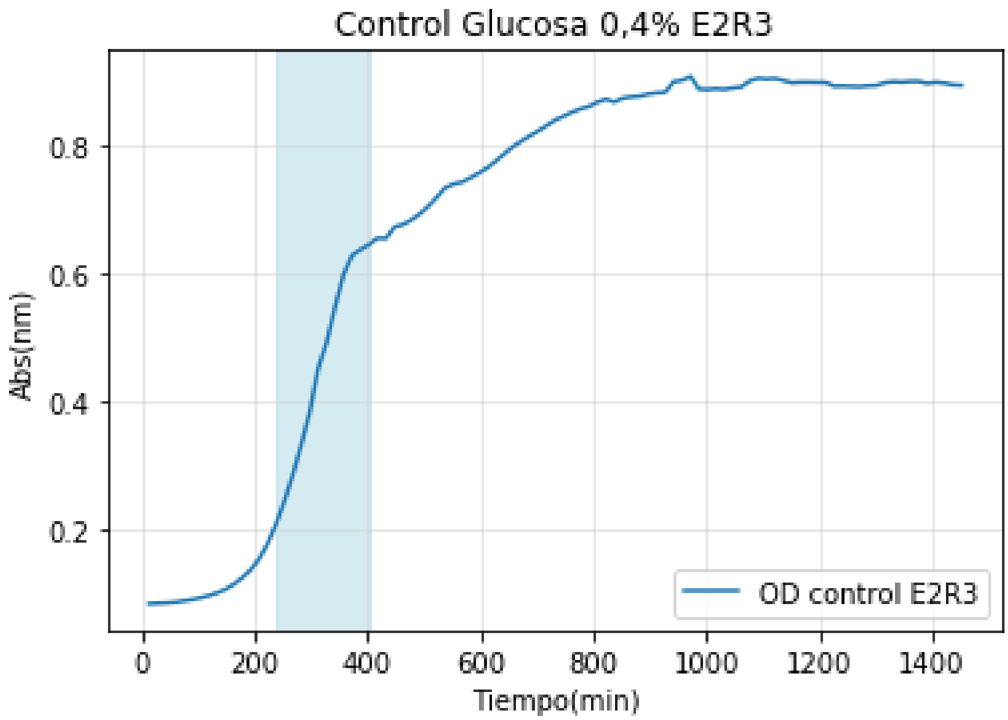
```
In [7]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
        #control glucosa rep 3
        y3= np.log(odcg153)-np.log(np.min(odcg153))
        print('Min OD = %e'%((np.min(odcg153))))
        evaly, params=Function_fit(tt,y3,0,-1, title = 'Ajuste control glucosa 0,4% E2R3')
        A3= params[0]
        um3=params[1]
        l3=params[2]
        print('A=%e'%(A3))
        print('um=%e'%(um3))
        print('l=%e'%(l3))

        #Cálculo datos para determinar extensión de la fase exponencial
        tm3=((A3/(np.exp(1)*um3))+l3)
        print('Tm=%e'%(tm3))
        t23=((np.log(2))/um3)
        print('doubpe=%e'%(t23))
        extdp3=2*t23
        print('ext=%e'%extdp3)
        ttot3=tm3+extdp3
        print('Tfinal=%e'%ttot3)


        #Delimitación fase exponencial en grafico con OD/tiempo
        y1=tt[15]
        y2=tt[26]
        plt.figure()
        plt.title('Control Glucosa 0,4% E2R3')
        plt.xlabel('Tiempo(min)')
        plt.ylabel('Abs(nm)')
        plt.plot(tt,odcg153,label='OD control E2R3')
        plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
        plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
        plt.legend(loc='lower right')

        #Fase exponencial OD/tiempo
        plt.figure()
        plt.title('Fase exponencial OD E2R3')
        plt.xlabel('Tiempo(min)')
        plt.ylabel('Abs(nm)')
        plt.plot(tt[15:27],odcg153[15:27],label='OD control E2R3')
        plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
        plt.legend(loc='lower right')
```

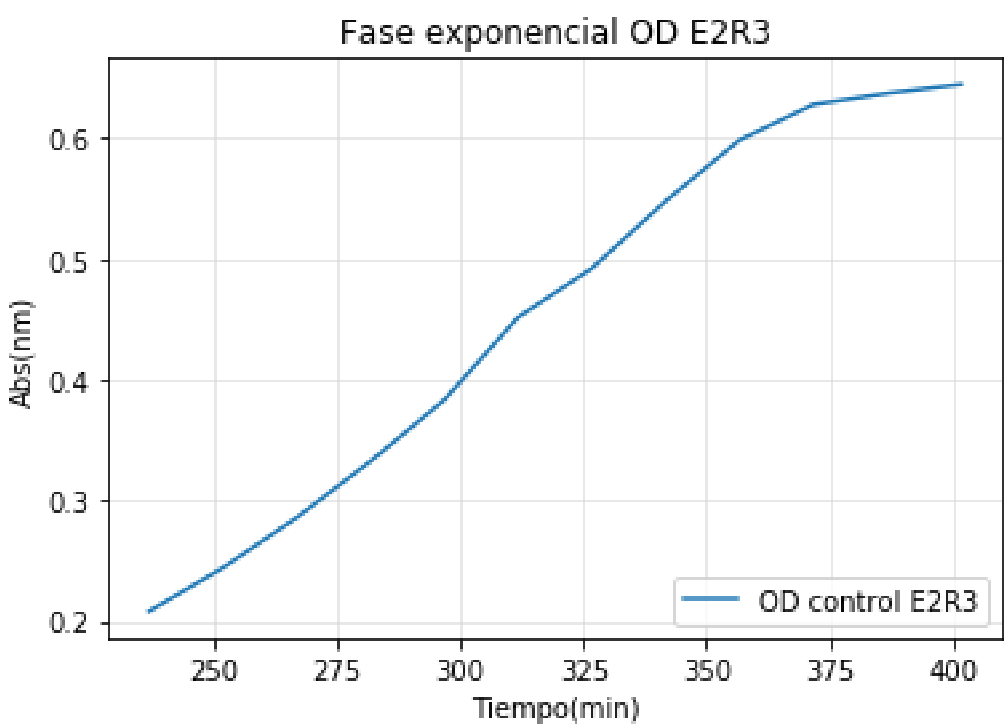
```
Min OD = 8.375000e-02
[  2.33929203e+00   9.40512328e-03   1.34262384e+02]
```




```
A=2.339292e+00
um=9.405123e-03
l=1.342624e+02
Tm=2.257633e+02
doubpe=7.369889e+01
ext=1.473978e+02
Tfinal=3.731611e+02
```

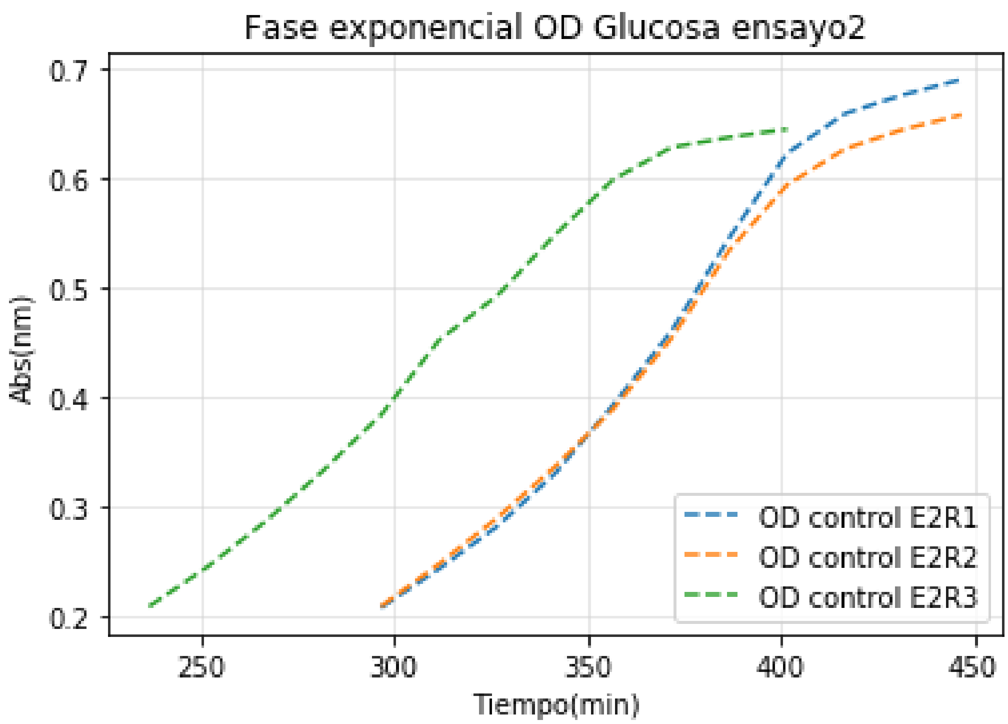
```
Out[7]: <matplotlib.legend.Legend at 0x23658b395c0>
```


Control Glucosa 0,4% E2R3
Abs(nm)
0.8
0.6
0.4
0.2
0
200
400
600
800
1000
1200
1400
Tiempo(min)
OD control E2R3


Fase exponencial OD E2R3
Abs(nm)
0.6
0.5
0.4
0.3
0.2
250
275
300
325
350
375
400
Tiempo(min)
OD control E2R3

```
In [8]: #Fase exponencial OD/tiempo
        plt.figure()
        plt.title('Fase exponencial OD Glucosa ensayo2')
        plt.xlabel('Tiempo(min)')
        plt.ylabel('Abs(nm)')
        plt.plot(tt[19:30],odcg151[19:30],'--',label='OD control E2R1')
        plt.plot(tt[19:30],odcg152[19:30],'--',label='OD control E2R2')
        plt.plot(tt[15:27],odcg153[15:27],'--',label='OD control E2R3')
        plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
        plt.legend(loc='lower right')
```

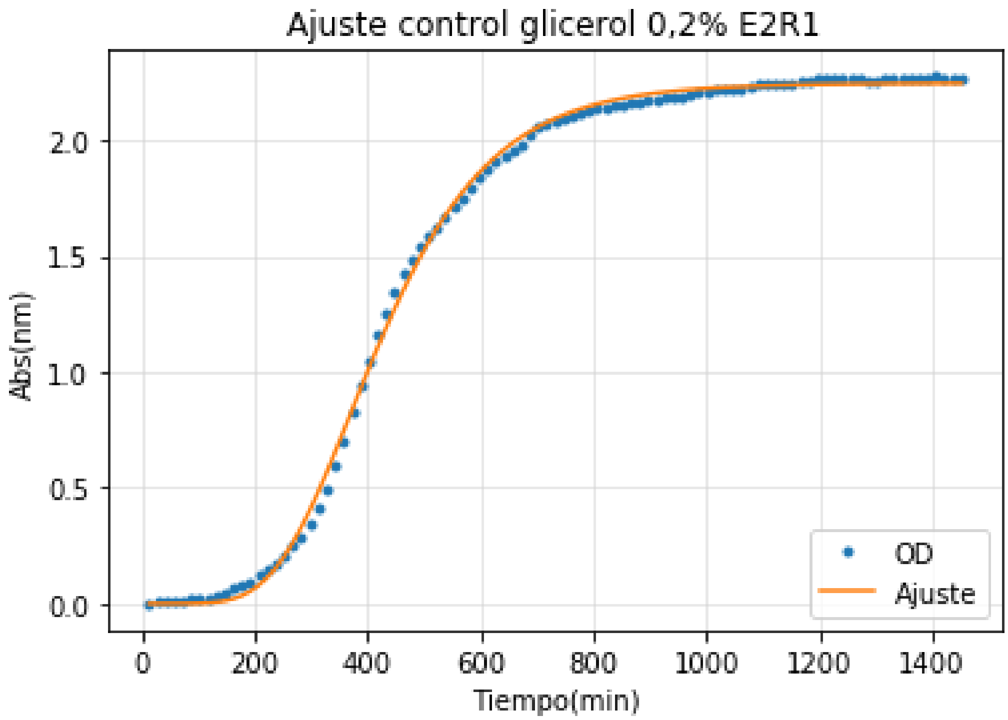
Out[8]: <matplotlib.legend.Legend at 0x23658c4cf28>




```
In [9]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
        #control glicerl rep 1
        y4= np.log(odcgl151)-np.log(np.min(odcgl151))
        print('Min OD = %e'%((np.min(odcgl151))))
        evaly, params=Function_fit(tt,y4,0,-1, title = 'Ajuste control glicerol 0,2% E2R1')
        A4= params[0]
        um4=params[1]
        l4=params[2]
        print('A=%e'%(A4))
        print('um=%e'%(um4))
        print('l=%e'%(l4))
```

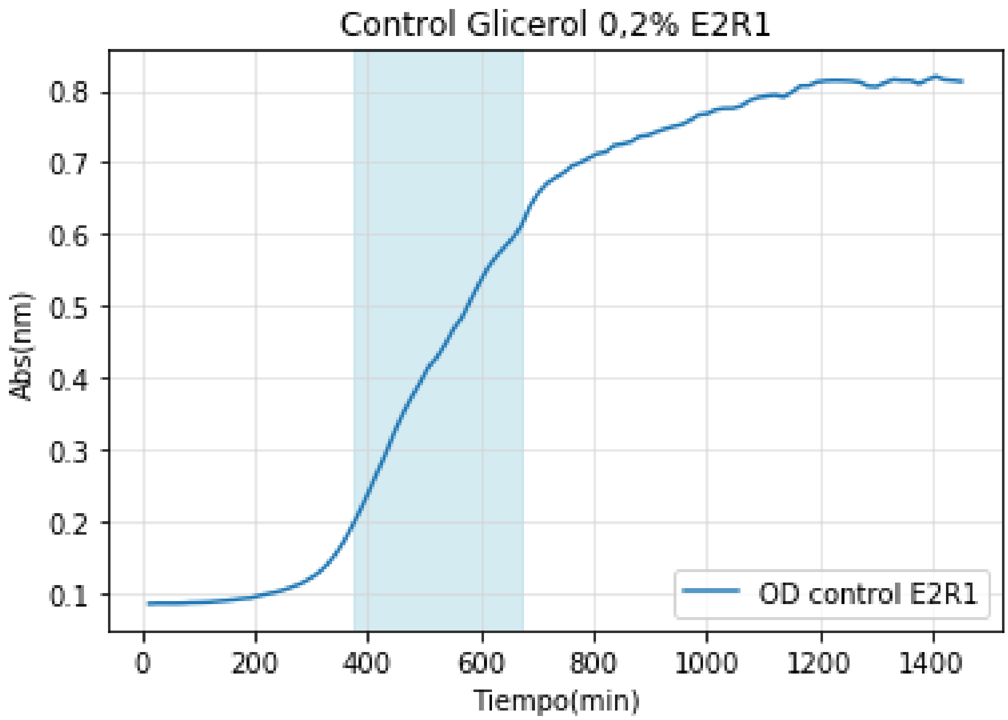
```
#Cálculo datos para determinar extensión de la fase exponencial
tm4=((A4/(np.exp(1)*um4))+l4)
print('Tm=%e'%(tm4))
t24=((np.log(2))/um4)
print('doubpe=%e'%(t24))
extdp4=2.5*t24
print('ext=%e'%extdp4)
ttot4=tm4+extdp4
print('Tfinal=%e'%ttot4)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[24]
y2=tt[44]
plt.figure()
plt.title('Control Glicerol 0,2% E2R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcgl151,label='OD control E2R1')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E2R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[24:45],odcgl151[24:45],label='OD control E2R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

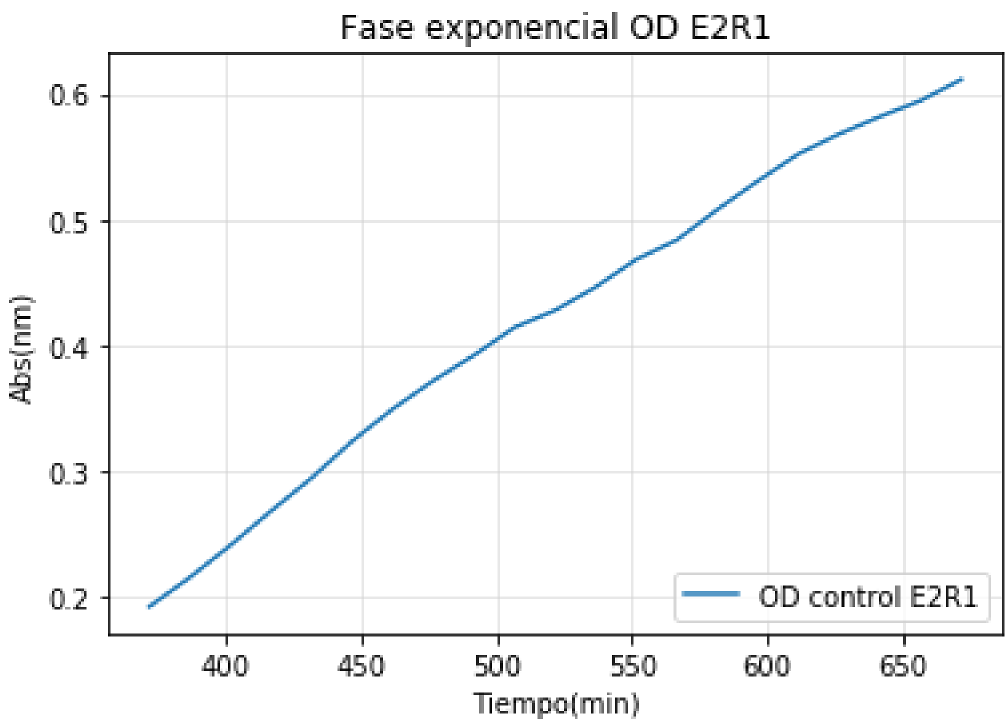
```
Min OD = 8.425000e-02
[  2.24595733e+00   6.08336131e-03   2.34248586e+02]
```




```
A=2.245957e+00
um=6.083361e-03
l=2.342486e+02
Tm=3.700685e+02
doubpe=1.139415e+02
ext=2.848537e+02
Tfinal=6.549222e+02
```

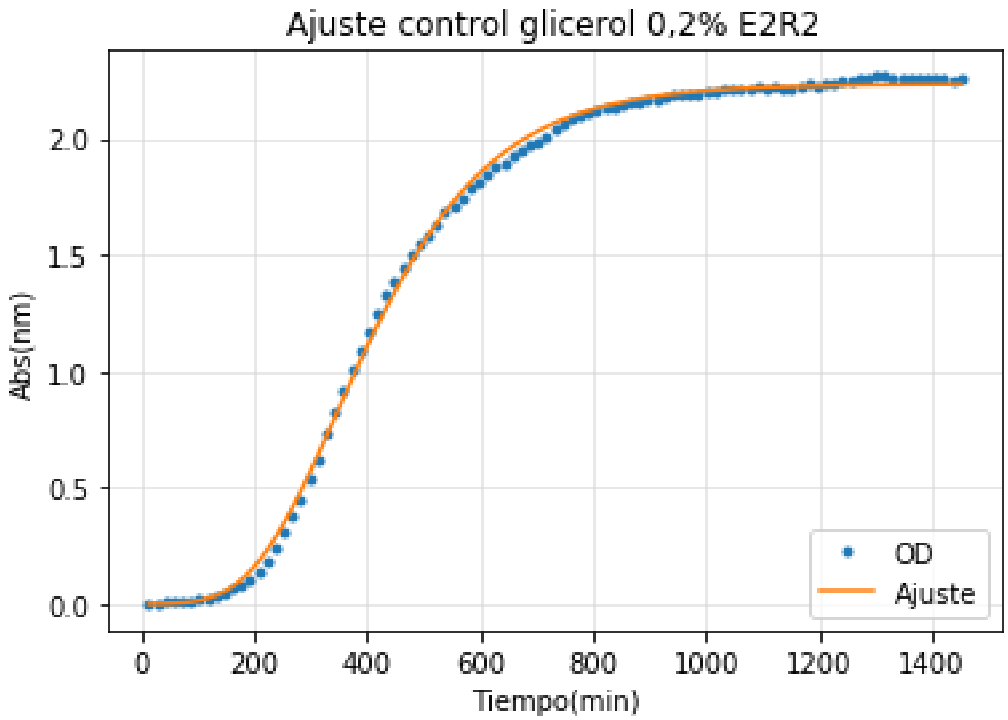
```
Out[9]: <matplotlib.legend.Legend at 0x23658dd3da0>
```


Control Glicerol 0,2% E2R1
Abs(nm)
Tiempo(min)
OD control E2R1


Fase exponencial OD E2R1
Abs(nm)
Tiempo(min)
OD control E2R1

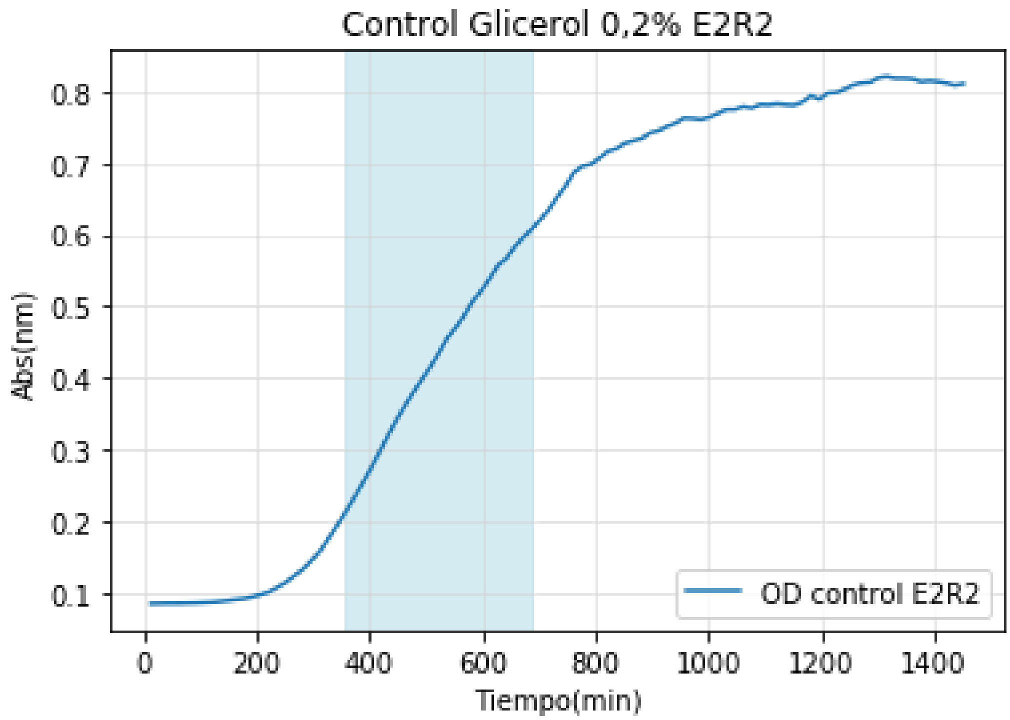
```
In [10]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
         #control glicerol rep 2
         y5= np.log(odcgl152)-np.log(np.min(odcgl152))
         print('Min OD = %e'%((np.min(odcgl152))))
         evaly, params=Function_fit(tt,y5,0,-1, title = 'Ajuste control glicerol 0,2% E2R2')
         A5= params[0]
         um5=params[1]
         l5=params[2]
         print('A=%e'%(A5))
         print('um=%e'%(um5))
         print('l=%e'%(l5))

         #Cálculo datos para determinar extensión de la fase exponencial
         tm5=((A5/(np.exp(1)*um5))+l5)
         print('Tm=%e'%(tm5))
         t25=((np.log(2))/um5)
         print('doubpe=%e'%(t25))
         extdp5=2.5*t25
         print('ext=%e'%extdp5)
         ttot5=tm5+extdp5
         print('Tfinal=%e'%ttot5)

         #Delimitación fase exponencial en grafico con OD/tiempo
         y1=tt[23]
         y2=tt[45]
         plt.figure()
         plt.title('Control Glicerol 0,2% E2R2')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt,odcgl152,label='OD control E2R2')
         plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

         #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD E2R2')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[23:46],odcgl152[23:46],label='OD control E2R2')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')
```

```
Min OD = 8.500000e-02
[  2.23521178e+00   5.43425313e-03   1.94280385e+02]
```

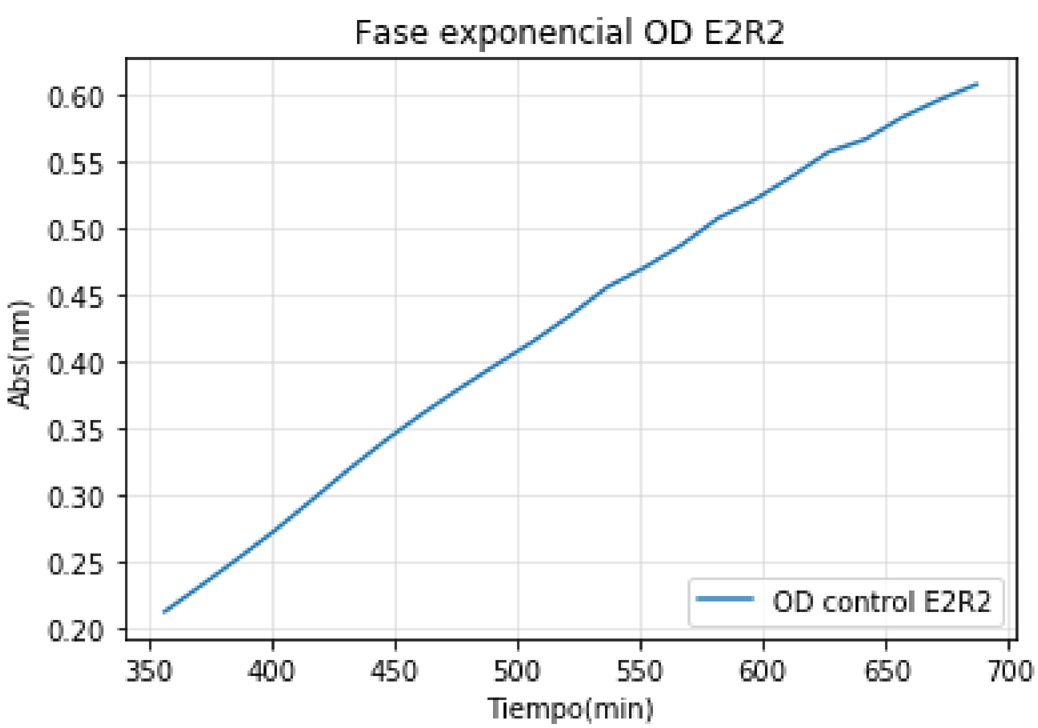



```
A=2.235212e+00
um=5.434253e-03
l=1.942804e+02
Tm=3.455962e+02
doubpe=1.275515e+02
ext=3.188788e+02
Tfinal=6.644750e+02
```

```
Out[10]: <matplotlib.legend.Legend at 0x236579d43c8>
```



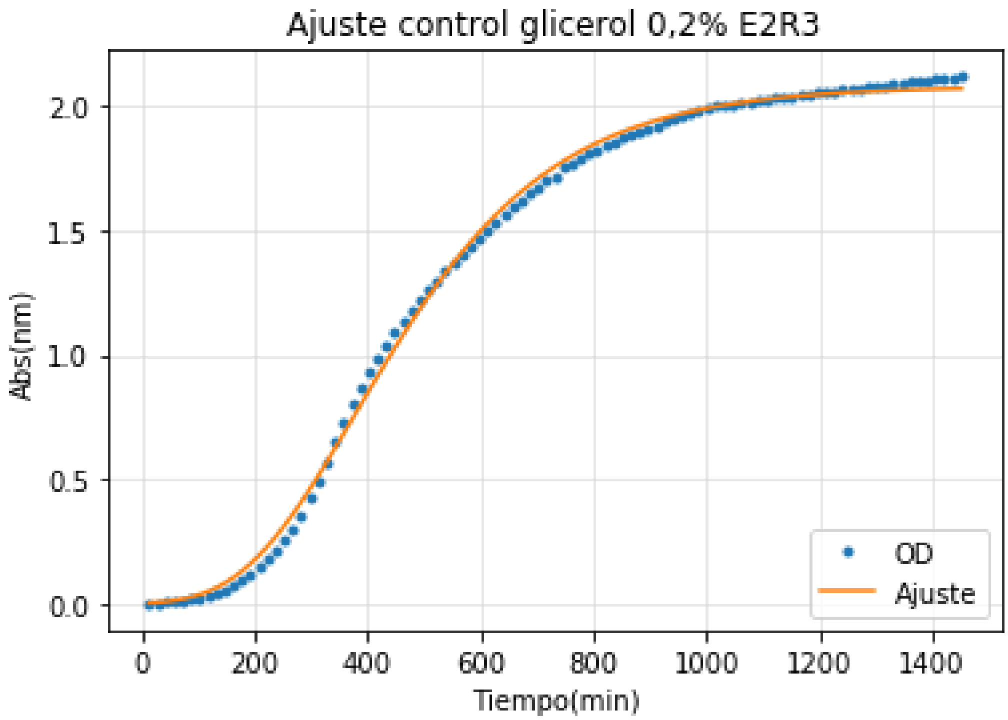
Control Glicerol 0,2% E2R2
Abs(nm)
Tiempo(min)
OD control E2R2



Fase exponencial OD E2R2
Abs(nm)
Tiempo(min)
OD control E2R2

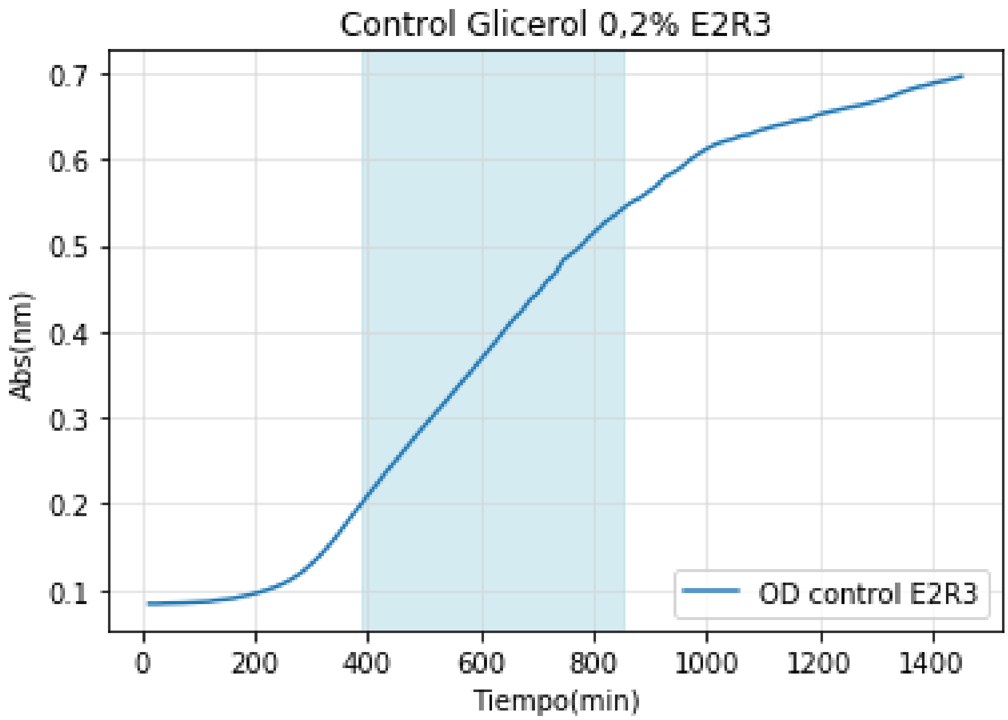
In [11]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#control glicerol rep 3
y6= np.log(odcgl153)-np.log(np.min(odcgl153))
print('Min OD = %e'%((np.min(odcgl153))))
evaly, params=Function_fit(tt,y6,0,-1, title = 'Ajuste control glicerol 0,2% E2R3')
A6= params[0]
um6=params[1]
l6=params[2]
print('A=%e'%(A6))
print('um=%e'%(um6))
print('l=%e'%(l6))

#Cálculo datos para determinar extensión de la fase exponencial
tm6=((A6/(np.exp(1)*um6))+l6)
print('Tm=%e'%(tm6))
t26=((np.log(2))/um6)
print('doubpe=%e'%(t26))
extdp6=2.5*t26
print('ext=%e'%extdp6)
ttot6=tm6+extdp6
print('Tfinal=%e'%ttot6)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[25]
y2=tt[56]
plt.figure()
plt.title('Control Glicerol 0,2% E2R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcgl153,label='OD control E2R3')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E2R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[25:57],odcgl153[25:57],label='OD control E2R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

```
Min OD = 8.375000e-02
[  2.07943812e+00   3.85150055e-03   1.79490460e+02]
```

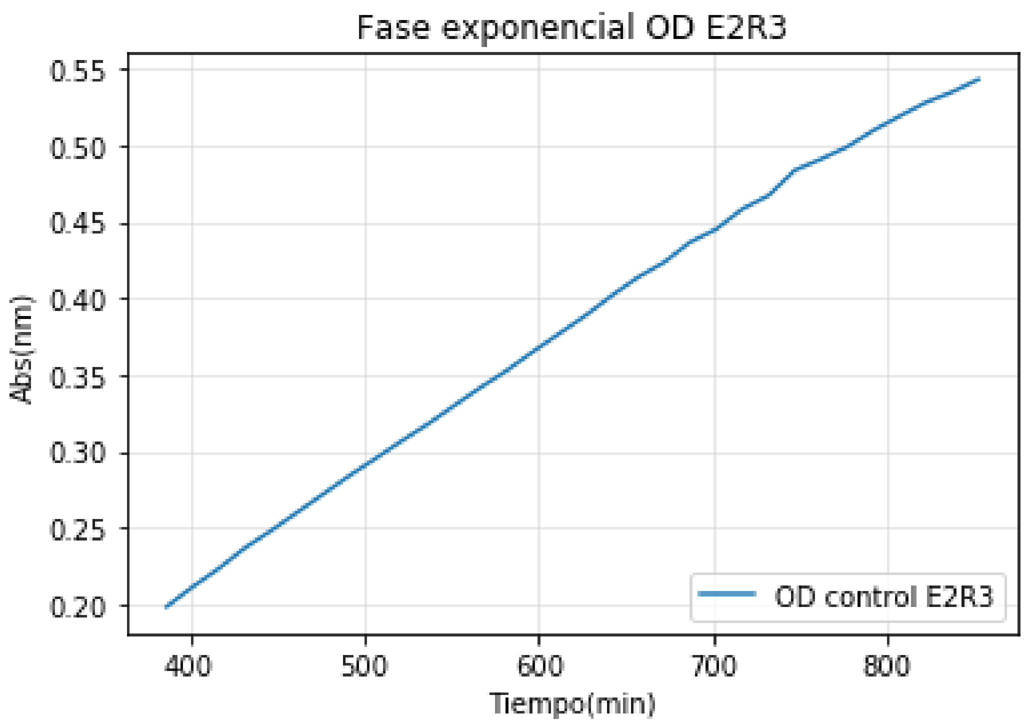



```
A=2.079438e+00
um=3.851501e-03
l=1.794905e+02
Tm=3.781098e+02
doubpe=1.799681e+02
ext=4.499202e+02
Tfinal=8.280300e+02
```

```
Out[11]: <matplotlib.legend.Legend at 0x23658a5fba8>
```



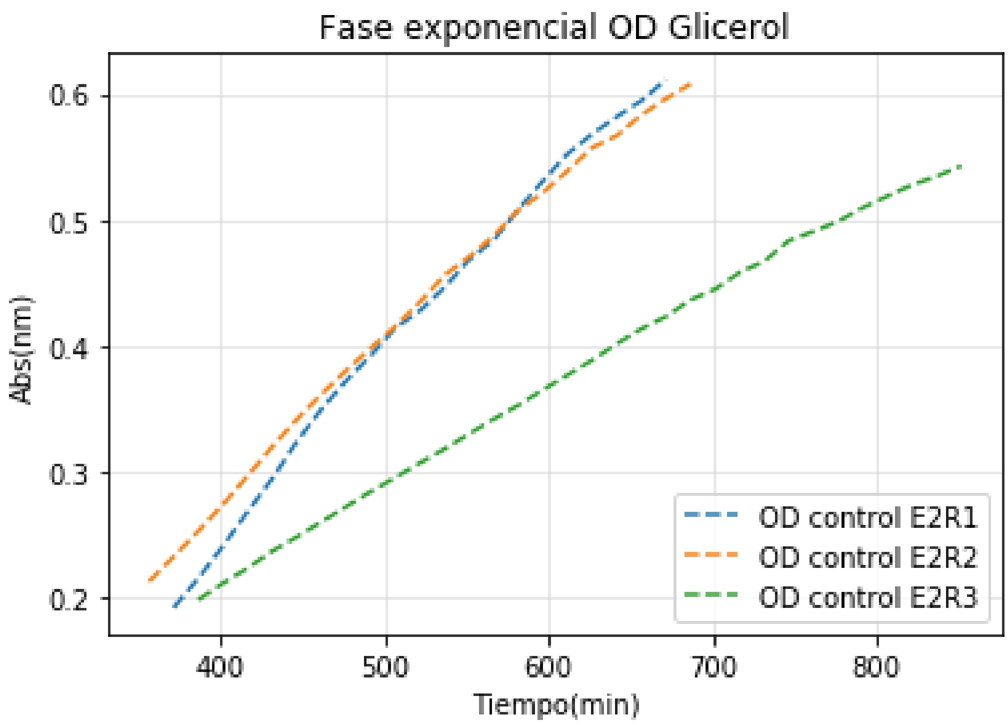
Control Glicerol 0,2% E2R3
Abs(nm)
Tiempo(min)
OD control E2R3



Fase exponencial OD E2R3
Abs(nm)
Tiempo(min)
OD control E2R3

In [12]:
```
#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD Glicerol')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[24:45],odcgl151[24:45],'--',label='OD control E2R1')
plt.plot(tt[23:46],odcgl152[23:46],'--',label='OD control E2R2')
plt.plot(tt[25:57],odcgl153[25:57],'--',label='OD control E2R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

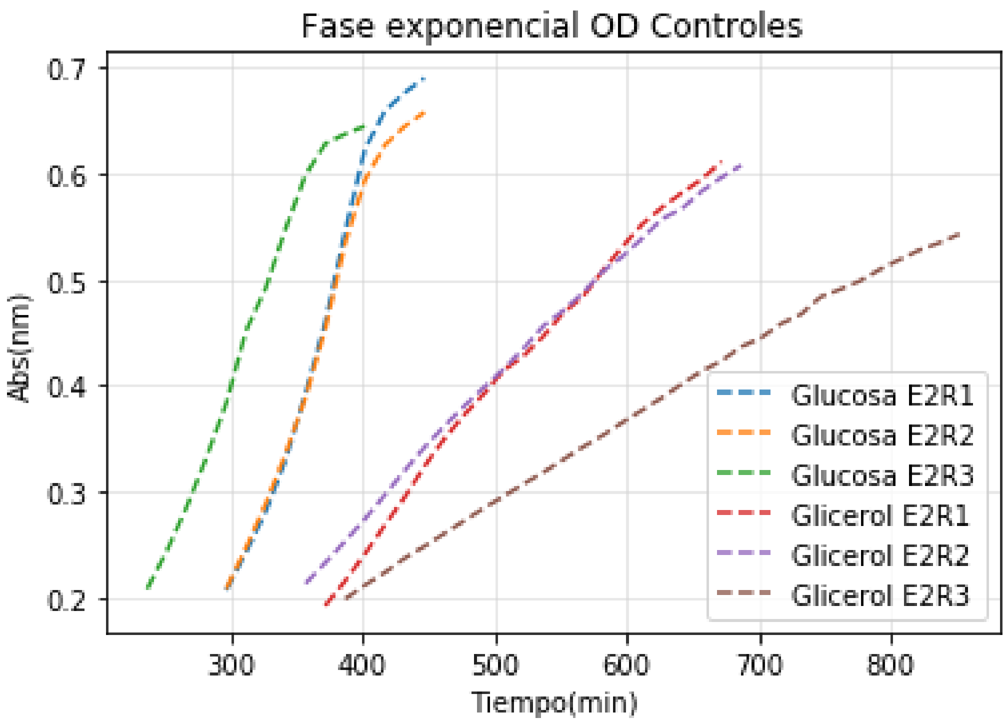
Out[12]: <matplotlib.legend.Legend at 0x23658f0bc88>



In [13]:
```
#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD Controles')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[19:30],odcg151[19:30],'--',label='Glucosa E2R1')
plt.plot(tt[19:30],odcg152[19:30],'--',label='Glucosa E2R2')
plt.plot(tt[15:27],odcg153[15:27],'--',label='Glucosa E2R3')
plt.plot(tt[24:45],odcgl151[24:45],'--',label='Glicerol E2R1')
plt.plot(tt[23:46],odcgl152[23:46],'--',label='Glicerol E2R2')
plt.plot(tt[25:57],odcgl153[25:57],'--',label='Glicerol E2R3')
```

```
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

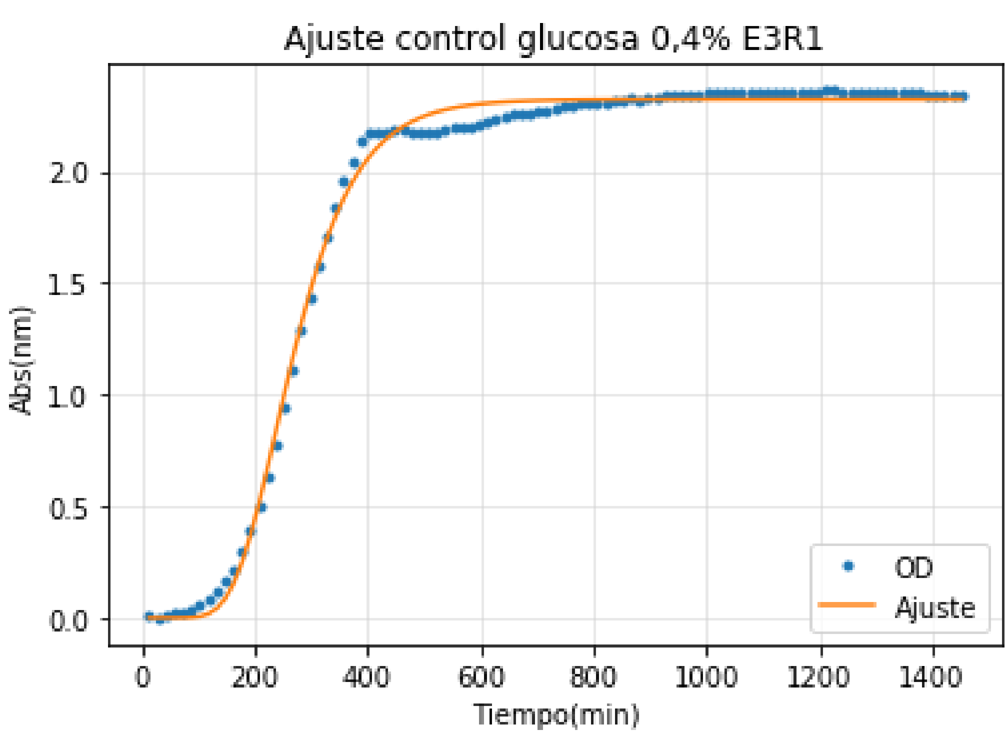
Out[13]: <matplotlib.legend.Legend at 0x23658fc7b70>



In [14]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#control glucosa rep 1
y7 = np.log(odcg181)-np.log(np.min(odcg181))
print('Min OD = %e'%((np.min(odcg181))))
evaly, params=Function_fit(tt,y7,0,-1,title = 'Ajuste control glucosa 0,4% E3R1')
A7 = params[0]
um7=params[1]
l7=params[2]
print('A=%e'%(A7))
print('um=%e'%(um7))
print('l=%e'%(l7))

#Cálculo datos para determinar extensión de la fase exponencial
tm7=((A7/(np.exp(1)*um7))+l7)
print('Tm=%e'%(tm7))
t27=((np.log(2))/um7)
print('doubpe=%e'%(t27))
extdp7=2*t27
print('ext=%e'%extdp7)
```

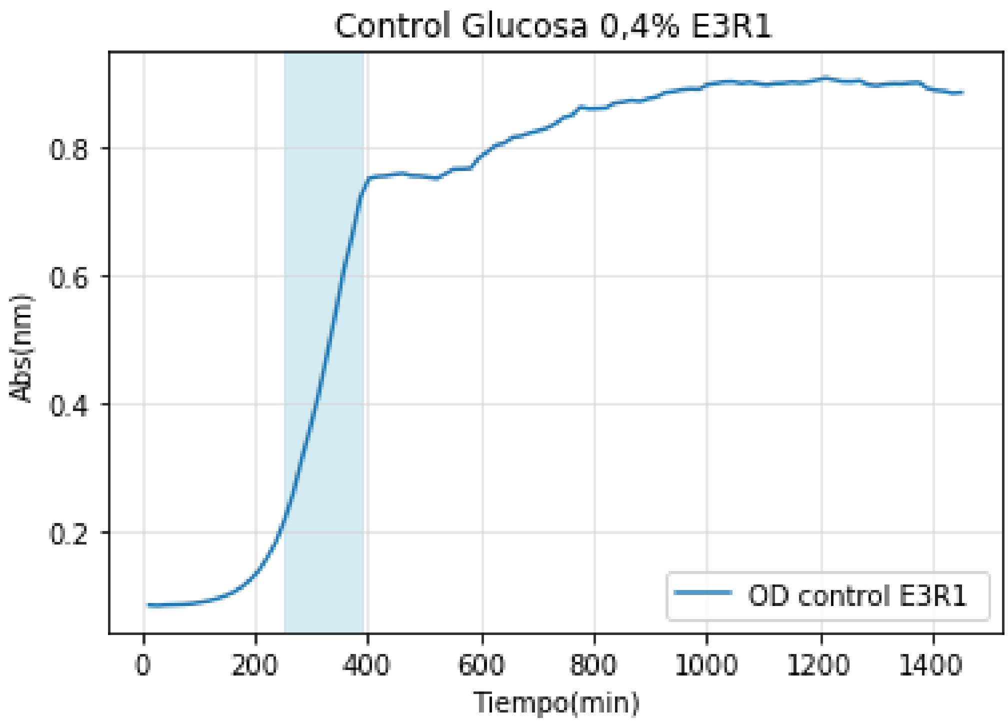
```
ttot7=tm7+extdp7
print('Tfinal=%e'%ttot7)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[16]
y2=tt[25]
plt.figure()
plt.title('Control Glucosa 0,4% E3R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcg181,label='OD control E3R1 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E3R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[16:26],odcg181[16:26],label='OD control E3R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

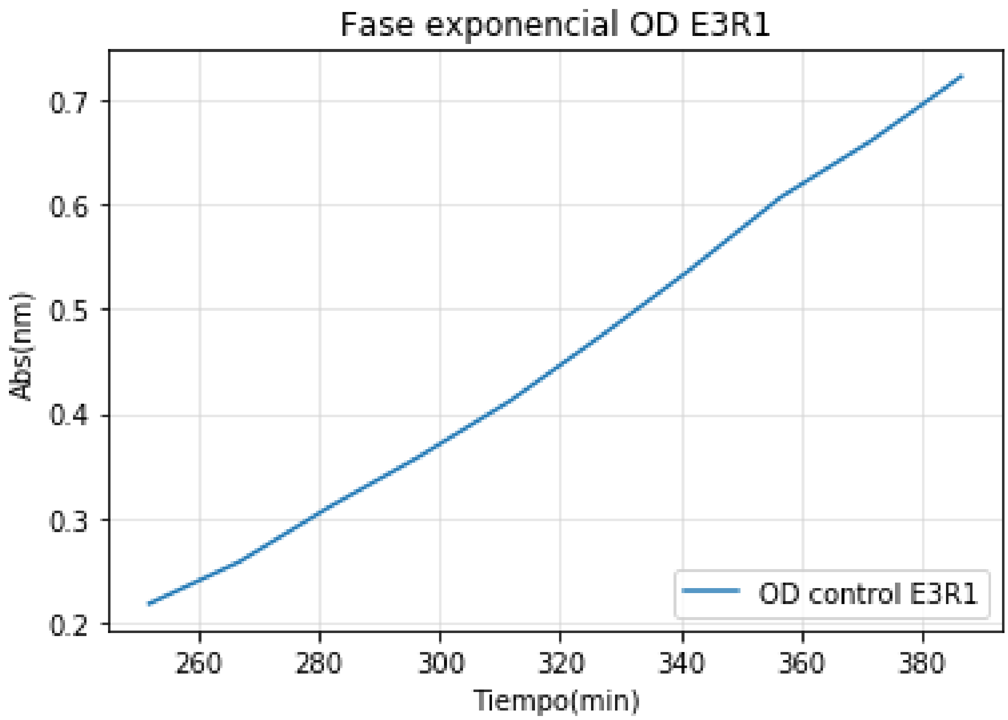
```
Min OD = 8.550000e-02
[  2.32234986e+00   1.11487857e-02   1.61538943e+02]
```



```
A=2.322350e+00
um=1.114879e-02
l=1.615389e+02
Tm=2.381701e+02
doubpe=6.217244e+01
ext=1.243449e+02
Tfinal=3.625150e+02
```

```
Out[14]: <matplotlib.legend.Legend at 0x23657931588>
```

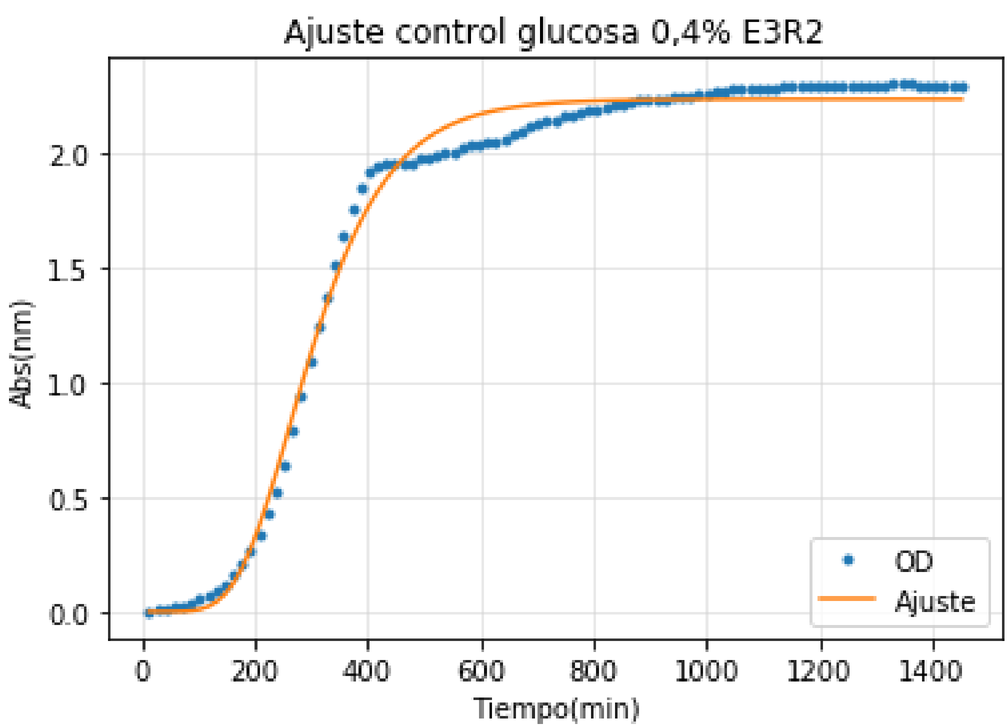




In [15]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#control glucosa rep 2
y8= np.log(odcg182)-np.log(np.min(odcg182))
print('Min OD = %e'%((np.min(odcg182))))
evaly, params=Function_fit(tt,y8,0,-1, title = 'Ajuste control glucosa 0,4% E3R2')
A8 = params[0]
um8=params[1]
l8=params[2]
print('A=%e'%(A8))
print('um=%e'%(um8))
print('l=%e'%(l8))

#Cálculo datos para determinar extensión de la fase exponencial
tm8=((A8/(np.exp(1)*um8))+l8)
print('Tm=%e'%(tm8))
t28=((np.log(2))/um8)
print('doubpe=%e'%(t28))
extdp8=2*t28
print('ext=%e'%extdp8)
ttot8=tm8+extdp8
print('Tfinal=%e'%ttot8)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[17]
```

```python
y2=tt[29]
plt.figure()
plt.title('Control Glucosa 0,4% E3R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcg182,label='OD control E3R2 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E3R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[17:30],odcg182[17:30],label='OD control E3R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

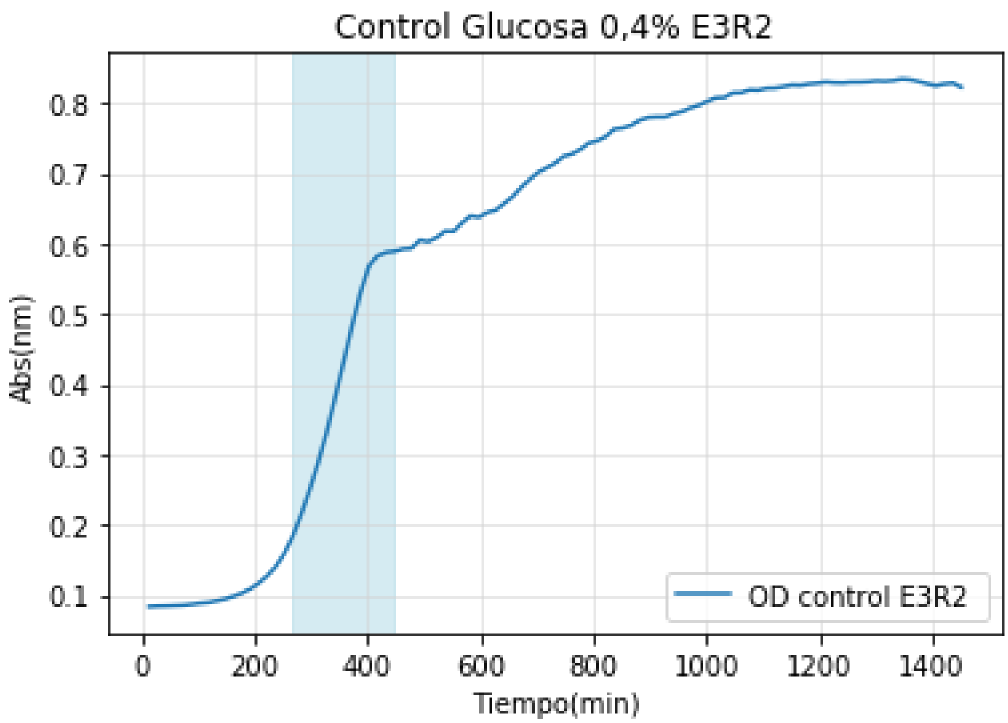
```
Min OD = 8.375000e-02
[  2.23365370e+00   8.60171922e-03   1.67065878e+02]
```

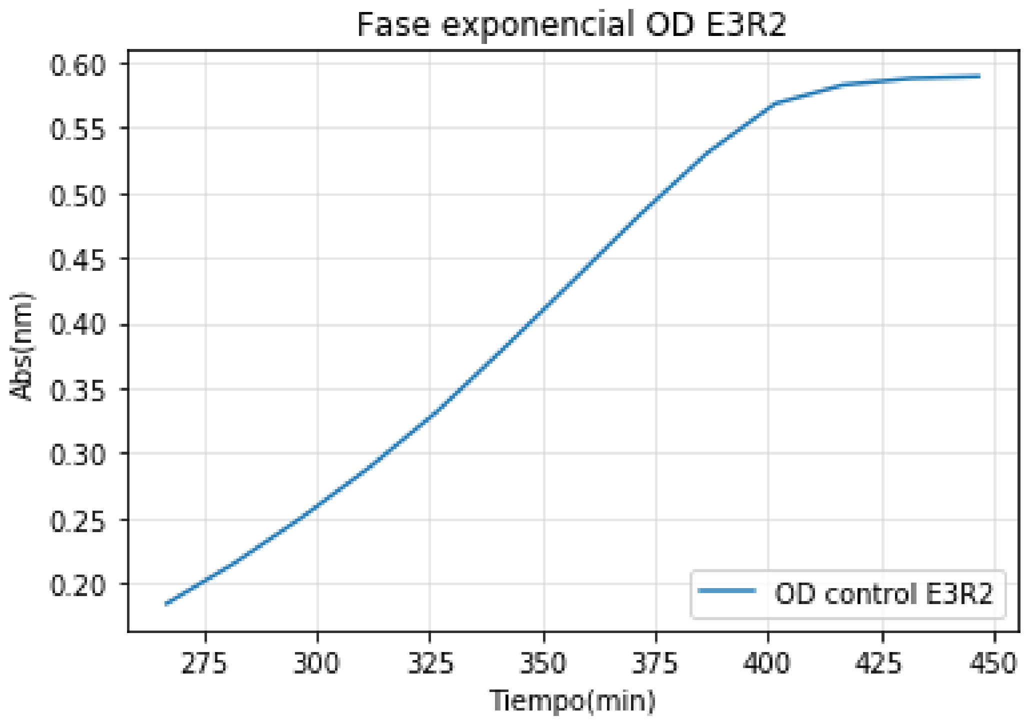



```
A=2.233654e+00
um=8.601719e-03
```

```
l=1.670659e+02
Tm=2.625951e+02
doubpe=8.058240e+01
ext=1.611648e+02
Tfinal=4.237599e+02
```

Out[15]: <matplotlib.legend.Legend at 0x23658a297b8>

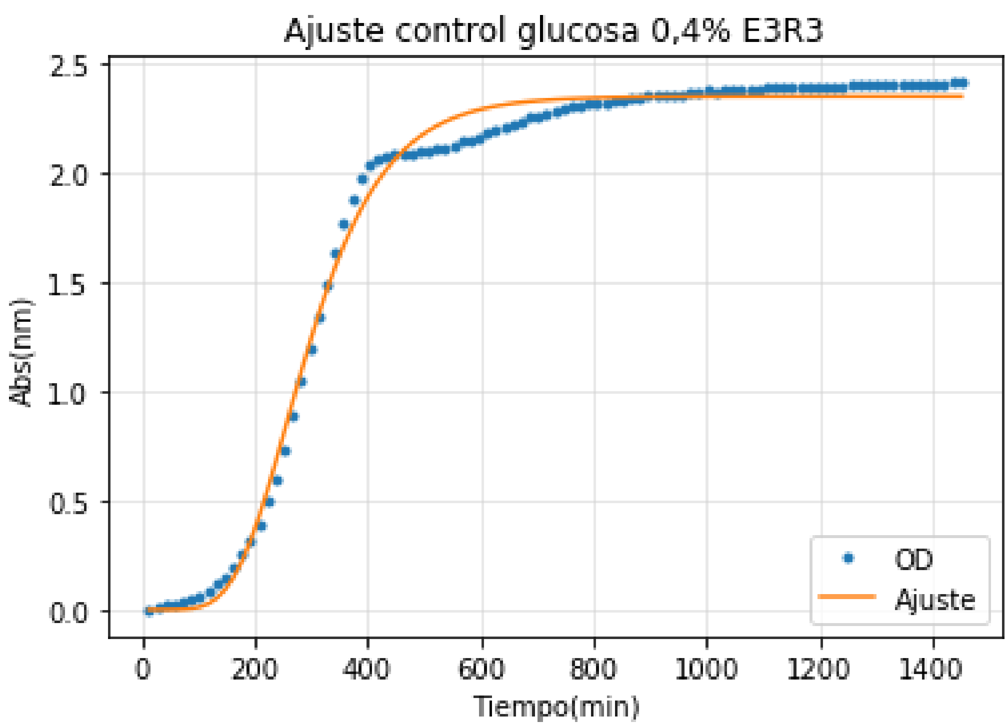




In [16]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#control glucosa rep 3
y9= np.log(odcg183)-np.log(np.min(odcg183))
print('Min OD = %e'%((np.min(odcg183))))
evaly, params=Function_fit(tt,y9,0,-1, title = 'Ajuste control glucosa 0,4% E3R3')
A9= params[0]
um9=params[1]
l9=params[2]
print('A=%e'%(A9))
print('um=%e'%(um9))
print('l=%e'%(l9))

#Cálculo datos para determinar extensión de la fase exponencial
tm9=((A9/(np.exp(1)*um9))+l9)
print('Tm=%e'%(tm9))
t29=((np.log(2))/um9)
print('doubpe=%e'%(t29))
extdp9=2*t29
print('ext=%e'%extdp9)
ttot9=tm9+extdp9
print('Tfinal=%e'%ttot9)


#Delimitación fase exponencial en grafico con OD/tiempo
```

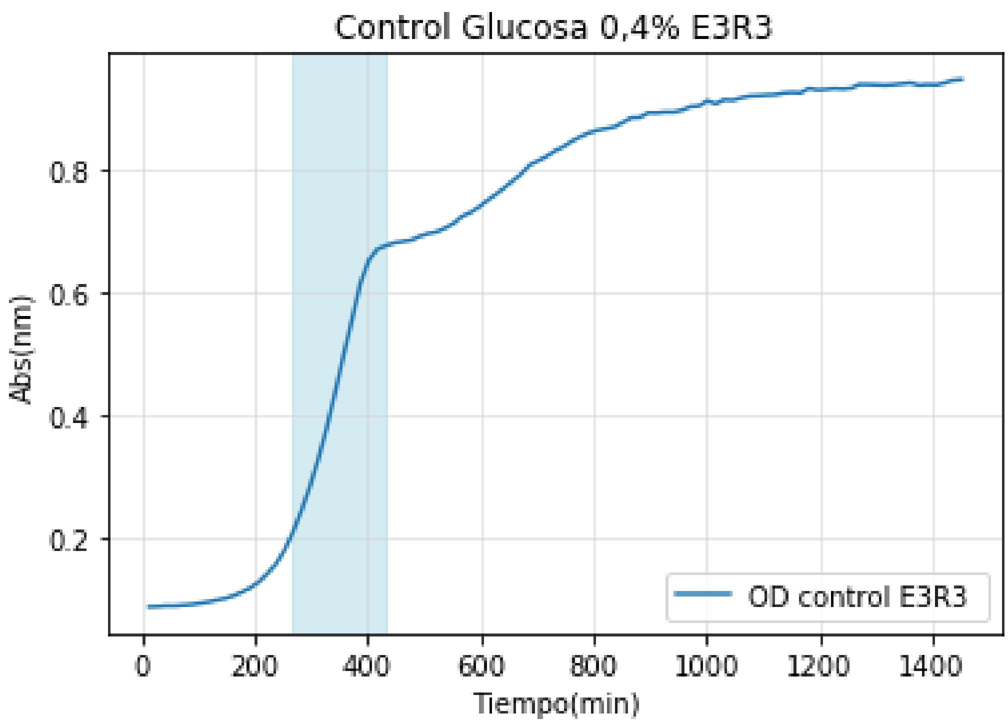
```
y1=tt[17]
y2=tt[28]
plt.figure()
plt.title('Control Glucosa 0,4% E3R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcg183,label='OD control E3R3 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E3R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[17:29],odcg183[17:29],label='OD control E3R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

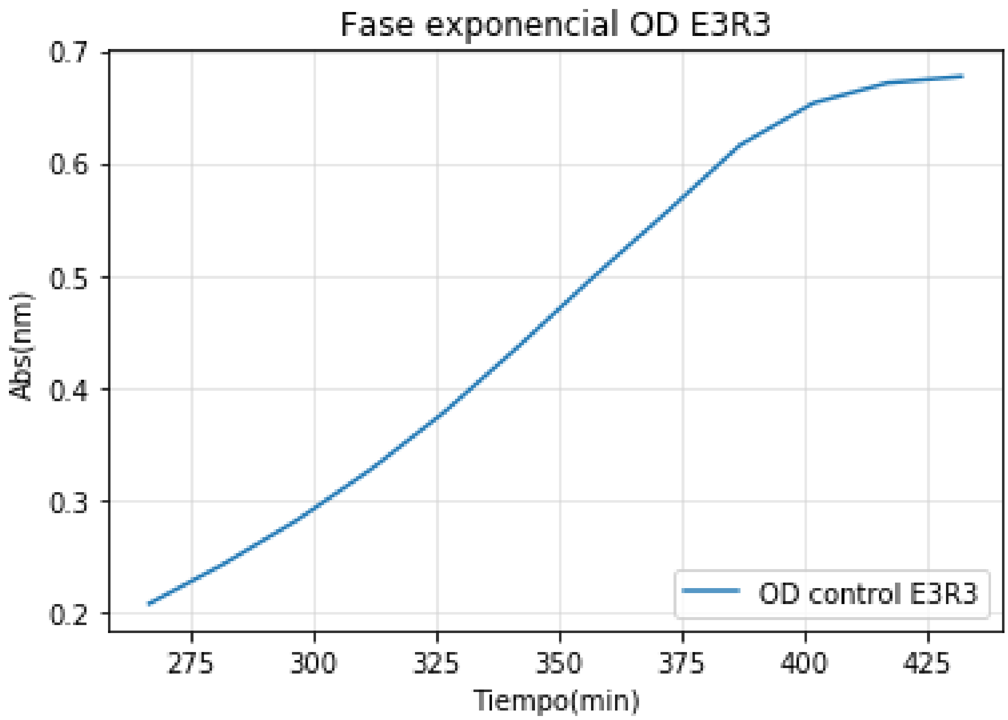
```
Min OD = 8.525000e-02
[  2.34758891e+00   9.20947423e-03   1.63131184e+02]
```



```
A=2.347589e+00
um=9.209474e-03
l=1.631312e+02
Tm=2.569074e+02
doubpe=7.526458e+01
ext=1.505292e+02
Tfinal=4.074366e+02
```

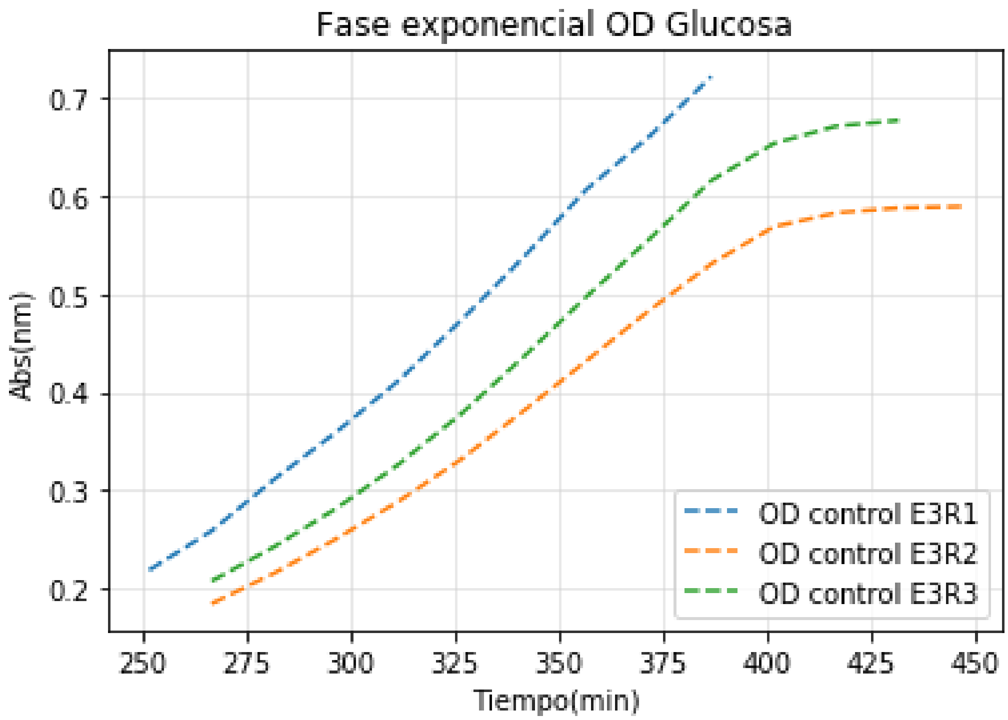
```
Out[16]: <matplotlib.legend.Legend at 0x23659151a20>
```






```
In [17]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD Glucosa')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[16:26],odcg181[16:26],'--',label='OD control E3R1')
         plt.plot(tt[17:30],odcg182[17:30],'--',label='OD control E3R2')
         plt.plot(tt[17:29],odcg183[17:29],'--',label='OD control E3R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')
```

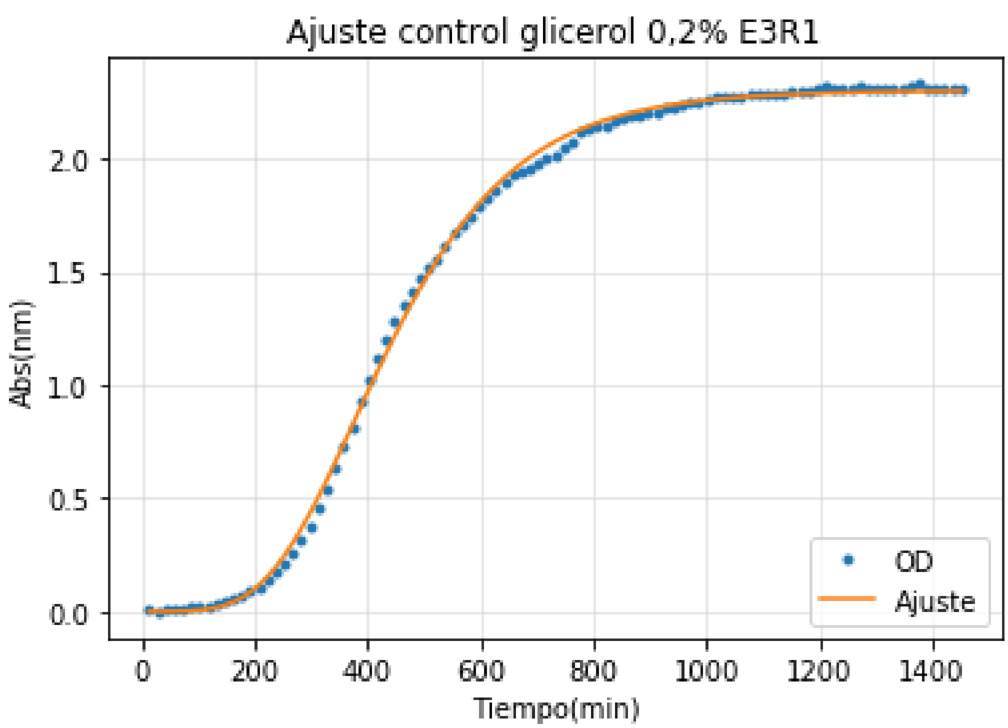
```
Out[17]: <matplotlib.legend.Legend at 0x23659275ba8>
```



In [18]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#control glicerl rep 1
y10= np.log(odcgl181)-np.log(np.min(odcgl181))
print('Min OD = %e'%((np.min(odcgl181))))
evaly, params=Function_fit(tt,y10,0,-1, title = 'Ajuste control glicerol 0,2% E3R1')
A10= params[0]
um10=params[1]
l10=params[2]
print('A=%e'%(A10))
print('um=%e'%(um10))
print('l=%e'%(l10))

#Cálculo datos para determinar extensión de la fase exponencial
tm10=((A10/(np.exp(1)*um10))+l10)
print('Tm=%e'%(tm10))
t210=((np.log(2))/um10)
print('doubpe=%e'%(t210))
extdp10=2.5*t210
print('ext=%e'%extdp10)
ttot10=tm10+extdp10
print('Tfinal=%e'%ttot10)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[25]
```

```
y2=tt[47]
plt.figure()
plt.title('Control Glicerol 0,2% E3R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcgl181,label='OD control E3R1 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E3R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[25:48],odcgl181[25:48],label='OD control E3R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

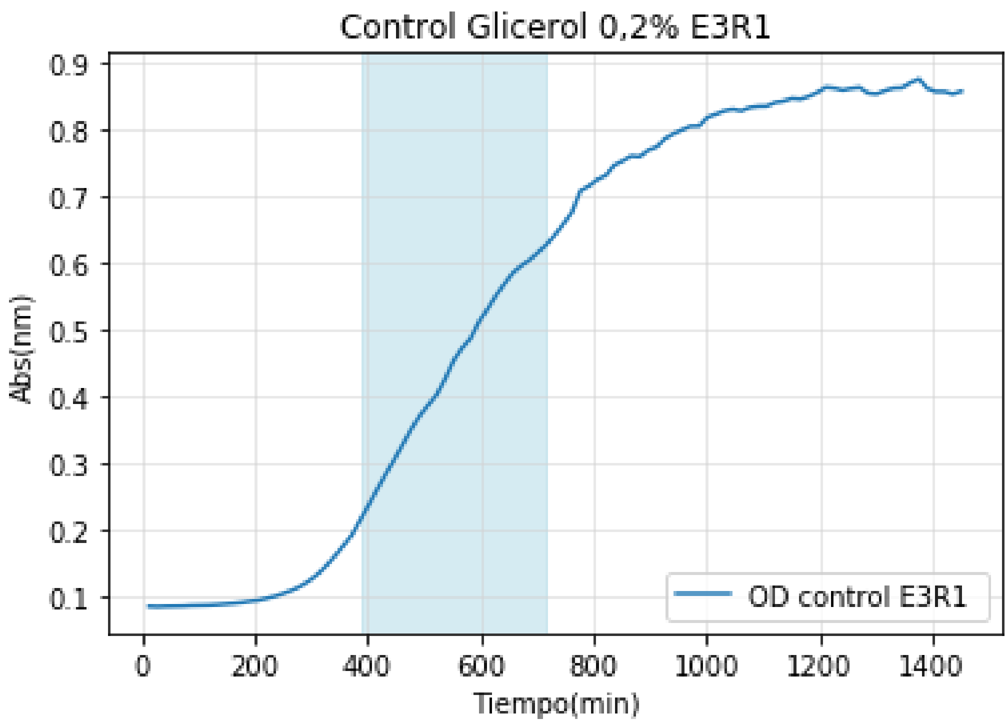
```
Min OD = 8.525000e-02
[  2.29993135e+00   5.42425453e-03   2.20607778e+02]
```

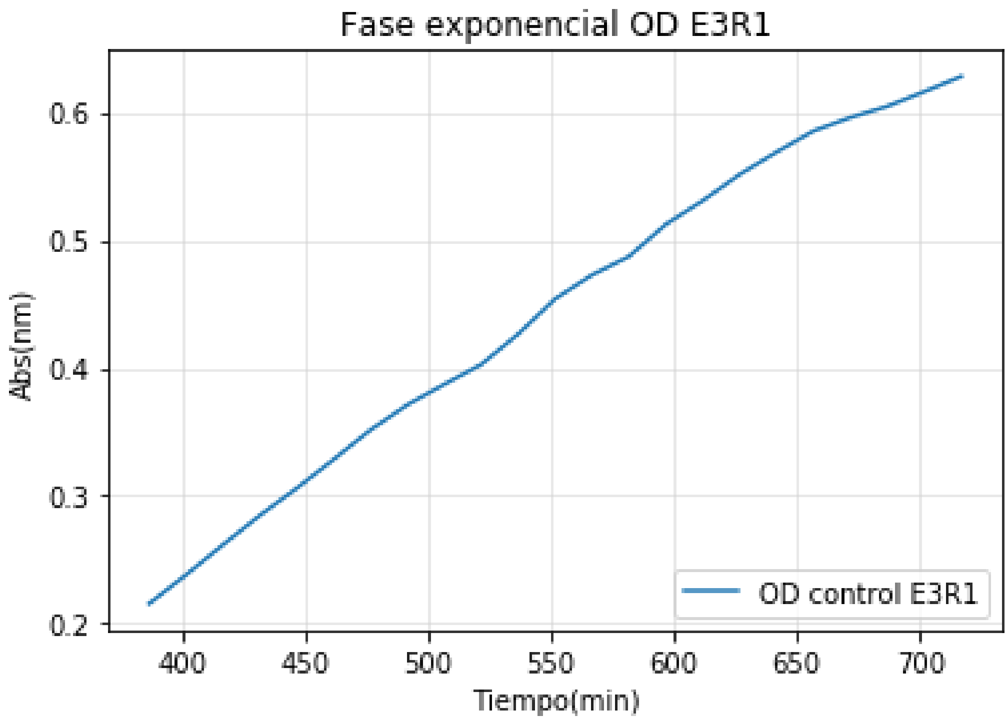



```
A=2.299931e+00
um=5.424255e-03
```

```
l=2.206078e+02
Tm=3.765919e+02
doubpe=1.277866e+02
ext=3.194666e+02
Tfinal=6.960584e+02
```

```
Out[18]: <matplotlib.legend.Legend at 0x236593f0ef0>
```

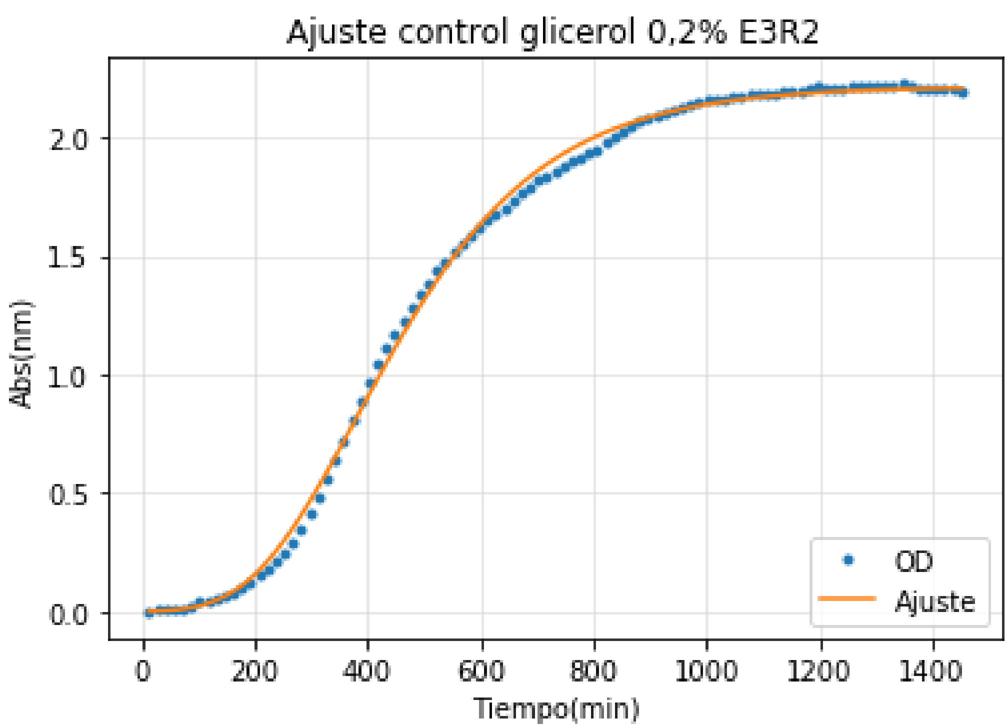





```
In [19]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
         #control glicerl rep 2
         y11= np.log(odcgl182)-np.log(np.min(odcgl182))
         print('Min OD = %e'%((np.min(odcgl182))))
         evaly, params=Function_fit(tt,y11,0,-1, title = 'Ajuste control glicerol 0,2% E3R2')
         A11= params[0]
         um11=params[1]
         l11=params[2]
         print('A=%e'%(A11))
         print('um=%e'%(um11))
         print('l=%e'%(l11))

         #Cálculo datos para determinar extensión de la fase exponencial
         tm11=((A11/(np.exp(1)*um11))+l11)
         print('Tm=%e'%(tm11))
         t211=((np.log(2))/um11)
         print('doubpe=%e'%(t211))
         extdp11=2.5*t211
         print('ext=%e'%extdp11)
         ttot11=tm11+extdp11
         print('Tfinal=%e'%ttot11)

         #Delimitación fase exponencial en grafico con OD/tiempo
         y1=tt[25]
```

```python
y2=tt[52]
plt.figure()
plt.title('Control Glicerol 0,2% E3R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcgl182,label='OD control E3R2 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E3R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[25:53],odcgl182[25:53],label='OD control E3R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

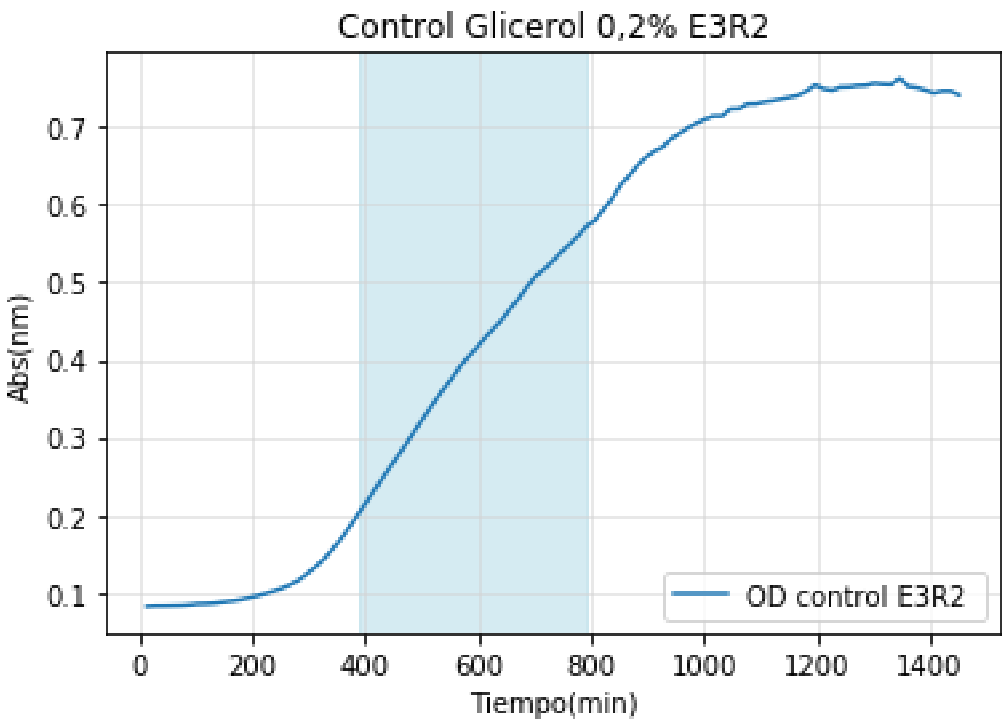
```
Min OD = 8.250000e-02
[  2.21283483e+00   4.40822880e-03   1.94027274e+02]
```

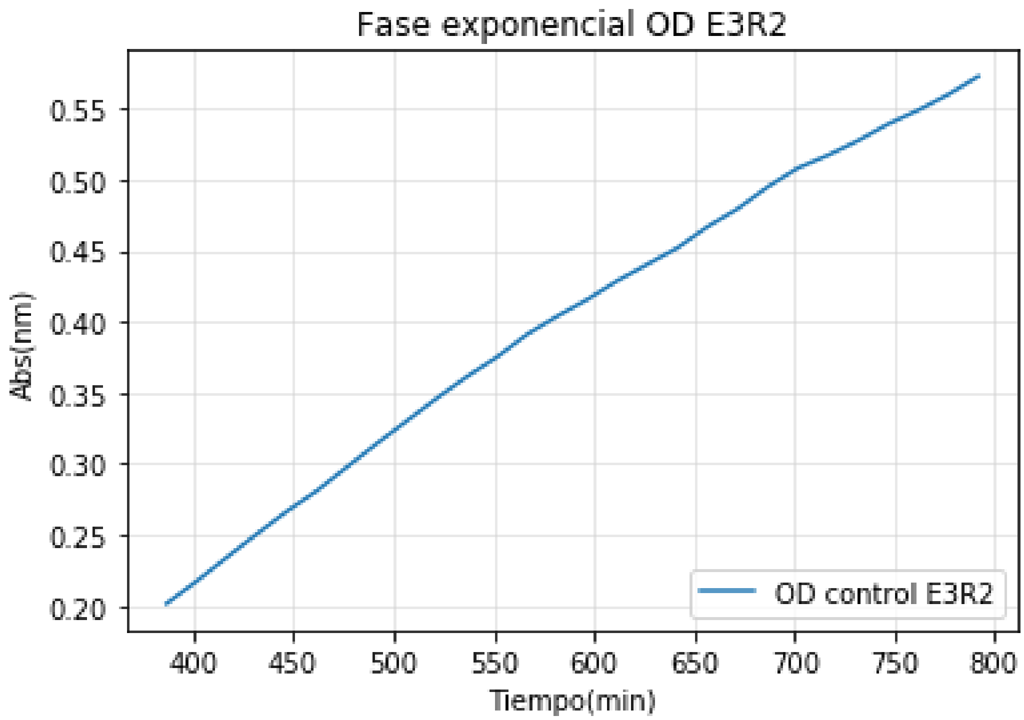



```
A=2.212835e+00
um=4.408229e-03
```

```
l=1.940273e+02
Tm=3.786947e+02
doubpe=1.572394e+02
ext=3.930985e+02
Tfinal=7.717932e+02
```

Out[19]: <matplotlib.legend.Legend at 0x23658a38978>

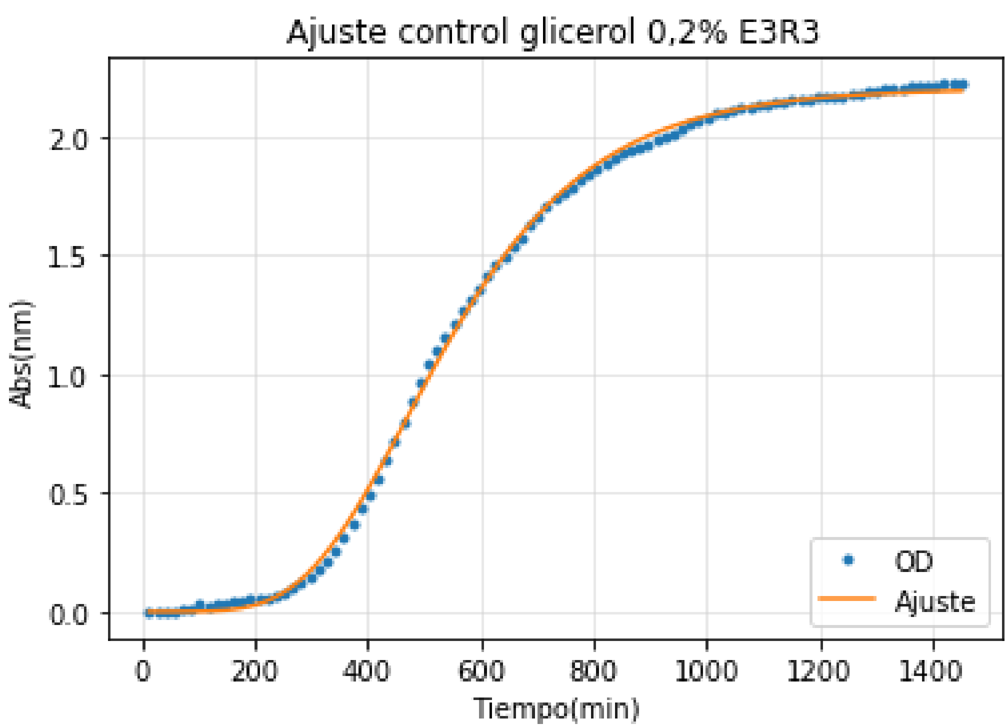




In [20]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#control glicerl rep 3
y12= np.log(odcgl183)-np.log(np.min(odcgl183))
print('Min OD = %e'%((np.min(odcgl183))))
evaly, params=Function_fit(tt,y12,0,-1, title = 'Ajuste control glicerol 0,2% E3R3')
A12= params[0]
um12=params[1]
l12=params[2]
print('A=%e'%(A12))
print('um=%e'%(um12))
print('l=%e'%(l12))

#Cálculo datos para determinar extensión de la fase exponencial
tm12=((A12/(np.exp(1)*um12))+l12)
print('Tm=%e'%(tm12))
t212=((np.log(2))/um12)
print('doubpe=%e'%(t212))
extdp12=2.5*t212
print('ext=%e'%extdp12)
ttot12=tm12+extdp12
print('Tfinal=%e'%ttot12)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[24]
```

```
y2=tt[50]
plt.figure()
plt.title('Control Glicerol 0,2% E3R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcgl183,label='OD control E3R3 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E3R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[24:51],odcgl183[24:51],label='OD control E3R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

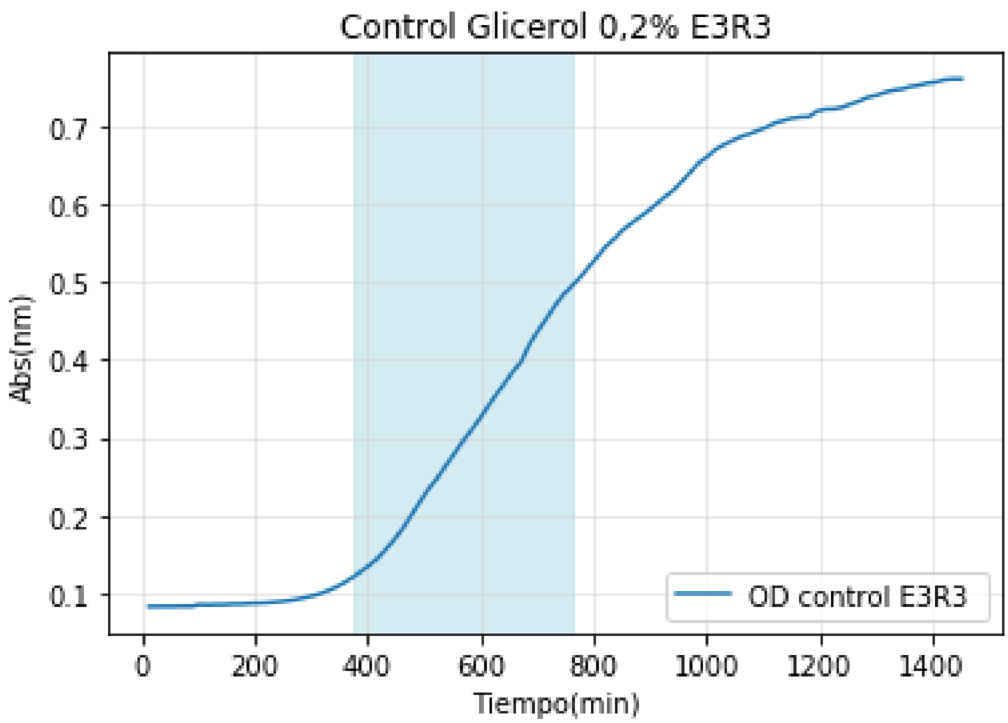
```
Min OD = 8.275000e-02
[  2.19895432e+00   4.44585642e-03   2.85665525e+02]
```

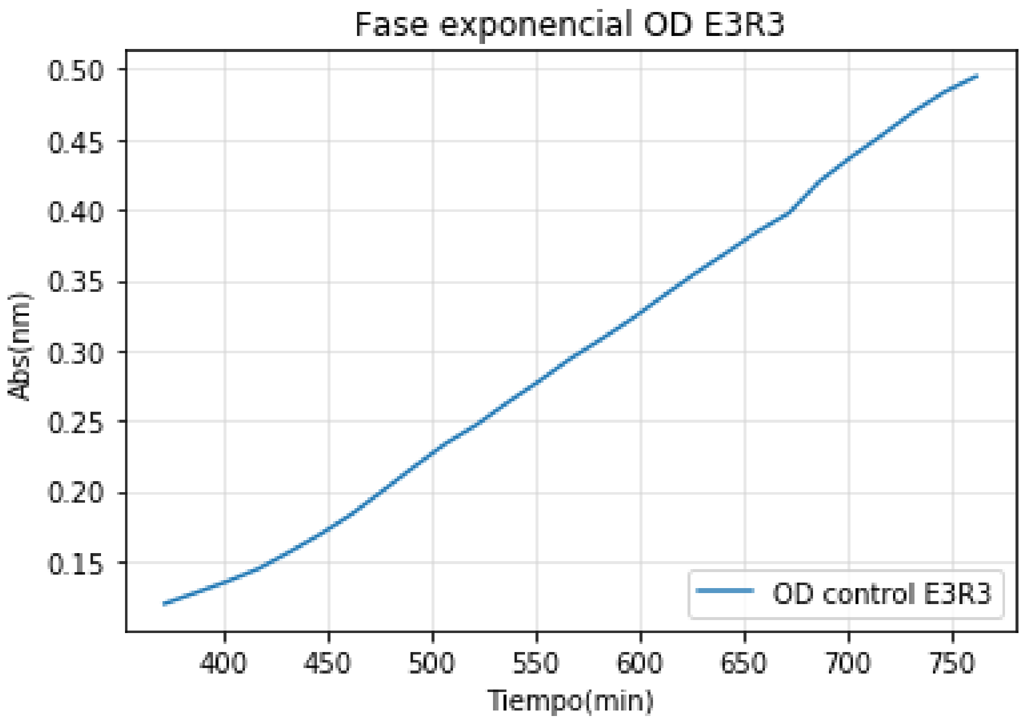



```
A=2.198954e+00
um=4.445856e-03
```

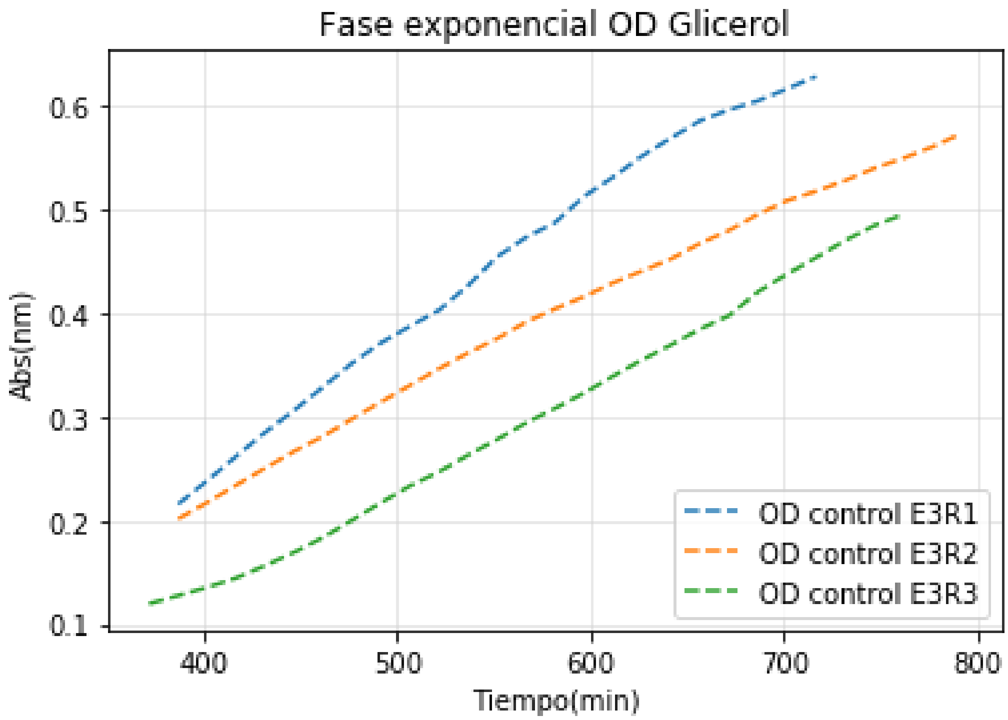
```
l=2.856655e+02
Tm=4.676215e+02
doubpe=1.559086e+02
ext=3.897715e+02
Tfinal=8.573929e+02
```

```
Out[20]: <matplotlib.legend.Legend at 0x2365945fa90>
```

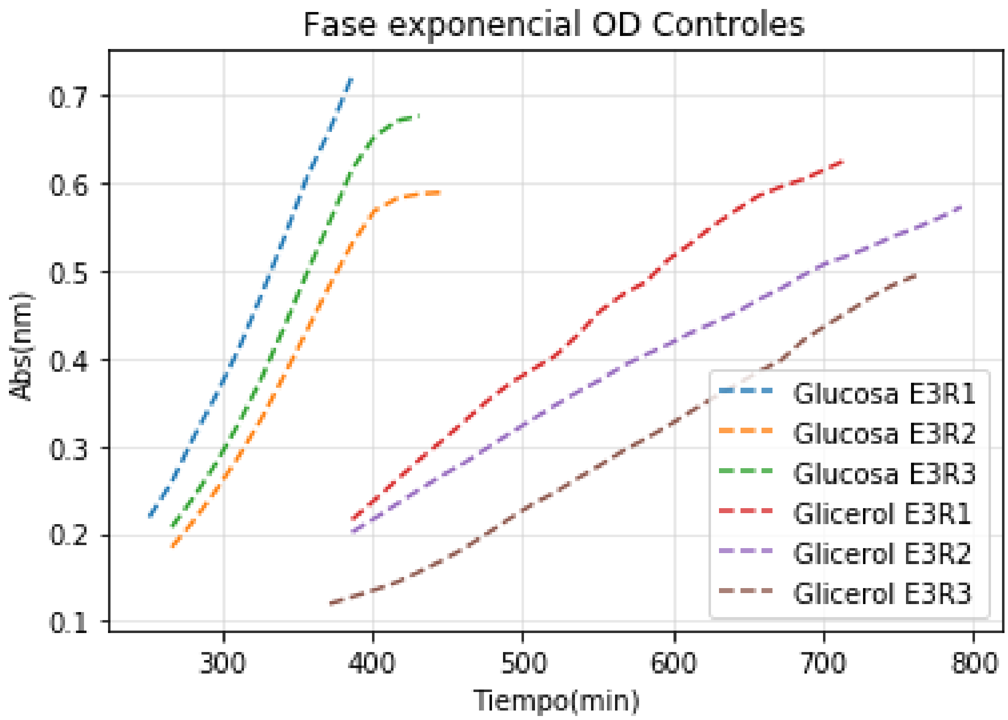





```
In [21]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD Glicerol')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[25:48],odcgl181[25:48],'--',label='OD control E3R1')
         plt.plot(tt[25:53],odcgl182[25:53],'--',label='OD control E3R2')
         plt.plot(tt[24:51],odcgl183[24:51],'--',label='OD control E3R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[21]: <matplotlib.legend.Legend at 0x2365954d6a0>
```



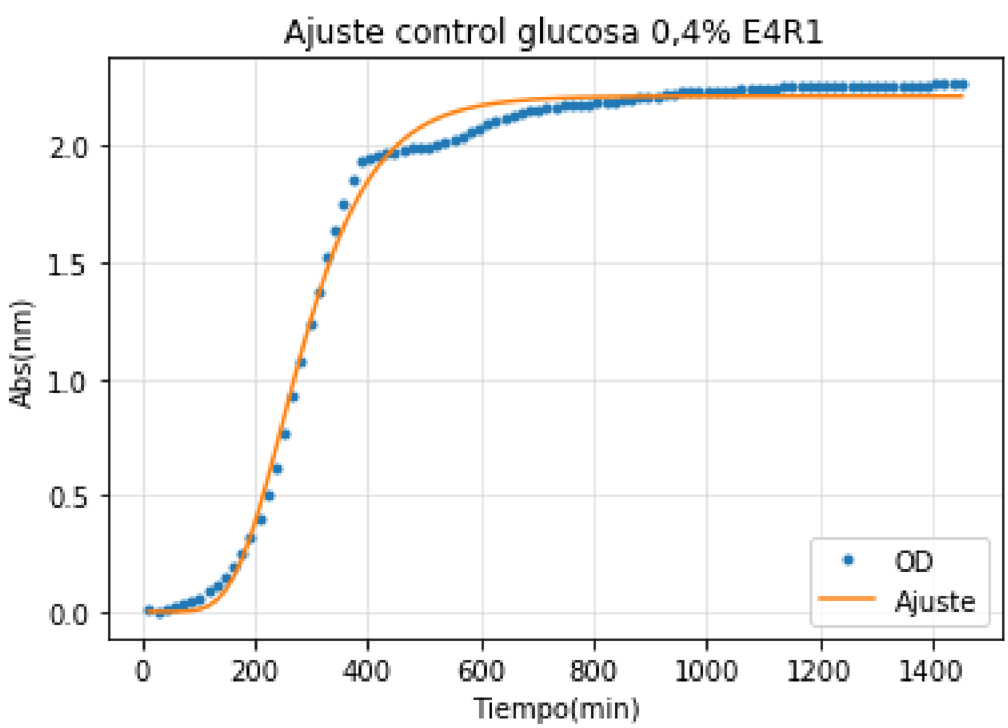

```
In [22]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD Controles')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[16:26],odcg181[16:26],'--',label='Glucosa E3R1')
         plt.plot(tt[17:30],odcg182[17:30],'--',label='Glucosa E3R2')
         plt.plot(tt[17:29],odcg183[17:29],'--',label='Glucosa E3R3')
         plt.plot(tt[25:48],odcgl181[25:48],'--',label='Glicerol E3R1')
         plt.plot(tt[25:53],odcgl182[25:53],'--',label='Glicerol E3R2')
         plt.plot(tt[24:51],odcgl183[24:51],'--',label='Glicerol E3R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[22]: <matplotlib.legend.Legend at 0x23659608be0>
```



In [23]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#control glucosa rep 1
y13 = np.log(odcg121)-np.log(np.min(odcg121))
print('Min OD = %e'%((np.min(odcg121))))
evaly, params=Function_fit(tt,y13,0,-1,title = 'Ajuste control glucosa 0,4% E4R1')
A13 = params[0]
um13=params[1]
l13=params[2]
print('A=%e'%(A13))
print('um=%e'%(um13))
print('l=%e'%(l13))

#Cálculo datos para determinar extensión de la fase exponencial
tm13=((A13/(np.exp(1)*um13))+l13)
print('Tm=%e'%(tm13))
t213=((np.log(2))/um13)
print('doubpe=%e'%(t213))
extdp13=2*t213
print('ext=%e'%extdp13)
ttot13=tm13+extdp13
print('Tfinal=%e'%ttot13)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[17]
```

```
y2=tt[27]
plt.figure()
plt.title('Control Glucosa 0,4% E4R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcg121,label='OD control E4R1 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E4R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[17:28],odcg121[17:28],label='OD control E4R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

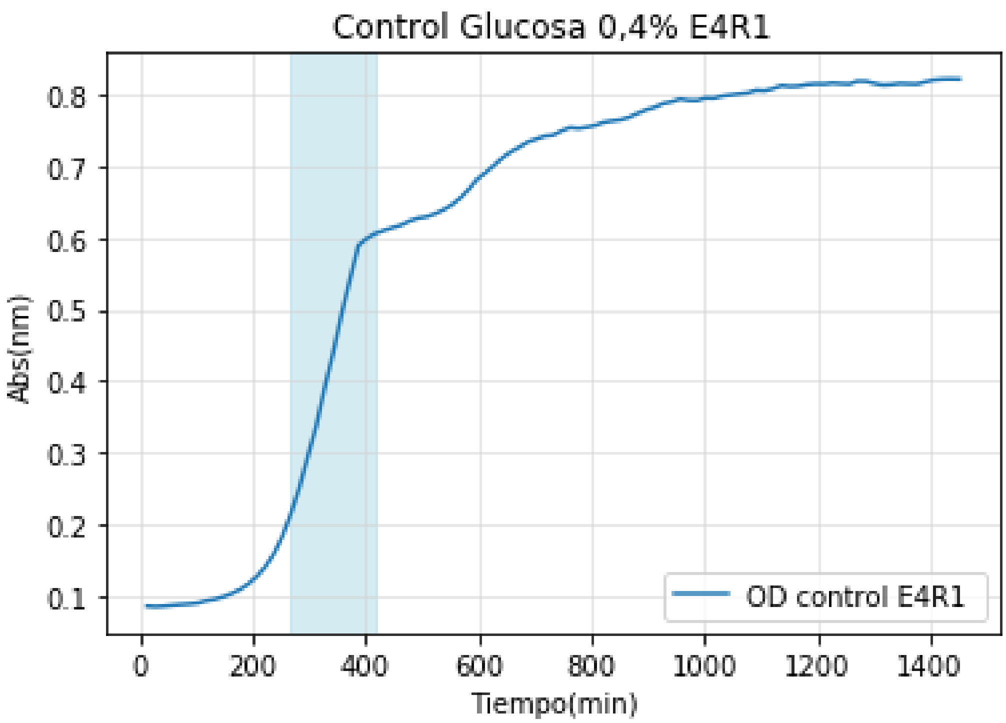
```
Min OD = 8.525000e-02
[  2.21400213e+00   9.27035018e-03   1.61117814e+02]
```

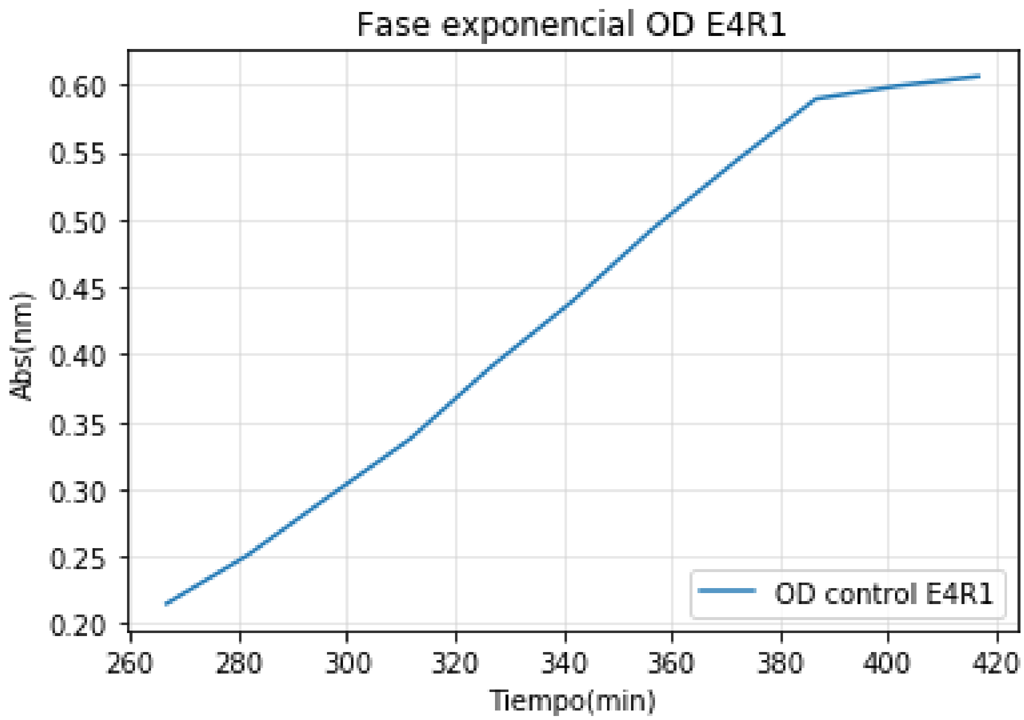



```
A=2.214002e+00
um=9.270350e-03
```

```
l=1.611178e+02
Tm=2.489770e+02
doubpe=7.477033e+01
ext=1.495407e+02
Tfinal=3.985177e+02
```

```
Out[23]: <matplotlib.legend.Legend at 0x2365946fa20>
```

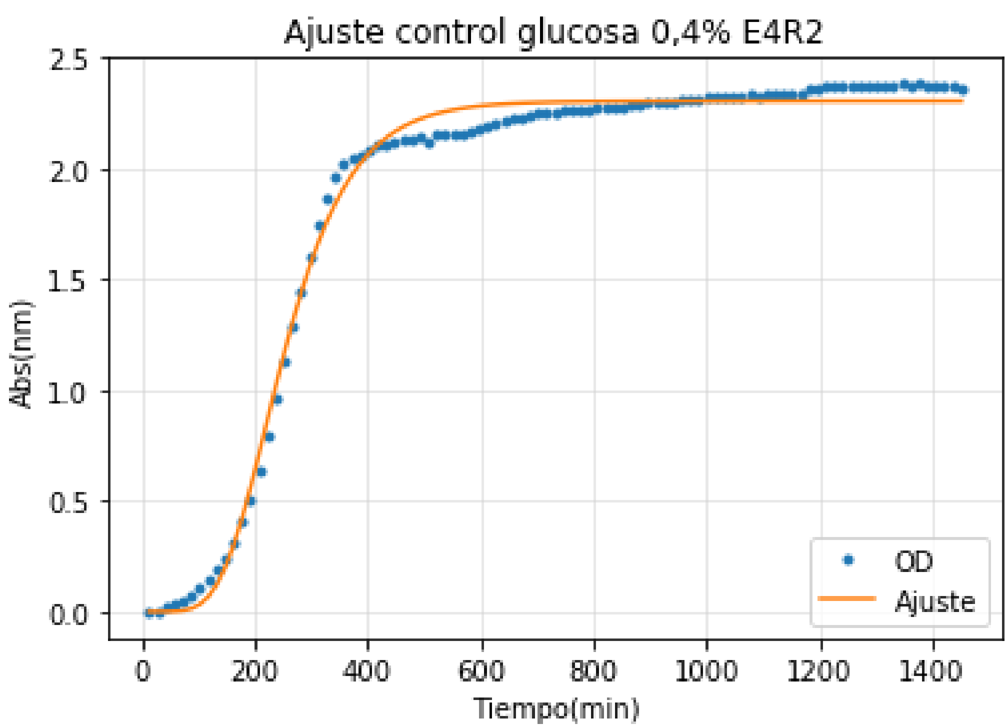





```
In [24]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
         #control glucosa rep 2
         y14= np.log(odcg122)-np.log(np.min(odcg122))
         print('Min OD = %e'%((np.min(odcg122))))
         evaly, params=Function_fit(tt,y14,0,-1, title = 'Ajuste control glucosa 0,4% E4R2')
         A14= params[0]
         um14=params[1]
         l14=params[2]
         print('A=%e'%(A14))
         print('um=%e'%(um14))
         print('l=%e'%(l14))

         #Cálculo datos para determinar extensión de la fase exponencial
         tm14=((A14/(np.exp(1)*um14))+l14)
         print('Tm=%e'%(tm14))
         t214=((np.log(2))/um14)
         print('doubpe=%e'%(t214))
         extdp14=2*t214
         print('ext=%e'%extdp14)
         ttot14=tm14+extdp14
         print('Tfinal=%e'%ttot14)

         #Delimitación fase exponencial en grafico con OD/tiempo
         y1=tt[14]
```

```
y2=tt[24]
plt.figure()
plt.title('Control Glucosa 0,4% E4R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcg122,label='OD control E4R2 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E4R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[14:25],odcg122[14:25],label='OD control E4R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

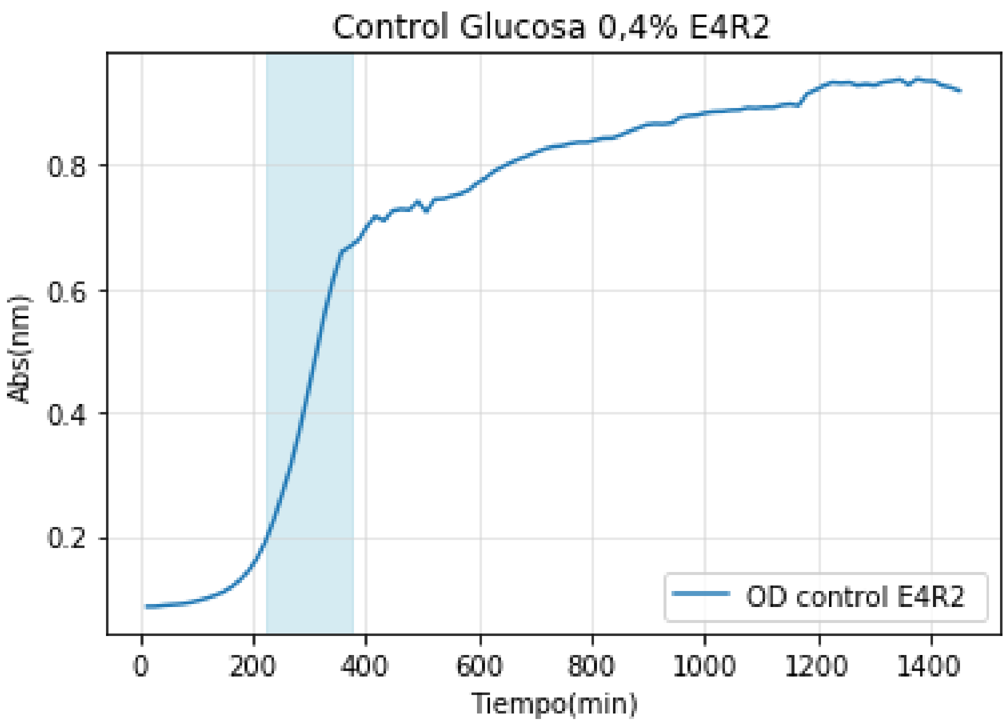
```
Min OD = 8.675000e-02
[  2.30555639e+00   1.03788860e-02   1.38136011e+02]
```

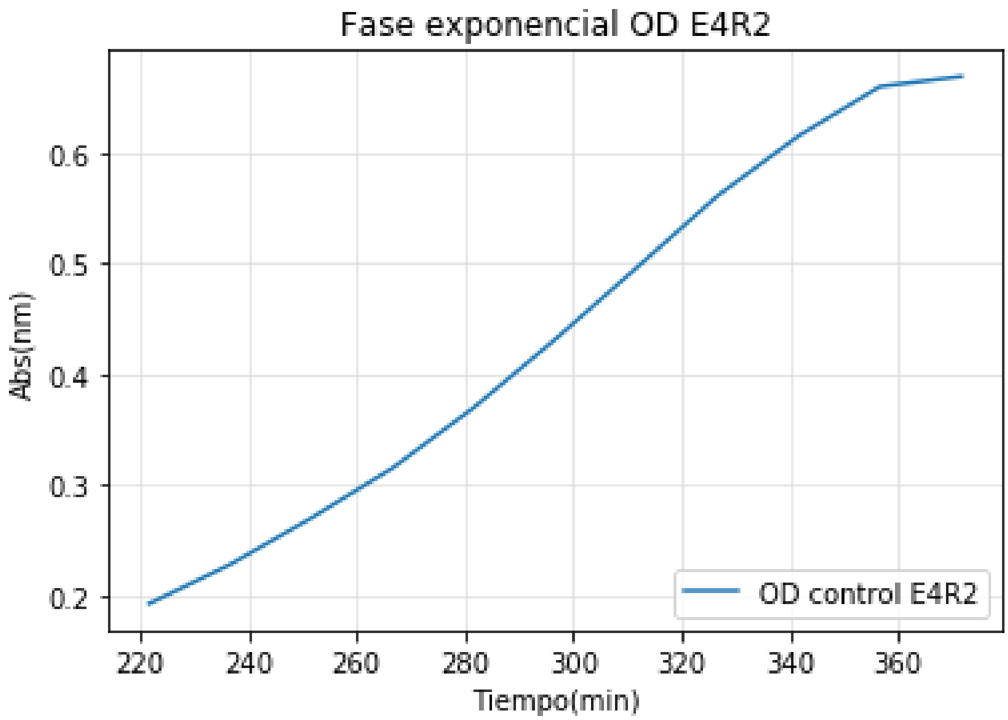



```
A=2.305556e+00
um=1.037889e-02
```

```
l=1.381360e+02
Tm=2.198564e+02
doubpe=6.678435e+01
ext=1.335687e+02
Tfinal=3.534251e+02
```

Out[24]: `<matplotlib.legend.Legend at 0x236577f12b0>`

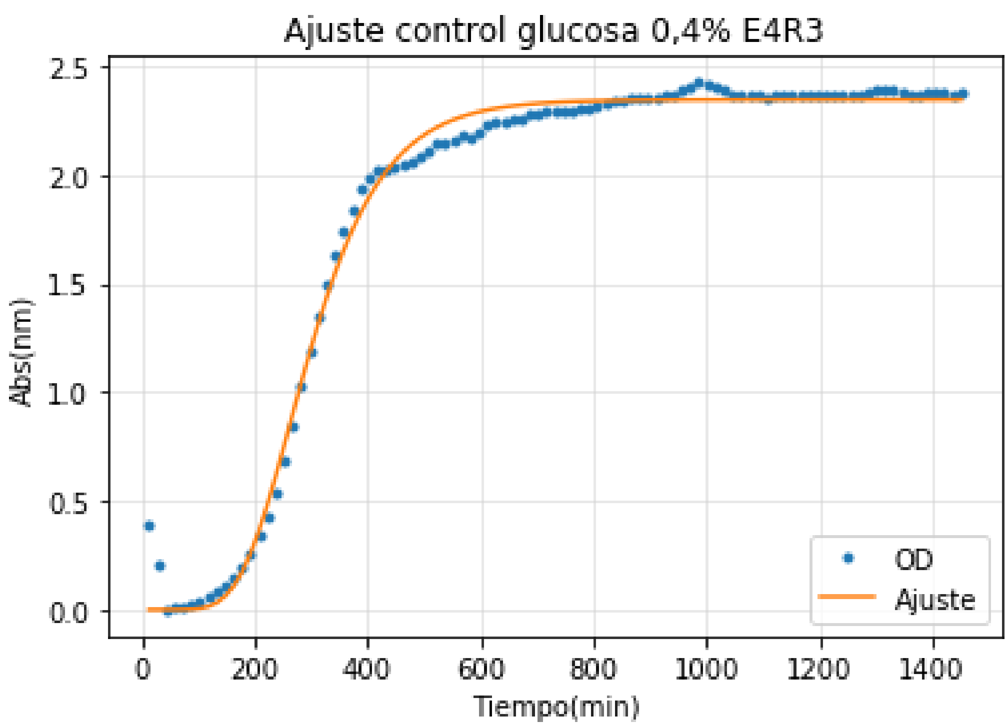




In [25]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#control glucosa rep 3
y15= np.log(odcg123)-np.log(np.min(odcg123))
print('Min OD = %e'%((np.min(odcg123))))
evaly, params=Function_fit(tt,y15,0,-1, title = 'Ajuste control glucosa 0,4% E4R3')
A15= params[0]
um15=params[1]
l15=params[2]
print('A=%e'%(A15))
print('um=%e'%(um15))
print('l=%e'%(l15))

#Cálculo datos para determinar extensión de la fase exponencial
tm15=((A15/(np.exp(1)*um15))+l15)
print('Tm=%e'%(tm15))
t215=((np.log(2))/um15)
print('doubpe=%e'%(t215))
extdp15=2*t215
print('ext=%e'%extdp15)
ttot15=tm15+extdp15
print('Tfinal=%e'%ttot15)


#Delimitación fase exponencial en grafico con OD/tiempo
```

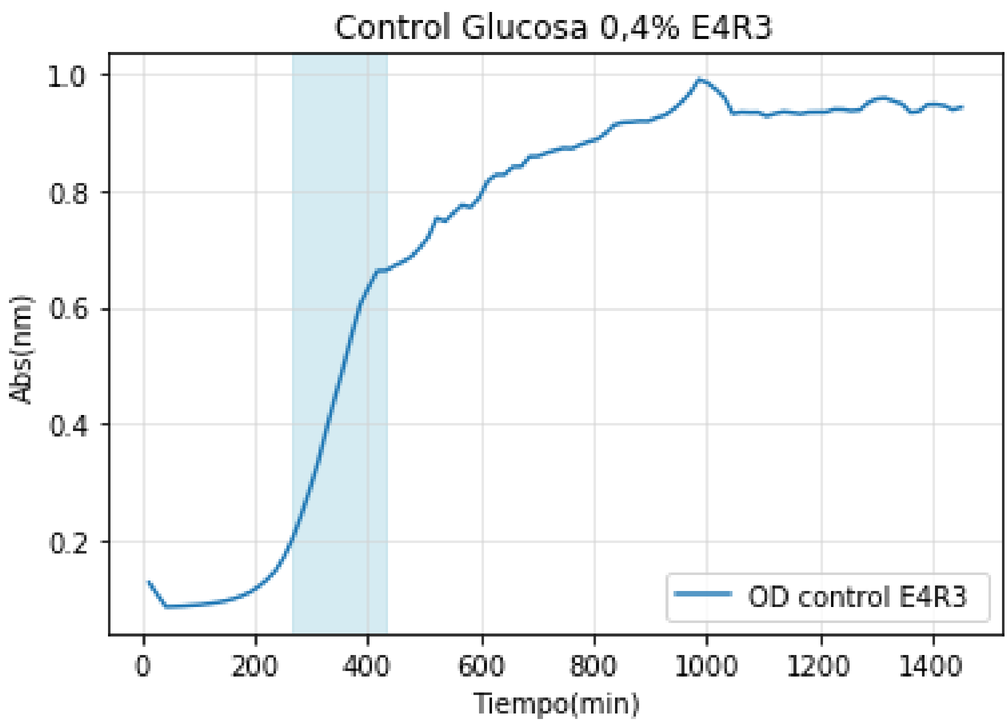
```
y1=tt[17]
y2=tt[28]
plt.figure()
plt.title('Control Glucosa 0,4% E4R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcg123,label='OD control E4R3 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E4R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[17:29],odcg123[17:29],label='OD control E4R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

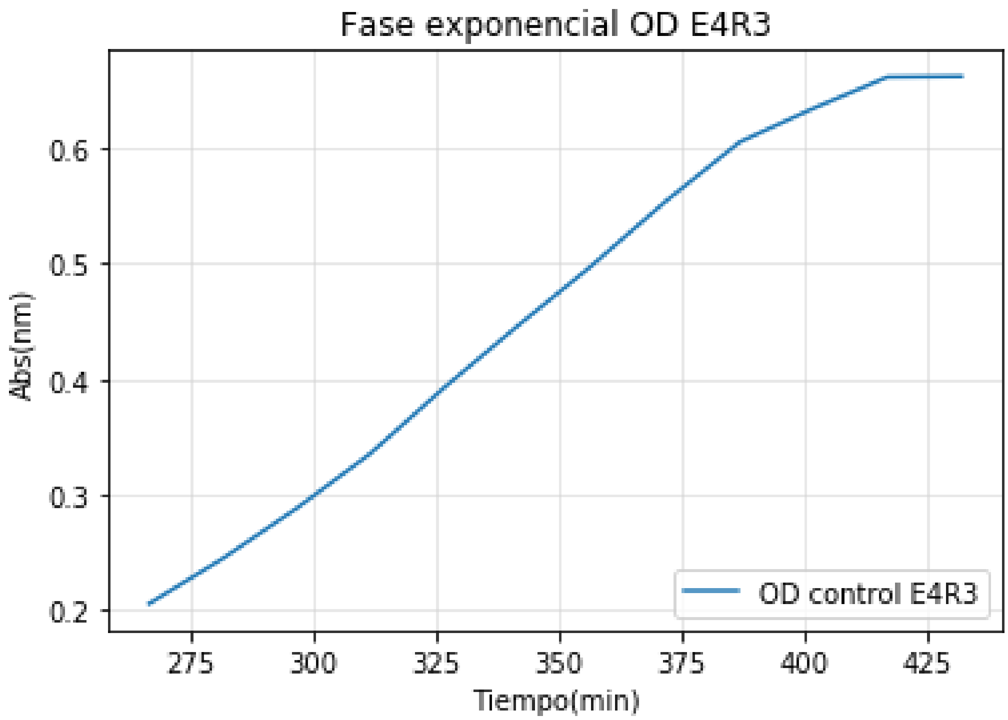
```
Min OD = 8.775000e-02
[  2.34400664e+00   9.59456675e-03   1.72702880e+02]
```



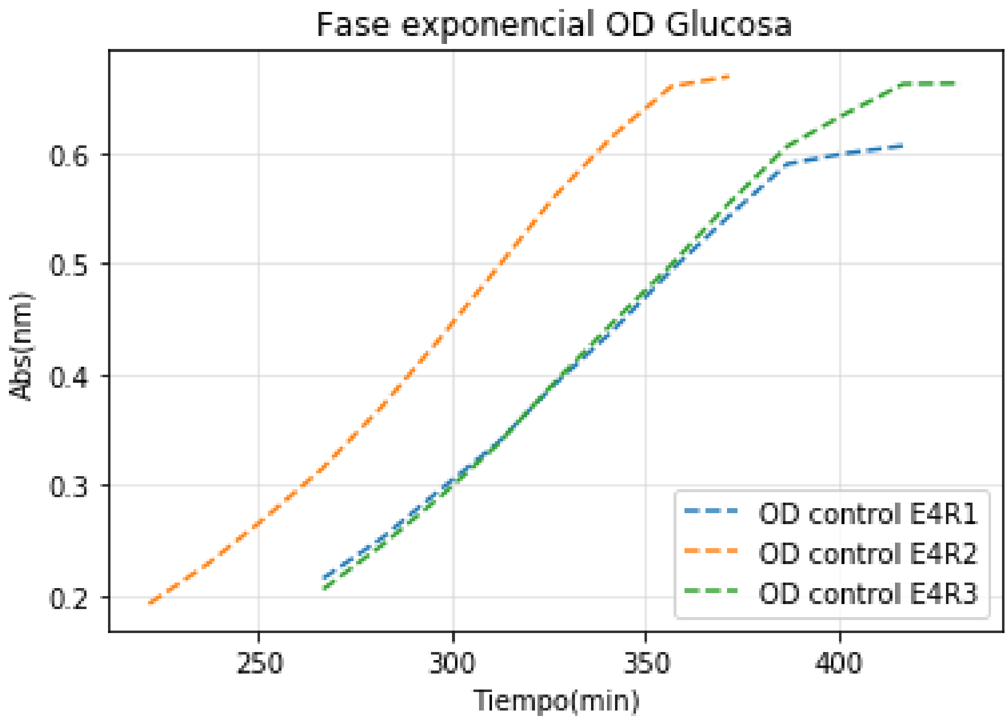
```
A=2.344007e+00
um=9.594567e-03
l=1.727029e+02
Tm=2.625779e+02
doubpe=7.224372e+01
ext=1.444874e+02
Tfinal=4.070653e+02
```

Out[25]: <matplotlib.legend.Legend at 0x2365a76eb70>





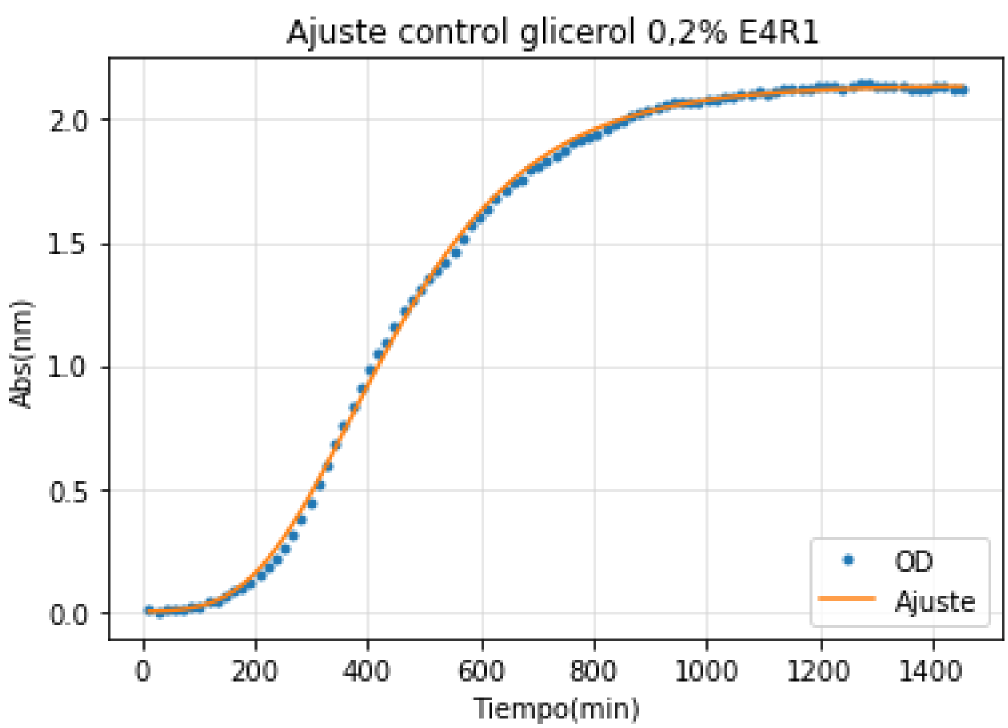

```
In [26]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD Glucosa')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[17:28],odcg121[17:28],'--',label='OD control E4R1')
         plt.plot(tt[14:25],odcg122[14:25],'--',label='OD control E4R2')
         plt.plot(tt[17:29],odcg123[17:29],'--',label='OD control E4R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[26]: <matplotlib.legend.Legend at 0x2365a88bf60>
```




```
In [27]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
         #control glicerl rep 1
         y16= np.log(odcgl121)-np.log(np.min(odcgl121))
         print('Min OD = %e'%((np.min(odcgl121))))
         evaly, params=Function_fit(tt,y16,0,-1, title = 'Ajuste control glicerol 0,2% E4R1')
         A16= params[0]
         um16=params[1]
         l16=params[2]
         print('A=%e'%(A16))
         print('um=%e'%(um16))
         print('l=%e'%(l16))

         #Cálculo datos para determinar extensión de la fase exponencial
         tm16=((A16/(np.exp(1)*um16))+l16)
         print('Tm=%e'%(tm16))
         t216=((np.log(2))/um16)
         print('doubpe=%e'%(t216))
         extdp16=2.5*t216
         print('ext=%e'%extdp16)
         ttot16=tm16+extdp16
         print('Tfinal=%e'%ttot16)

         #Delimitación fase exponencial en grafico con OD/tiempo
         y1=tt[24]
```

```
y2=tt[51]
plt.figure()
plt.title('Control Glicerol 0,2% E4R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcgl121,label='OD control E4R1 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E4R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[24:52],odcgl121[24:52],label='OD control E4R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

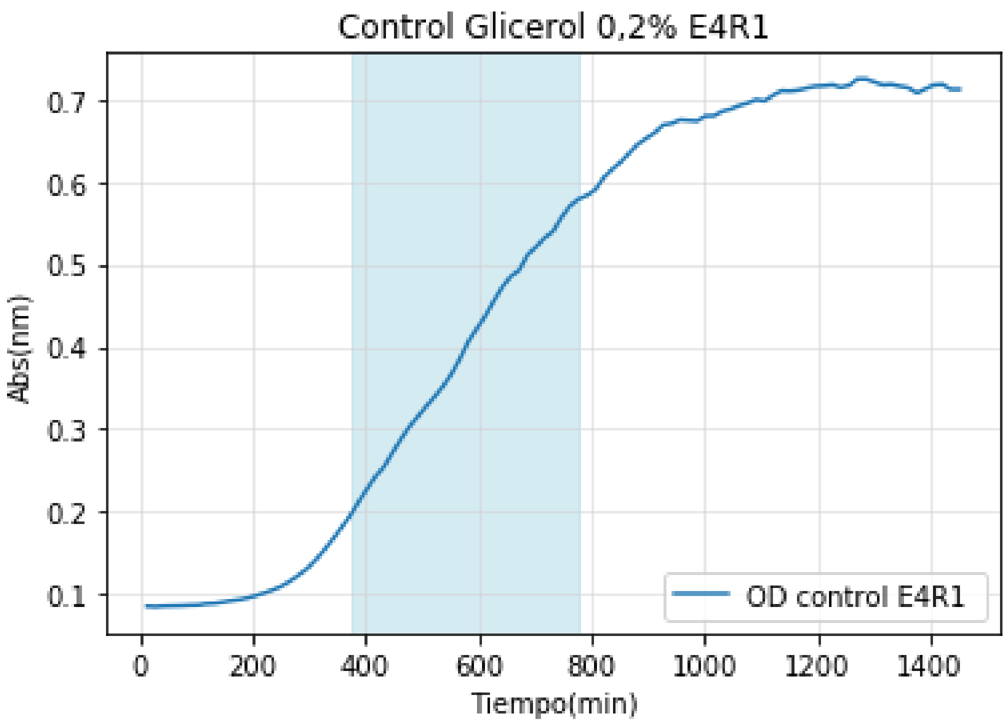
```
Min OD = 8.500000e-02
[  2.13735411e+00   4.44419084e-03   1.92719677e+02]
```

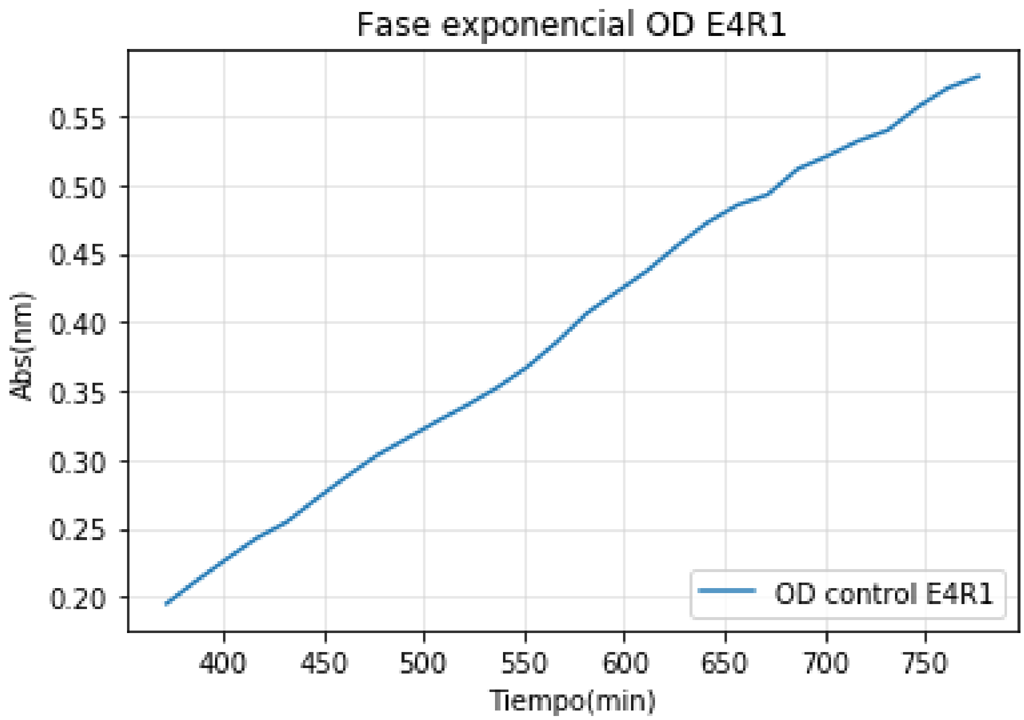



```
A=2.137354e+00
um=4.444191e-03
```

```
l=1.927197e+02
Tm=3.696447e+02
doubpe=1.559670e+02
ext=3.899175e+02
Tfinal=7.595623e+02
```

```
Out[27]: <matplotlib.legend.Legend at 0x2365aa0e780>
```

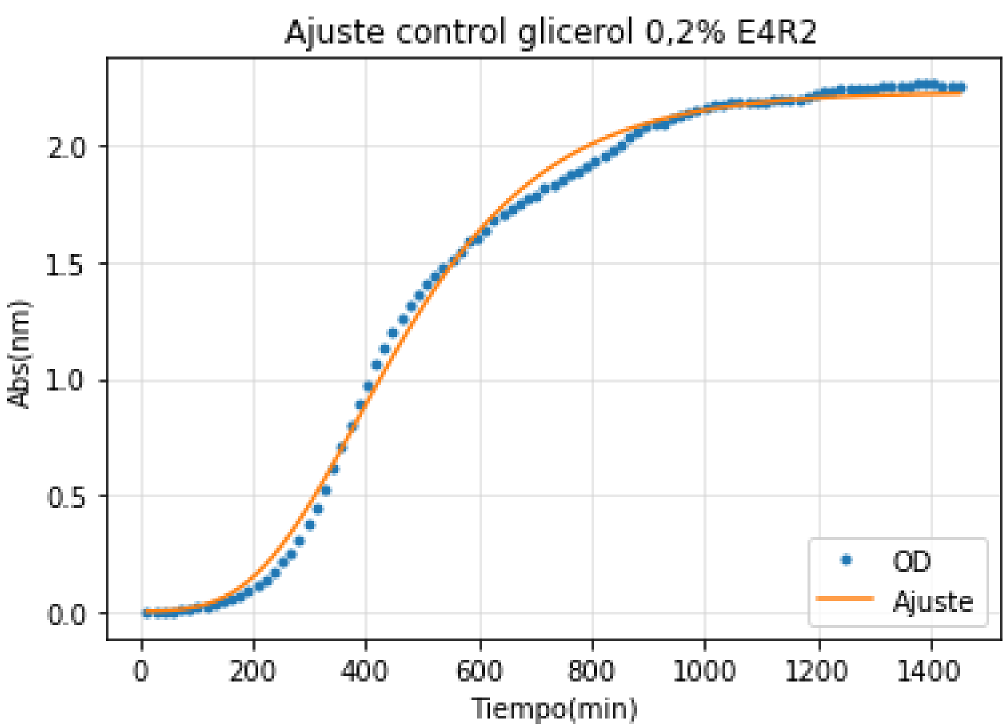




In [28]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#control glicerl rep 2
y17= np.log(odcgl122)-np.log(np.min(odcgl122))
print('Min OD = %e'%((np.min(odcgl122))))
evaly, params=Function_fit(tt,y17,0,-1, title = 'Ajuste control glicerol 0,2% E4R2')
A17= params[0]
um17=params[1]
l17=params[2]
print('A=%e'%(A17))
print('um=%e'%(um17))
print('l=%e'%(l17))

#Cálculo datos para determinar extensión de la fase exponencial
tm17=((A17/(np.exp(1)*um17))+l17)
print('Tm=%e'%(tm17))
t217=((np.log(2))/um17)
print('doubpe=%e'%(t217))
extdp17=2.5*t217
print('ext=%e'%extdp17)
ttot17=tm17+extdp17
print('Tfinal=%e'%ttot17)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[25]
```

```
y2=tt[52]
plt.figure()
plt.title('Control Glicerol 0,2% E4R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcgl122,label='OD control E4R2 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E4R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[25:53],odcgl122[25:53],label='OD control E4R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

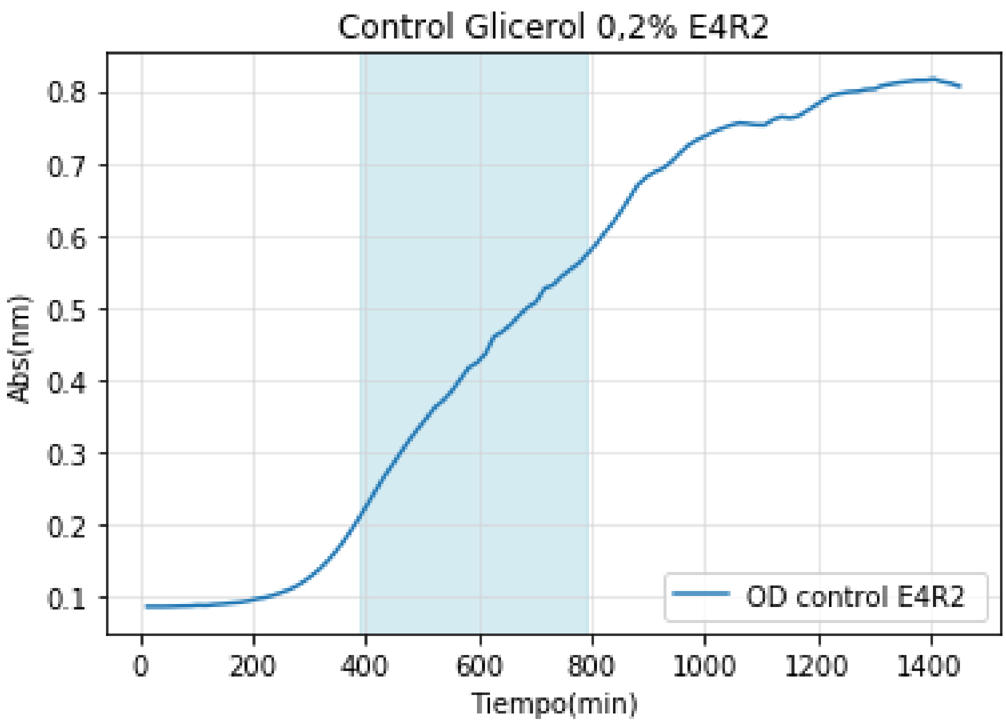
```
Min OD = 8.500000e-02
[  2.22944589e+00   4.42704053e-03   1.98978142e+02]
```

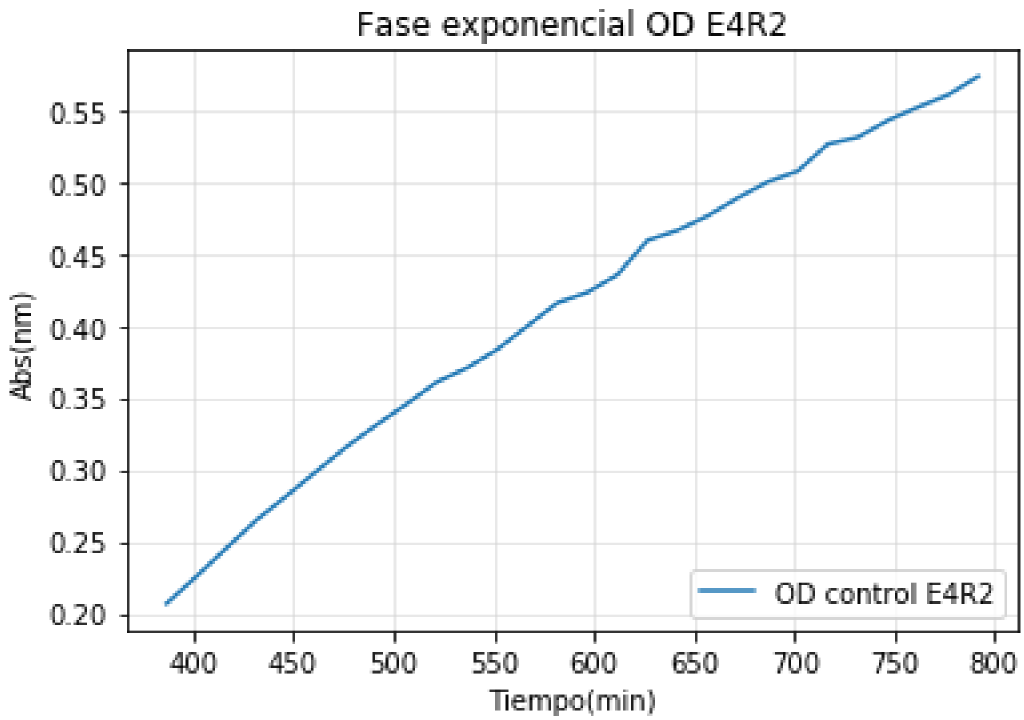



```
A=2.229446e+00
um=4.427041e-03
```

```
l=1.989781e+02
Tm=3.842413e+02
doubpe=1.565712e+02
ext=3.914281e+02
Tfinal=7.756693e+02
```

```
Out[28]: <matplotlib.legend.Legend at 0x236591dbeb8>
```

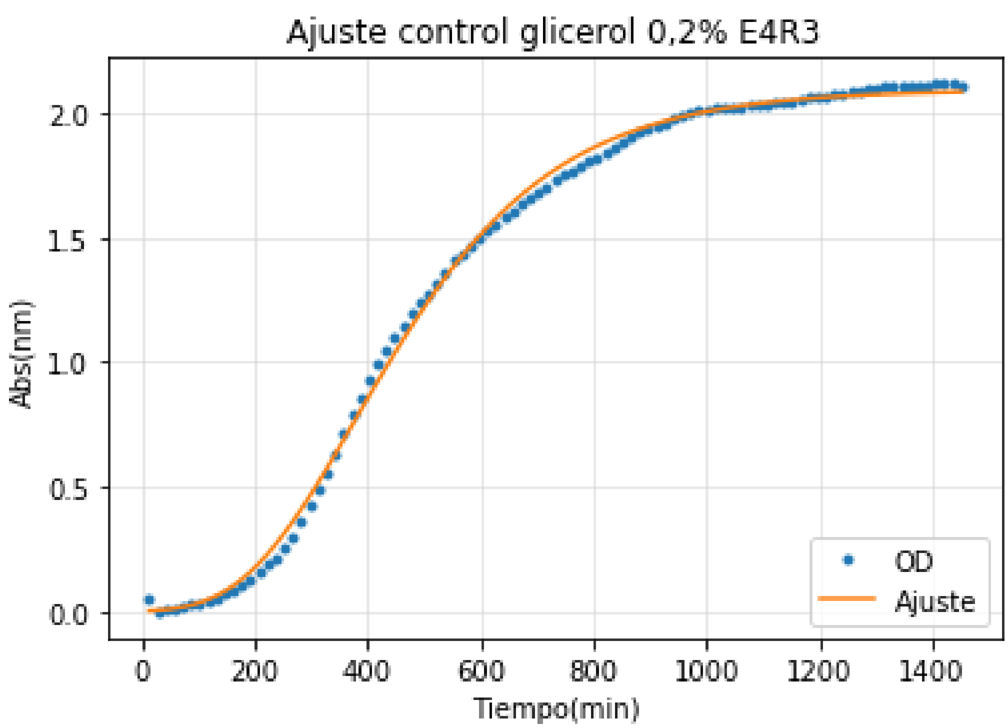




In [29]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#control glicerl rep 3
y18= np.log(odcgl123)-np.log(np.min(odcgl123))
print('Min OD = %e'%((np.min(odcgl123))))
evaly, params=Function_fit(tt,y18,0,-1, title = 'Ajuste control glicerol 0,2% E4R3')
A18= params[0]
um18=params[1]
l18=params[2]
print('A=%e'%(A18))
print('um=%e'%(um18))
print('l=%e'%(l18))

#Cálculo datos para determinar extensión de la fase exponencial
tm18=((A18/(np.exp(1)*um18))+l18)
print('Tm=%e'%(tm18))
t218=((np.log(2))/um18)
print('doubpe=%e'%(t218))
extdp18=2.5*t218
print('ext=%e'%extdp18)
ttot18=tm18+extdp18
print('Tfinal=%e'%ttot18)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[25]
```

```
y2=tt[56]
plt.figure()
plt.title('Control Glicerol 0,2% E4R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,odcgl123,label='OD control E4R3')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E4R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[25:57],odcgl123[25:57],label='OD control E4R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

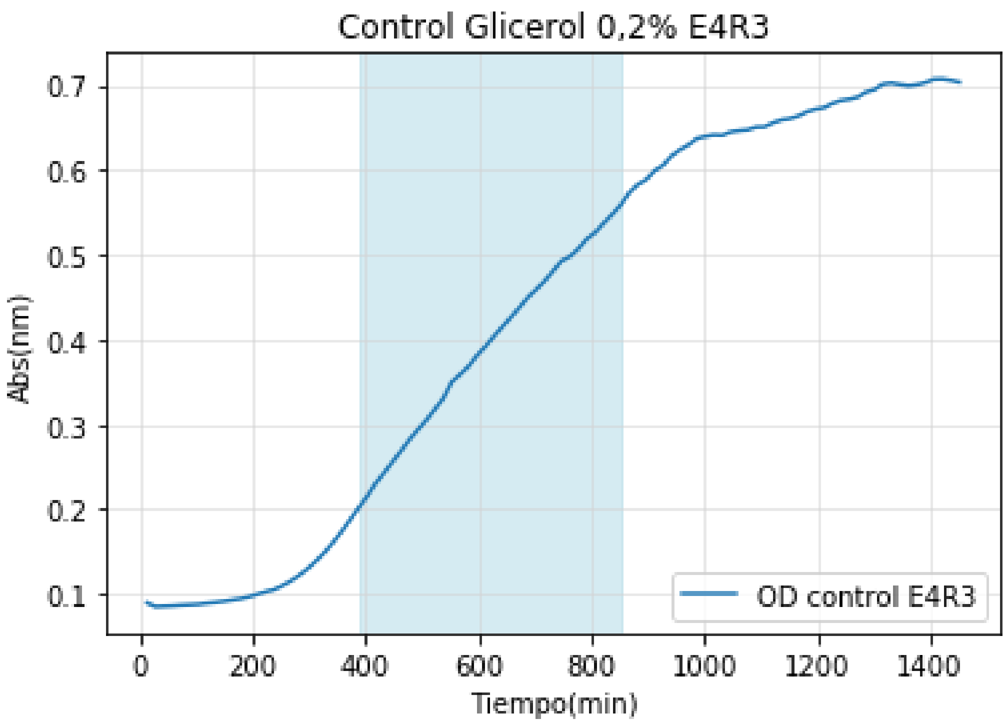
```
Min OD = 8.525000e-02
[  2.09342076e+00   3.90264068e-03   1.80268803e+02]
```

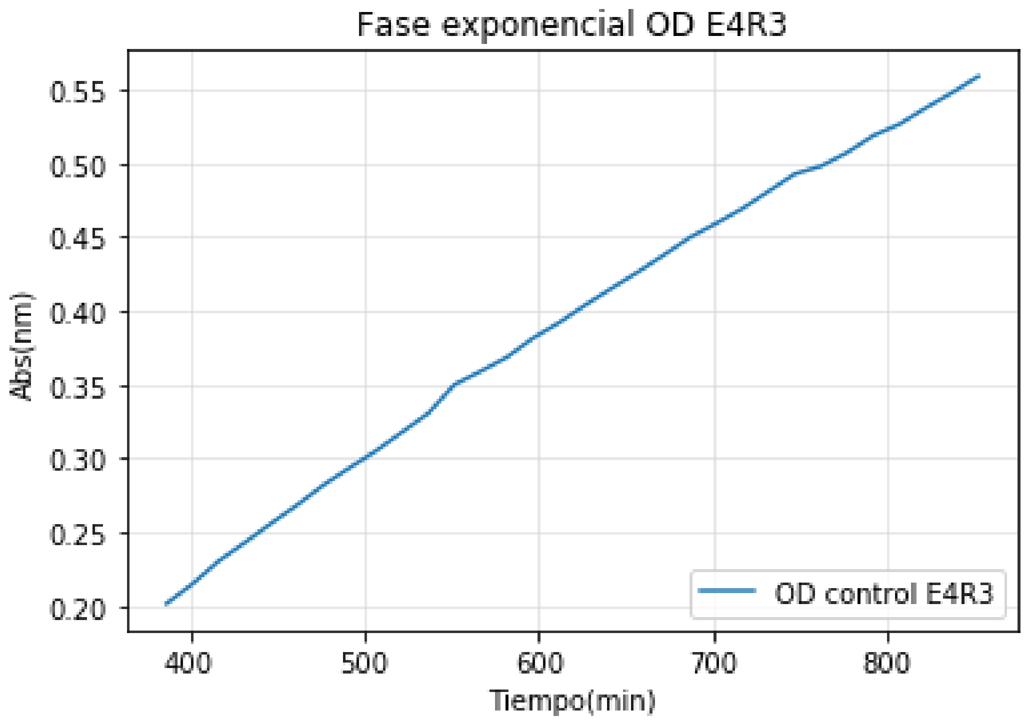



```
A=2.093421e+00
um=3.902641e-03
```

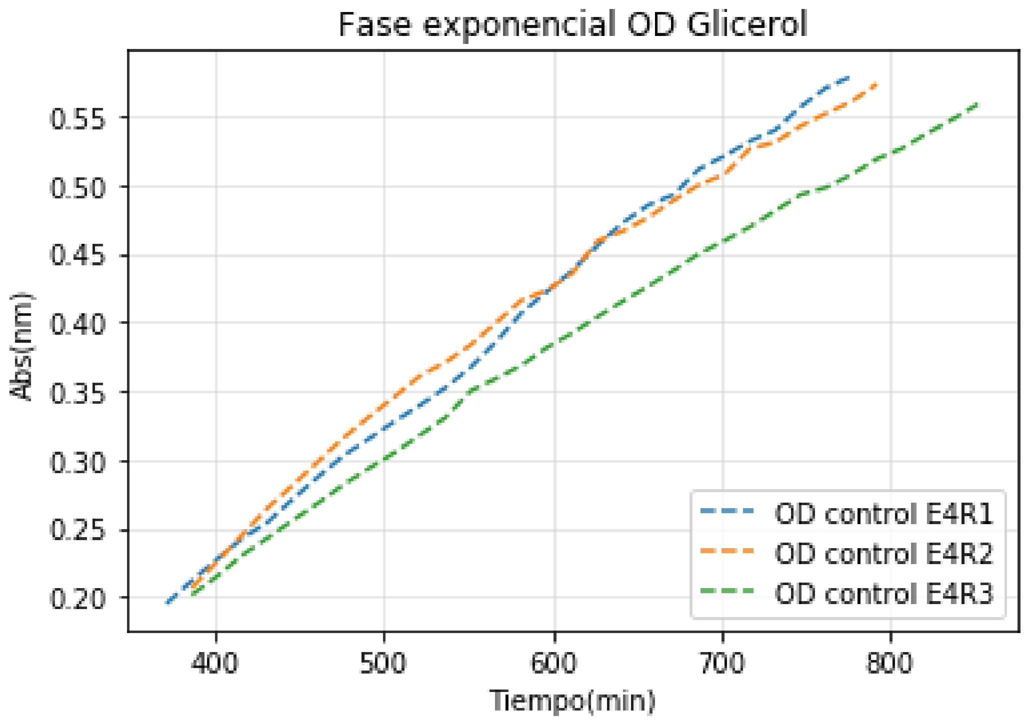
```
l=1.802688e+02
Tm=3.776035e+02
doubpe=1.776098e+02
ext=4.440245e+02
Tfinal=8.216280e+02
```

```
Out[29]: <matplotlib.legend.Legend at 0x2365a67fd30>
```

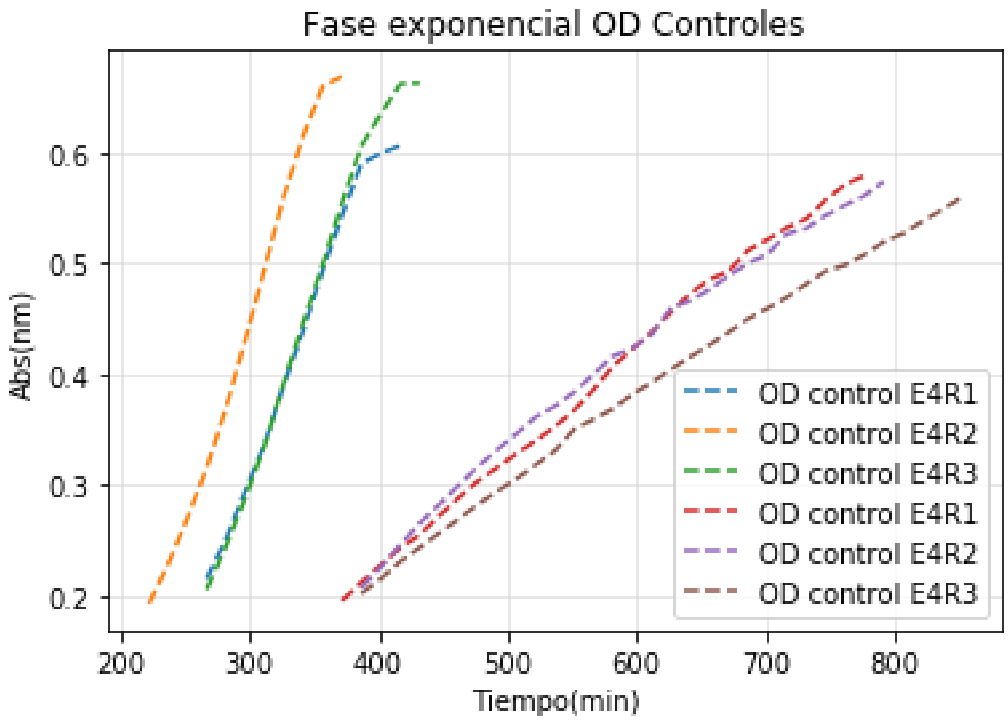





```
In [30]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD Glicerol')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[24:52],odcgl121[24:52],'--',label='OD control E4R1')
         plt.plot(tt[25:53],odcgl122[25:53],'--',label='OD control E4R2')
         plt.plot(tt[25:57],odcgl123[25:57],'--',label='OD control E4R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[30]: <matplotlib.legend.Legend at 0x2365ab44f60>
```



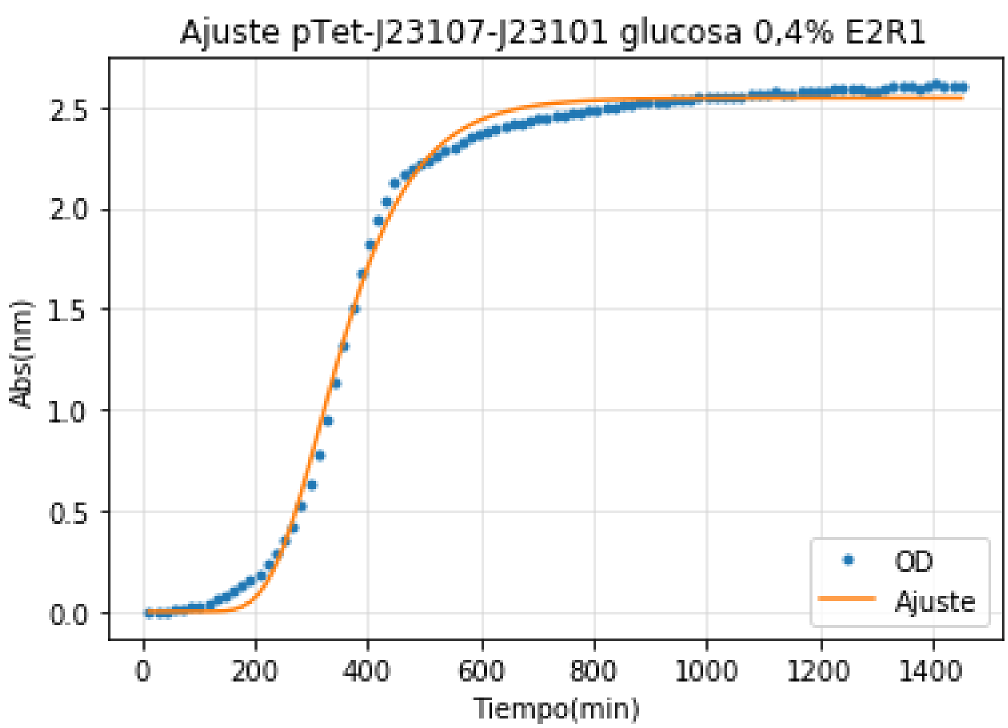

```
In [31]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD Controles')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[17:28],odcg121[17:28],'--',label='OD control E4R1')
         plt.plot(tt[14:25],odcg122[14:25],'--',label='OD control E4R2')
         plt.plot(tt[17:29],odcg123[17:29],'--',label='OD control E4R3')
         plt.plot(tt[24:52],odcgl121[24:52],'--',label='OD control E4R1')
         plt.plot(tt[25:53],odcgl122[25:53],'--',label='OD control E4R2')
         plt.plot(tt[25:57],odcgl123[25:57],'--',label='OD control E4R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[31]: <matplotlib.legend.Legend at 0x2365ac0fc18>
```



In [32]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#ptet-J23101-std glucosa rep 1
y19= np.log(od15231)-np.log(np.min(od15231))
print('Min OD = %e'%((np.min(od15231))))
evaly, params=Function_fit(tt,y19,0,-1,title = 'Ajuste pTet-J23107-J23101 glucosa 0,4%
A19 = params[0]
um19=params[1]
l19=params[2]
print('A=%e'%(A19))
print('um=%e'%(um19))
print('l=%e'%(l19))

#Cálculo datos para determinar extensión de la fase exponencial
tm19=((A19/(np.exp(1)*um19))+l19)
print('Tm=%e'%(tm19))
t219=((np.log(2))/um19)
print('doubpe=%e'%(t219))
extdp19=2*t219
print('ext=%e'%extdp19)
ttot19=tm19+extdp19
print('Tfinal=%e'%ttot19)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[21]
```

```
y2=tt[31]
plt.figure()
plt.title('pTet-J23107-J23101 Glucosa 0,4% E2R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od15231,label='OD pTet-J23107-J23101 E2R1 ')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E2R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[21:32],od15231[21:32],label='OD pTet-J23107-J23101 E2R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

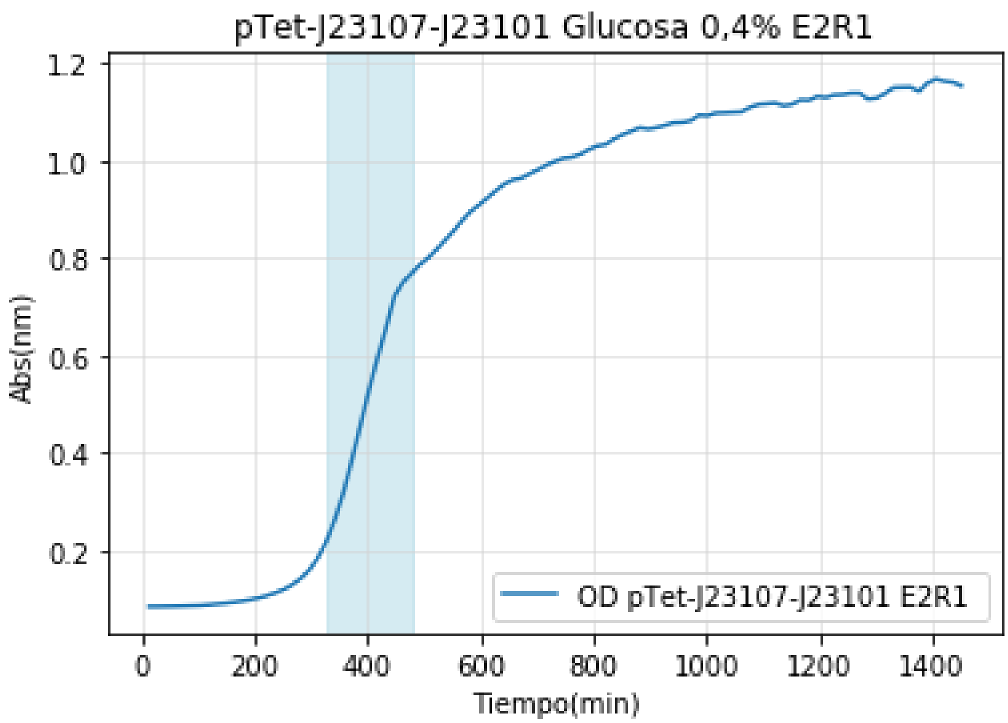
```
Min OD = 8.570000e-02
[  2.54342379e+00   1.03117507e-02   2.25391606e+02]
```

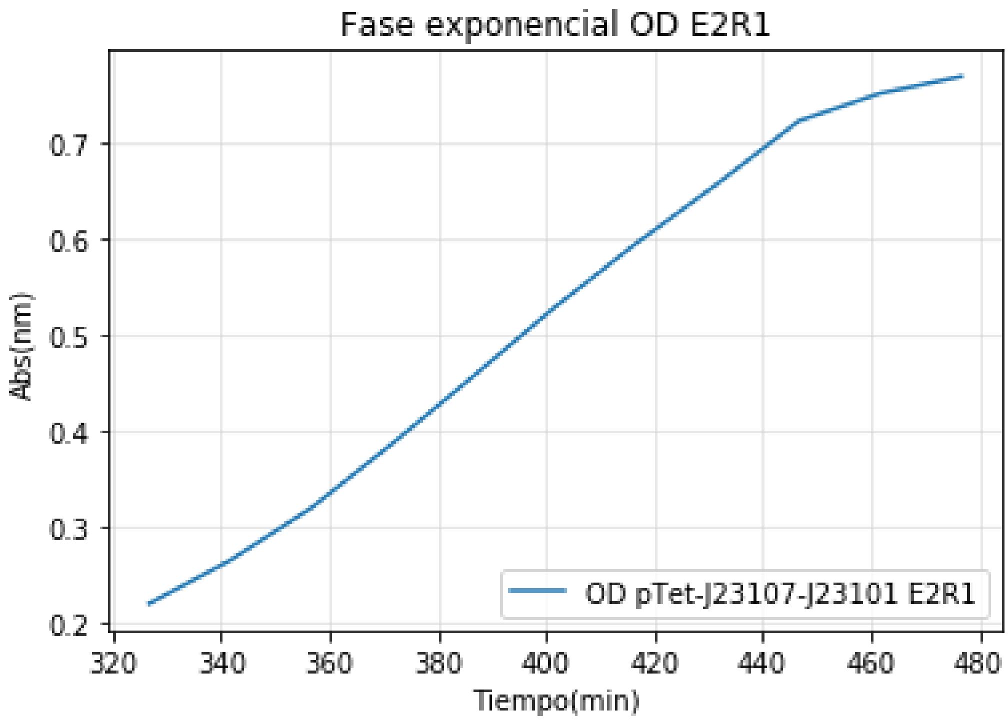



```
A=2.543424e+00
um=1.031175e-02
```

```
l=2.253916e+02
Tm=3.161302e+02
doubpe=6.721916e+01
ext=1.344383e+02
Tfinal=4.505685e+02
```

Out[32]: <matplotlib.legend.Legend at 0x2365aa73668>

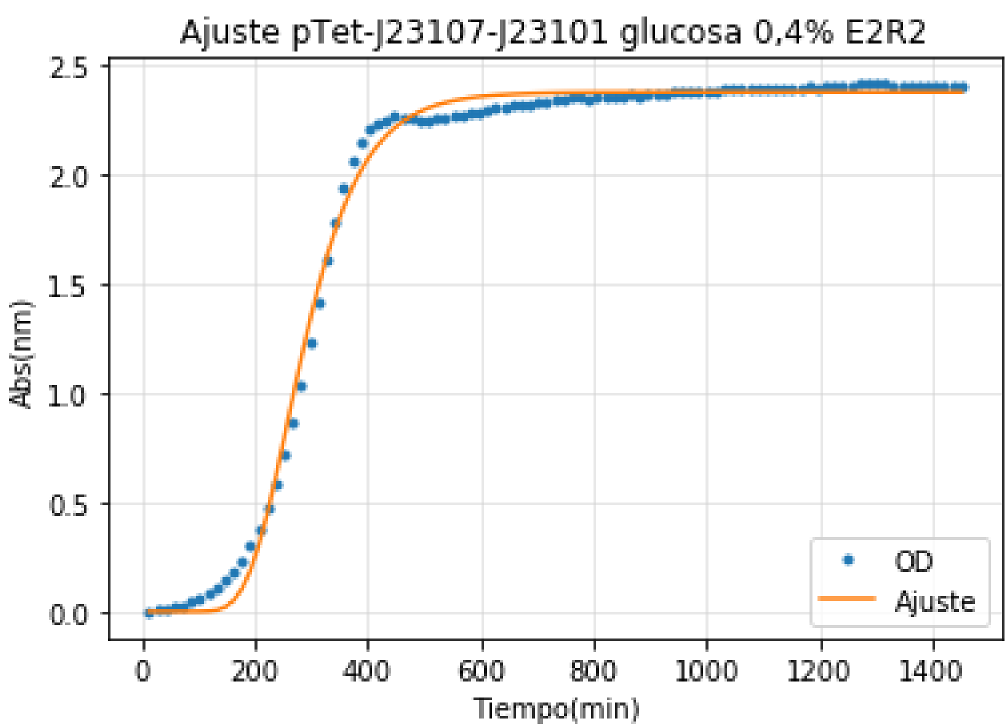





```
In [33]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
         #ptet-std-std glucosa rep 2
         y20= np.log(od15232)-np.log(np.min(od15232))
         print('Min OD = %e'%((np.min(od15232))))
         evaly, params=Function_fit(tt,y20,0,-1,title = 'Ajuste pTet-J23107-J23101 glucosa 0,4%
         A20= params[0]
         um20=params[1]
         l20=params[2]
         print('A=%e'%(A20))
         print('um=%e'%(um20))
         print('l=%e'%(l20))

         #Cálculo datos para determinar extensión de la fase exponencial
         tm20=((A20/(np.exp(1)*um20))+l20)
         print('Tm=%e'%(tm20))
         t220=((np.log(2))/um20)
         print('doubpe=%e'%(t220))
         extdp20=2*t220
         print('ext=%e'%extdp20)
         ttot20=tm20+extdp20
         print('Tfinal=%e'%ttot20)

         #Delimitación fase exponencial en grafico con OD/tiempo
         y1=tt[17]
```

```
y2=tt[26]
plt.figure()
plt.title('pTet-J23107-J23101 Glucosa 0,4% E2R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od15232,label='OD pTet-J23107-J23101 E2R2')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E2R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[17:27],od15232[17:27],label='OD pTet-J23107-J23101 E2R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

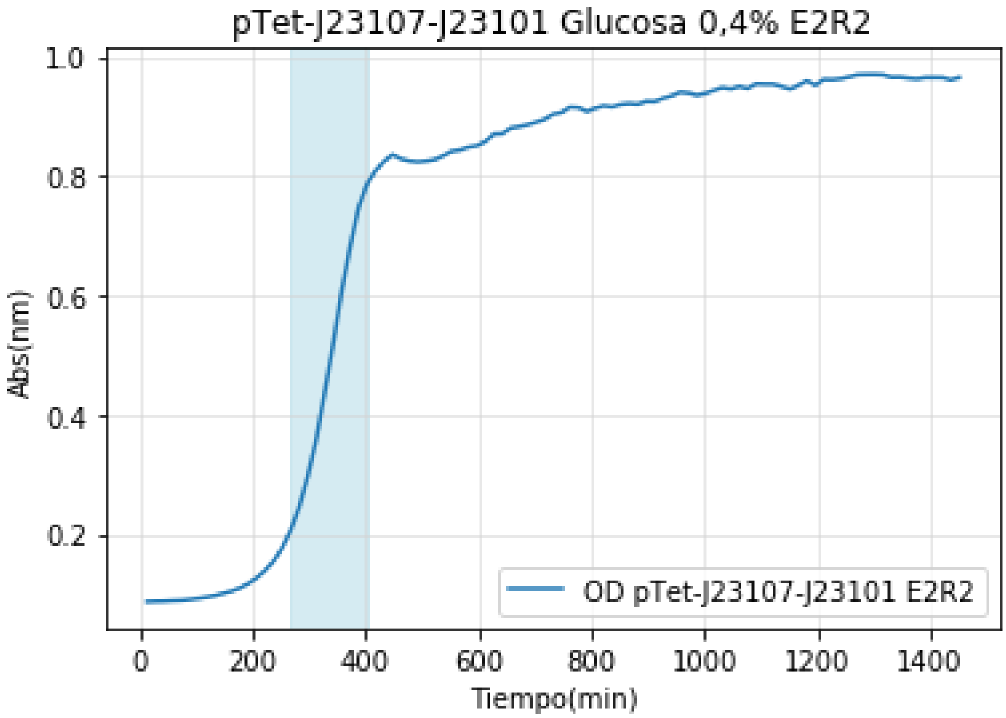
```
Min OD = 8.650000e-02
[ 2.38049312e+00   1.22442727e-02   1.86353375e+02]
```

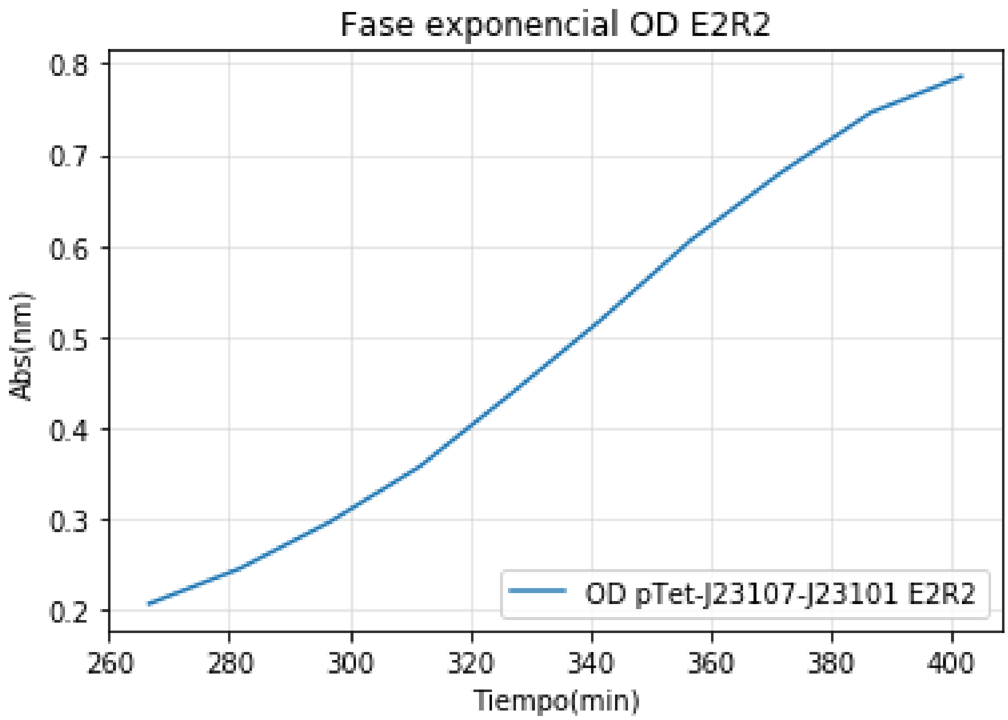



```
A=2.380493e+00
um=1.224427e-02
```

```
l=1.863534e+02
Tm=2.578753e+02
doubpe=5.660991e+01
ext=1.132198e+02
Tfinal=3.710952e+02
```

Out[33]: <matplotlib.legend.Legend at 0x23659036128>

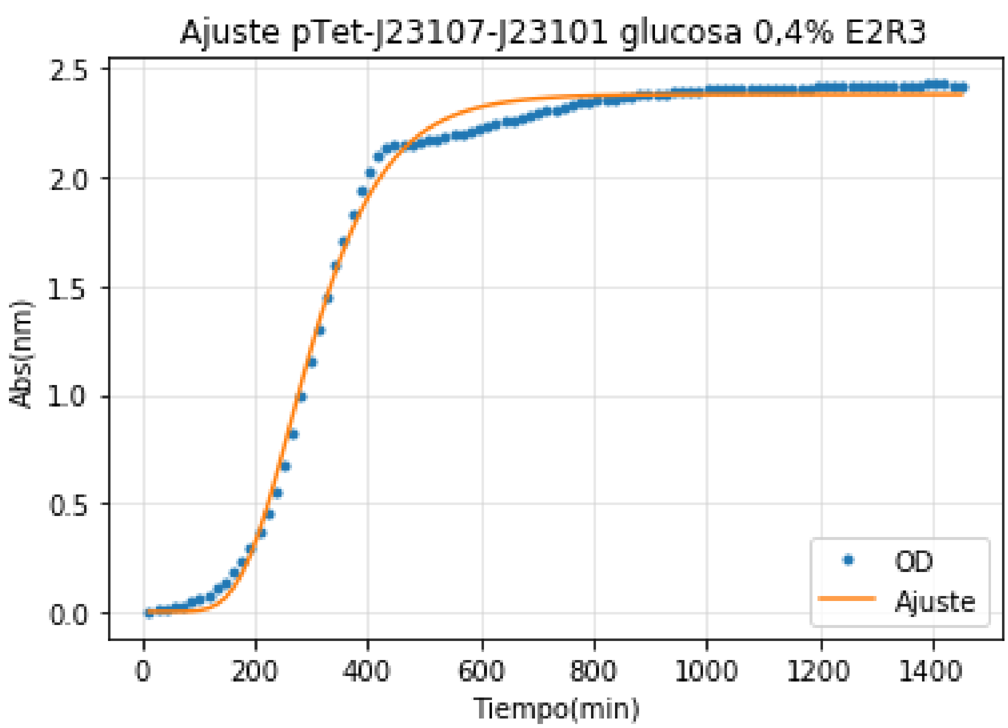




In [34]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#ptet-std-std glucosa rep 3
y21= np.log(od15233)-np.log(np.min(od15233))
print('Min OD = %e'%((np.min(od15233))))
evaly, params=Function_fit(tt,y21,0,-1,title = 'Ajuste pTet-J23107-J23101 glucosa 0,4%
A21= params[0]
um21=params[1]
l21=params[2]
print('A=%e'%(A21))
print('um=%e'%(um21))
print('l=%e'%(l21))

#Cálculo datos para determinar extensión de la fase exponencial
tm21=((A21/(np.exp(1)*um21))+l21)
print('Tm=%e'%(tm21))
t221=((np.log(2))/um21)
print('doubpe=%e'%(t221))
extdp21=2*t221
print('ext=%e'%extdp21)
ttot21=tm21+extdp21
print('Tfinal=%e'%ttot21)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[17]
```

```
y2=tt[28]
plt.figure()
plt.title('pTet-J23107-J23101 Glucosa 0,4% E2R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od15233,label='OD pTet-J23107-J23101 E2R3')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E2R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[17:29],od15233[17:29],label='OD pTet-J23107-J23101 E2R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

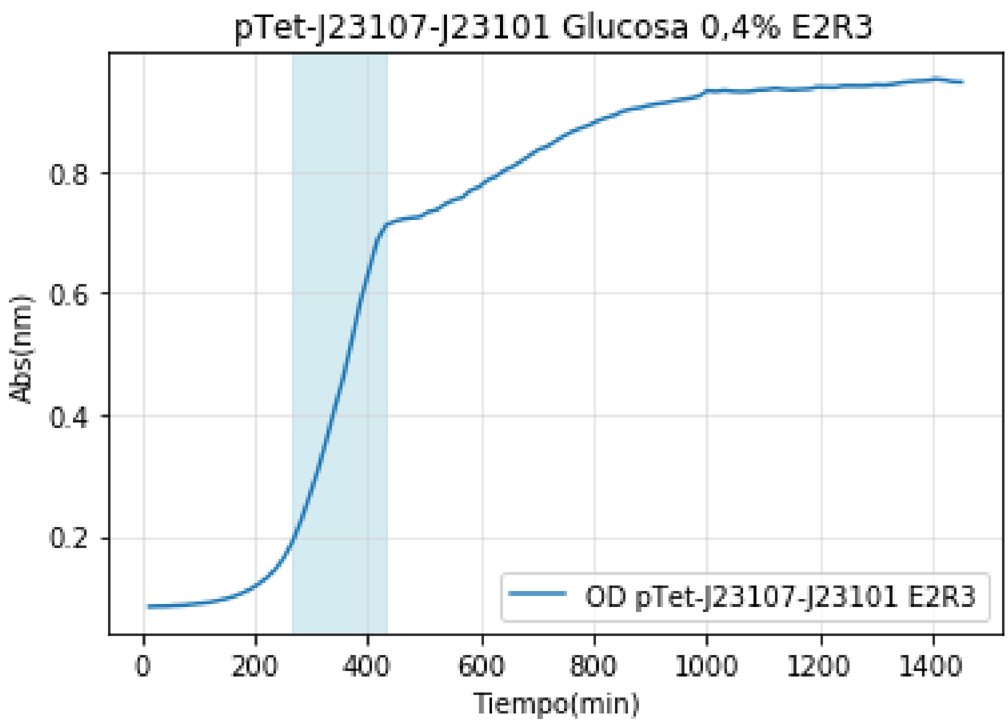
```
Min OD = 8.400000e-02
[  2.38113195e+00   9.65546943e-03   1.72796102e+02]
```

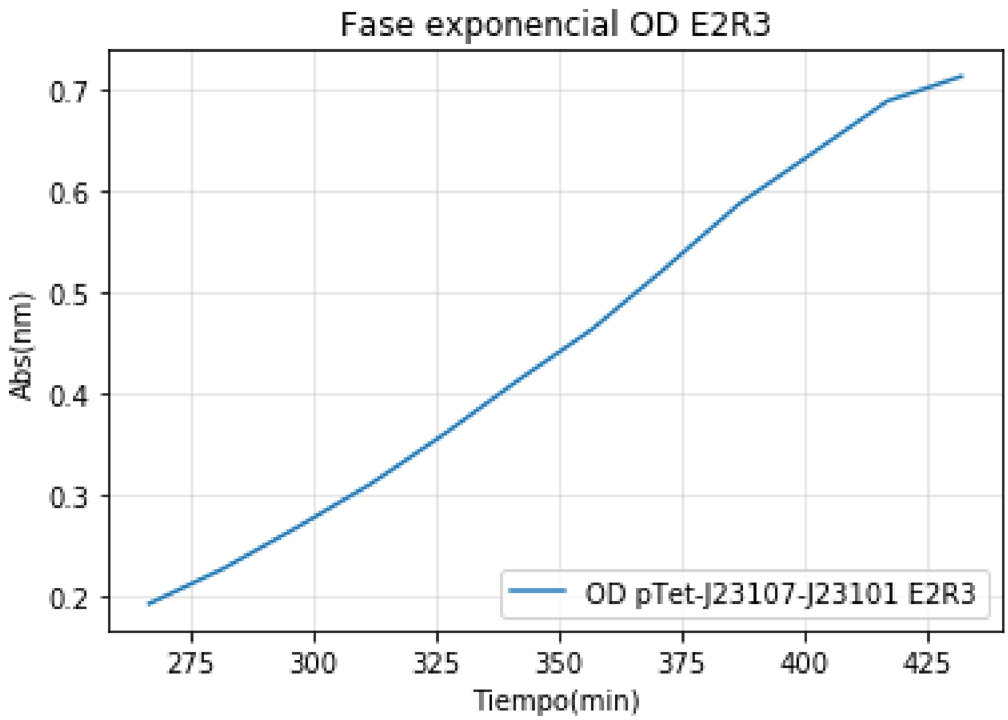



```
A=2.381132e+00
um=9.655469e-03
```

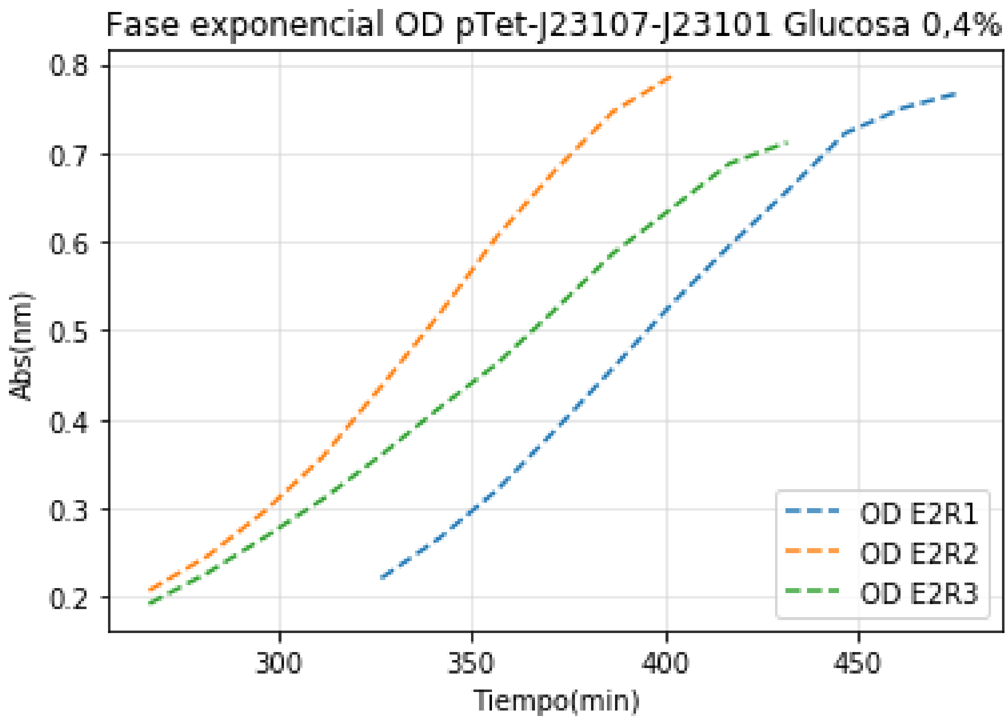
```
l=1.727961e+02
Tm=2.635187e+02
doubpe=7.178804e+01
ext=1.435761e+02
Tfinal=4.070948e+02
```

```
Out[34]: <matplotlib.legend.Legend at 0x2365ada2710>
```





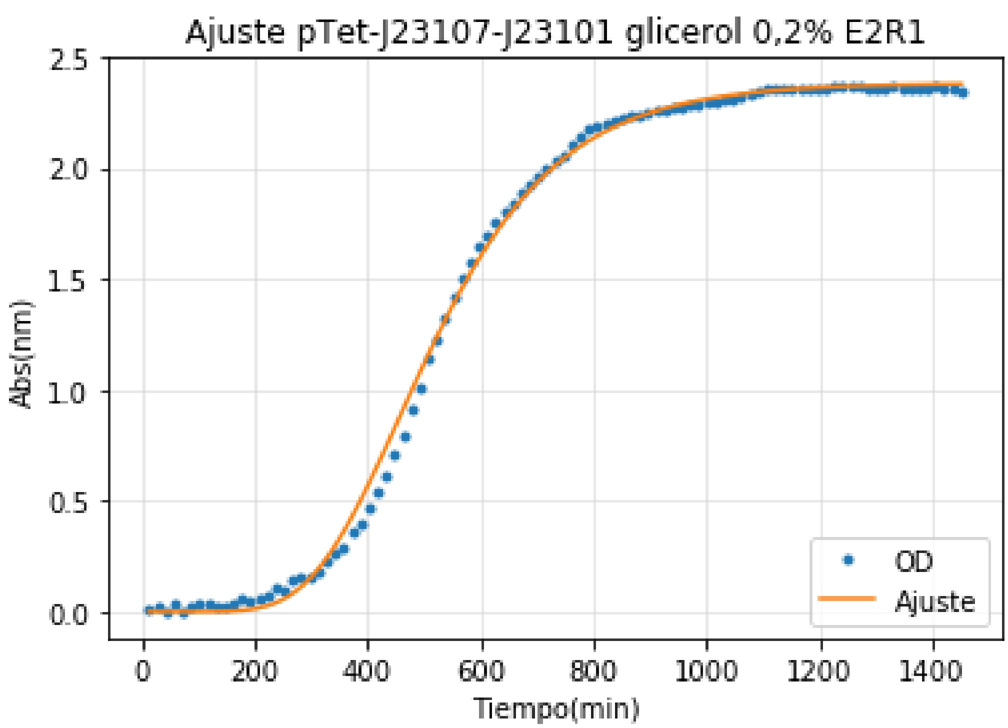

```
In [35]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD pTet-J23107-J23101 Glucosa 0,4%')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[21:32],od15231[21:32],'--',label='OD E2R1')
         plt.plot(tt[17:27],od15232[17:27],'--',label='OD E2R2')
         plt.plot(tt[17:29],od15233[17:29],'--',label='OD E2R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[35]: <matplotlib.legend.Legend at 0x2365aebbf98>
```




```
In [36]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
         #ptet-std-std glicerol rep 1
         y22= np.log(od1523g1)-np.log(np.min(od1523g1))
         print('Min OD = %e'%((np.min(od1523g1))))
         evaly, params=Function_fit(tt,y22,0,-1,title = 'Ajuste pTet-J23107-J23101 glicerol 0,2%
         A22= params[0]
         um22=params[1]
         l22=params[2]
         print('A=%e'%(A22))
         print('um=%e'%(um22))
         print('l=%e'%(l22))

         #Cálculo datos para determinar extensión de la fase exponencial
         tm22=((A22/(np.exp(1)*um22))+l22)
         print('Tm=%e'%(tm22))
         t222=((np.log(2))/um22)
         print('doubpe=%e'%(t222))
         extdp22=2.5*t222
         print('ext=%e'%extdp22)
         ttot22=tm22+extdp22
         print('Tfinal=%e'%ttot22)

         #Delimitación fase exponencial en grafico con OD/tiempo
         y1=tt[30]
```

```python
y2=tt[52]
plt.figure()
plt.title('pTet-J23107-J23101 Glicerol 0,2% E2R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od1523g1,label='OD pTet-J23107-J23101 E2R1')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E2R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[30:53],od1523g1[30:53],label='OD pTet-J23107-J23101 E2R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

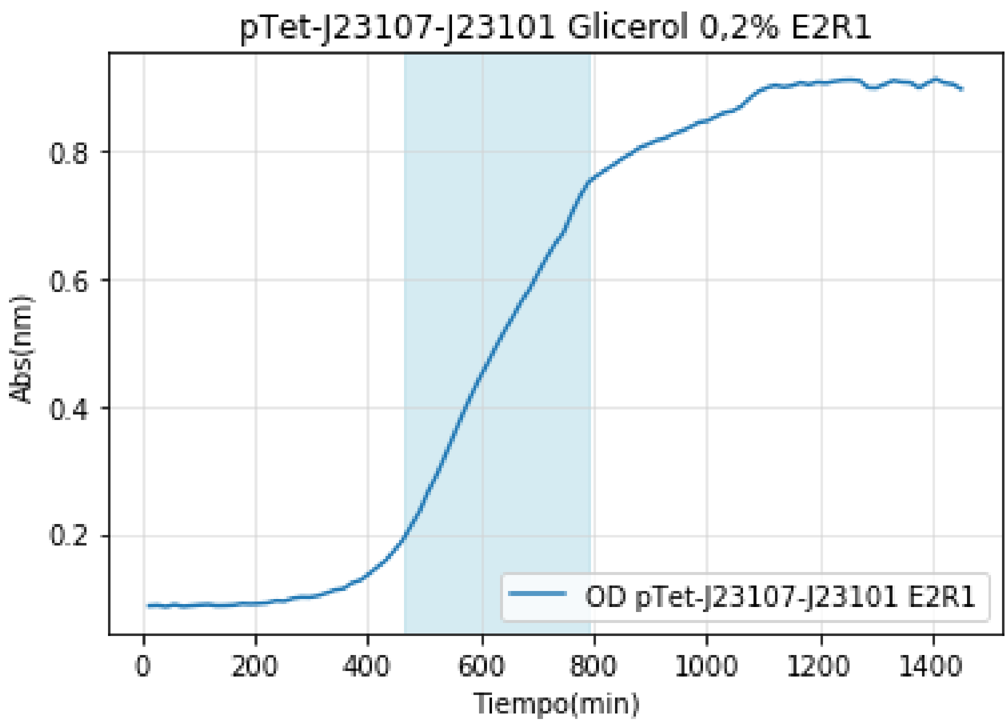
```
Min OD = 8.580000e-02
[  2.37993854e+00   5.62626737e-03   3.00000000e+02]
```

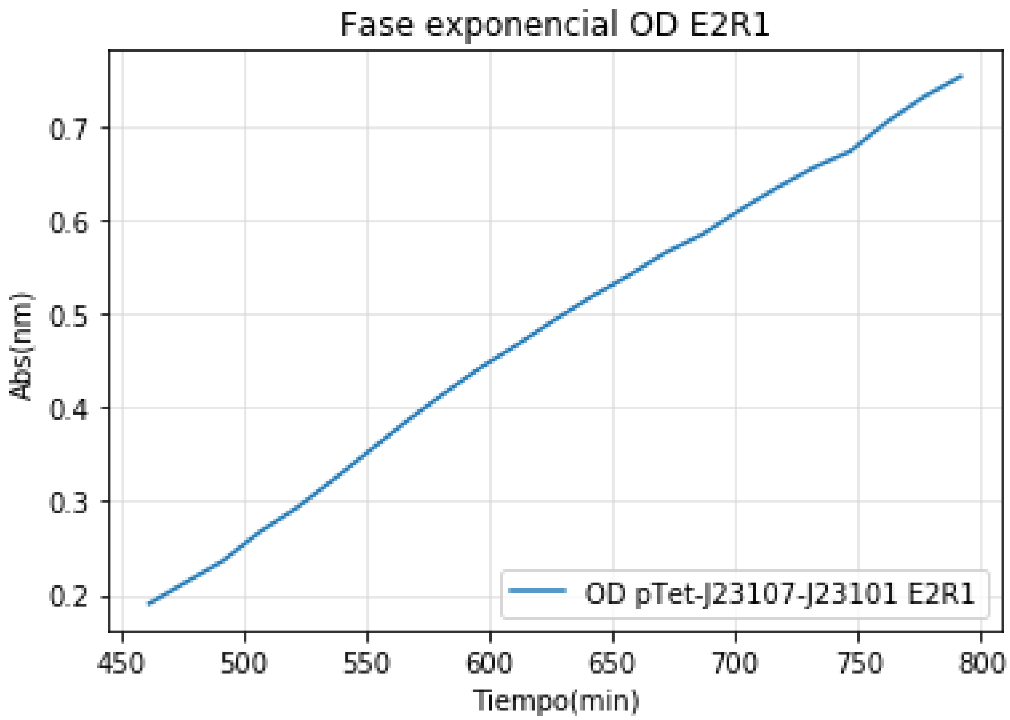



```
A=2.379939e+00
um=5.626267e-03
```

```
l=3.000000e+02
Tm=4.556148e+02
doubpe=1.231984e+02
ext=3.079960e+02
Tfinal=7.636108e+02
```

```
Out[36]: <matplotlib.legend.Legend at 0x2365b046e10>
```

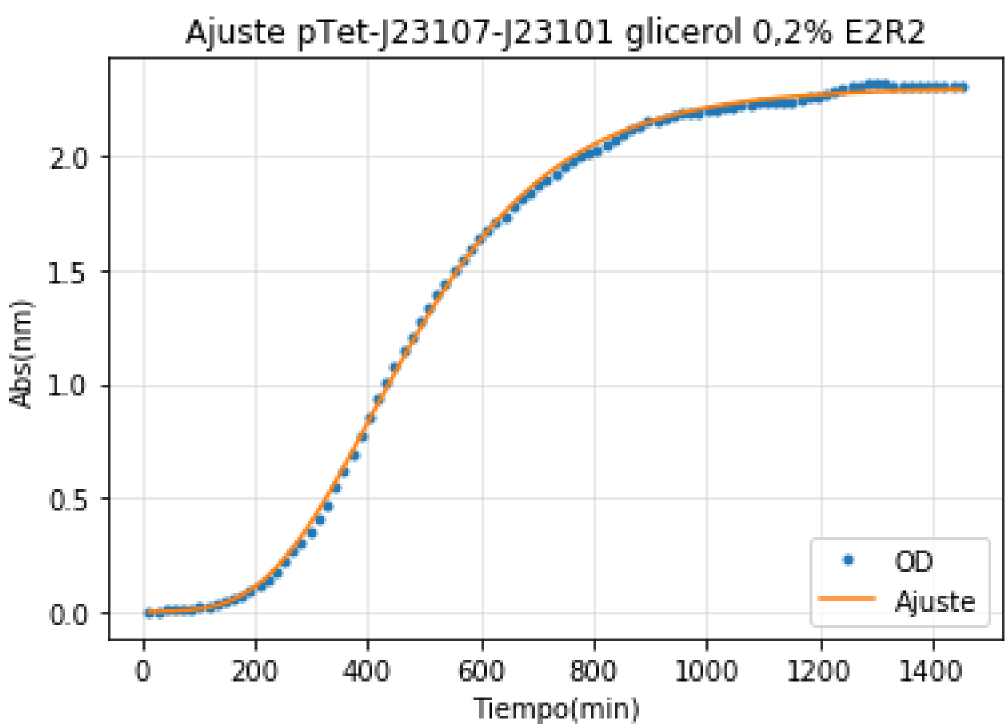




In [37]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#ptet-std-std glicerol rep 2
y23= np.log(od1523g2)-np.log(np.min(od1523g2))
print('Min OD = %e'%((np.min(od1523g2))))
evaly, params=Function_fit(tt,y23,0,-1,title = 'Ajuste pTet-J23107-J23101 glicerol 0,2%
A23= params[0]
um23=params[1]
l23=params[2]
print('A=%e'%(A23))
print('um=%e'%(um23))
print('l=%e'%(l23))

#Cálculo datos para determinar extensión de la fase exponencial
tm23=((A23/(np.exp(1)*um23))+l23)
print('Tm=%e'%(tm23))
t223=((np.log(2))/um23)
print('doubpe=%e'%(t223))
extdp23=2.5*t223
print('ext=%e'%extdp23)
ttot23=tm23+extdp23
print('Tfinal=%e'%ttot23)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[27]
```

```python
y2=tt[53]
plt.figure()
plt.title('pTet-J23107-J23101 Glicerol 0,2% E2R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od1523g2,label='OD pTet-J23107-J23101 E2R2')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E2R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[27:54],od1523g2[27:54],label='OD pTet-J23107-J23101 E2R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

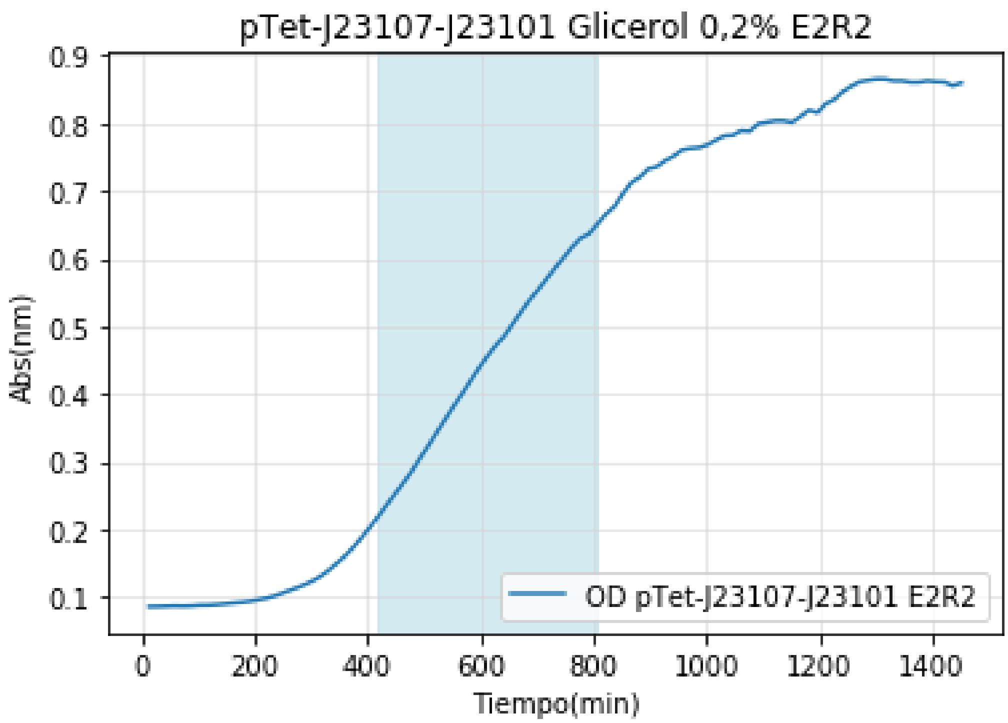
```
Min OD = 8.550000e-02
[  2.29805766e+00   4.61718516e-03   2.20040295e+02]
```

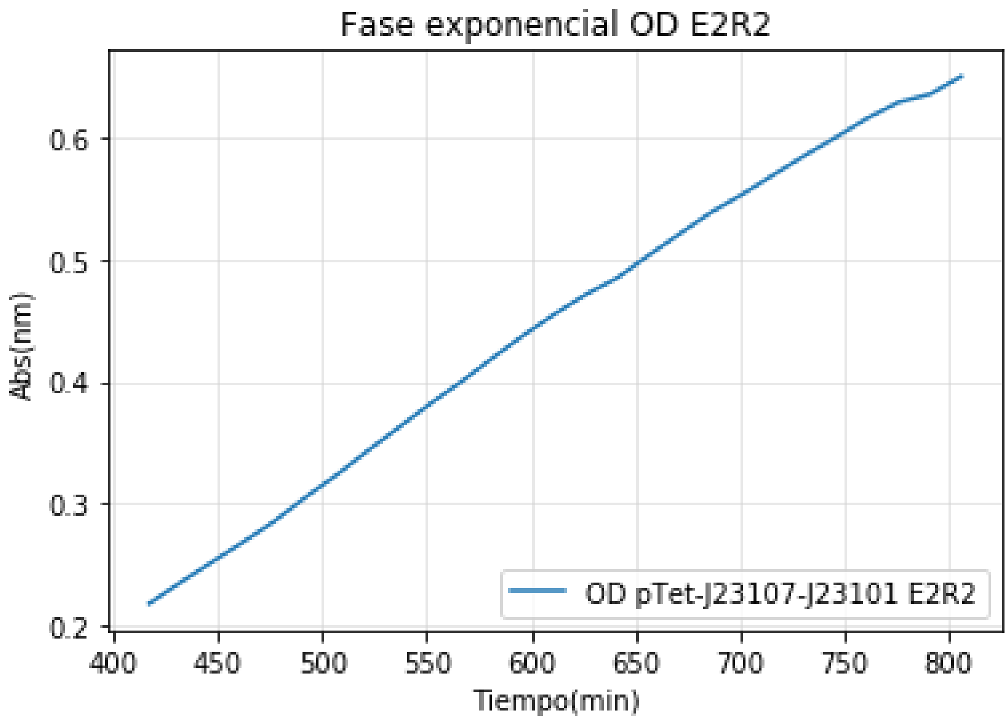



```
A=2.298058e+00
um=4.617185e-03
```

```
l=2.200403e+02
Tm=4.031406e+02
doubpe=1.501233e+02
ext=3.753083e+02
Tfinal=7.784489e+02
```

```
Out[37]: <matplotlib.legend.Legend at 0x2365acea908>
```

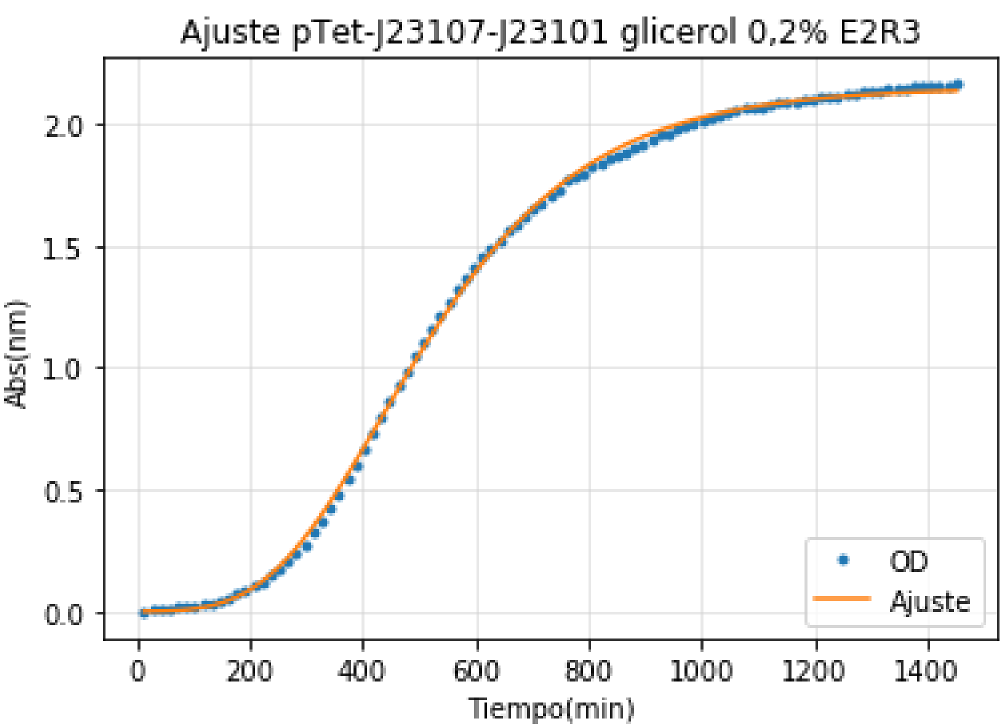




In [38]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#ptet-std-std glicerol rep 3
y24= np.log(od1523g3)-np.log(np.min(od1523g3))
print('Min OD = %e'%((np.min(od1523g3))))
evaly, params=Function_fit(tt,y24,0,-1,title = 'Ajuste pTet-J23107-J23101 glicerol 0,2%
A24= params[0]
um24=params[1]
l24=params[2]
print('A=%e'%(A24))
print('um=%e'%(um24))
print('l=%e'%(l24))

#Cálculo datos para determinar extensión de la fase exponencial
tm24=((A24/(np.exp(1)*um24))+l24)
print('Tm=%e'%(tm24))
t224=((np.log(2))/um24)
print('doubpe=%e'%(t224))
extdp24=2*t224
print('ext=%e'%extdp24)
ttot24=tm24+extdp24
print('Tfinal=%e'%ttot24)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[28]
```

```
y2=tt[59]
plt.figure()
plt.title('pTet-J23107-J23101 Glicerol 0,2% E2R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od1523g3,label='OD pTet-J23107-J23101 E2R3')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E2R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[28:60],od1523g3[28:60],label='OD pTet-J23107-J23101 E2R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

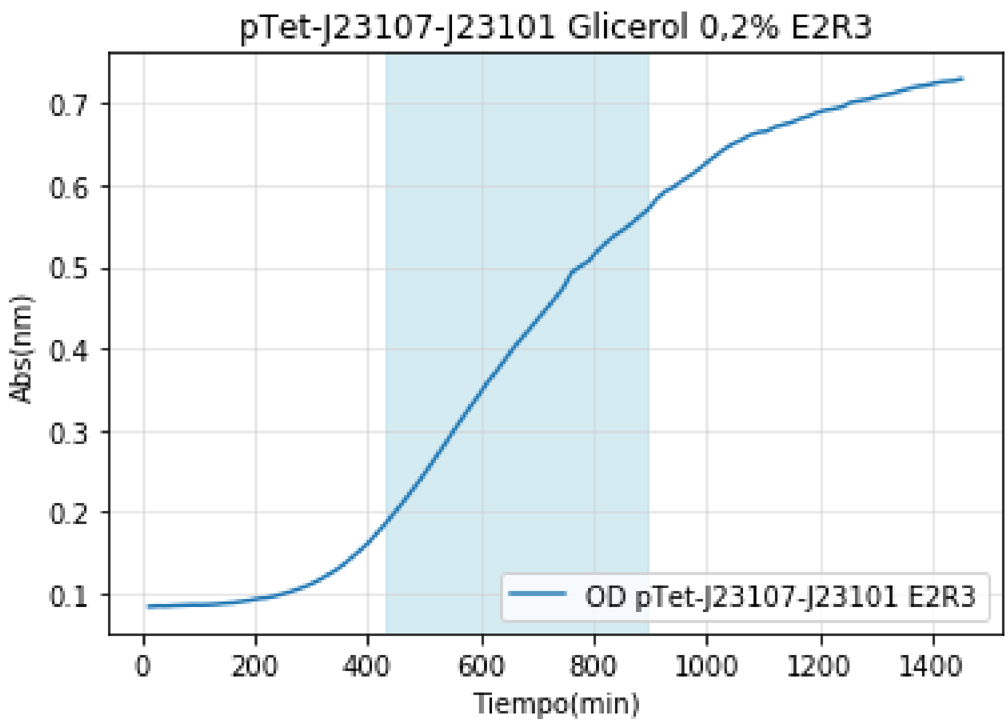
```
Min OD = 8.400000e-02
[  2.14788549e+00   3.93566781e-03   2.30548233e+02]
```

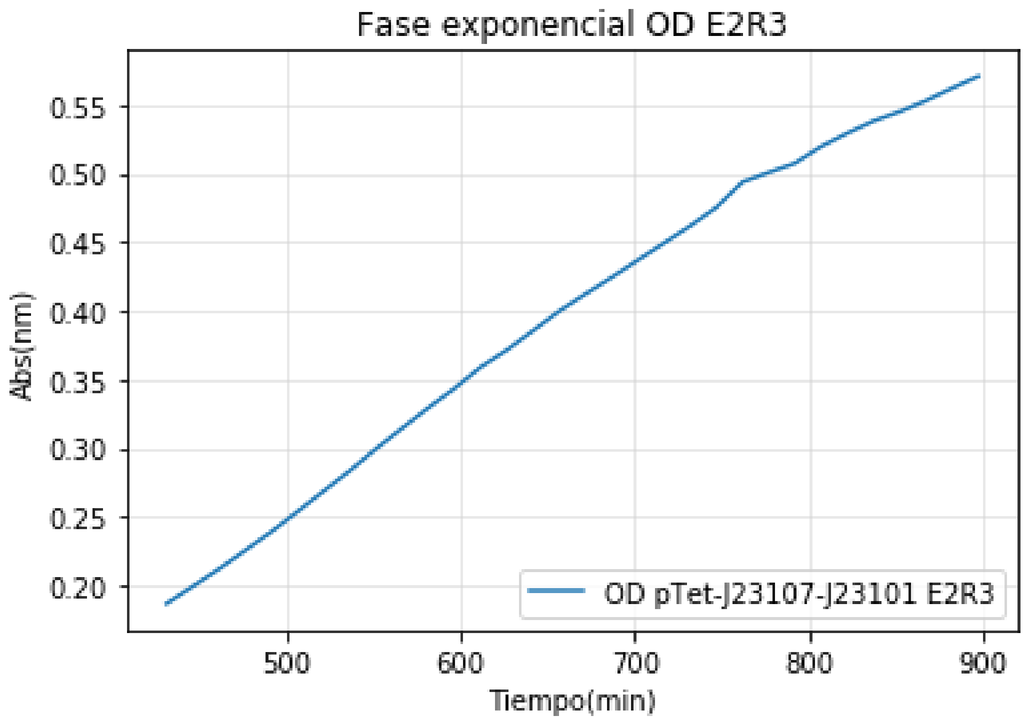



```
A=2.147885e+00
um=3.935668e-03
```

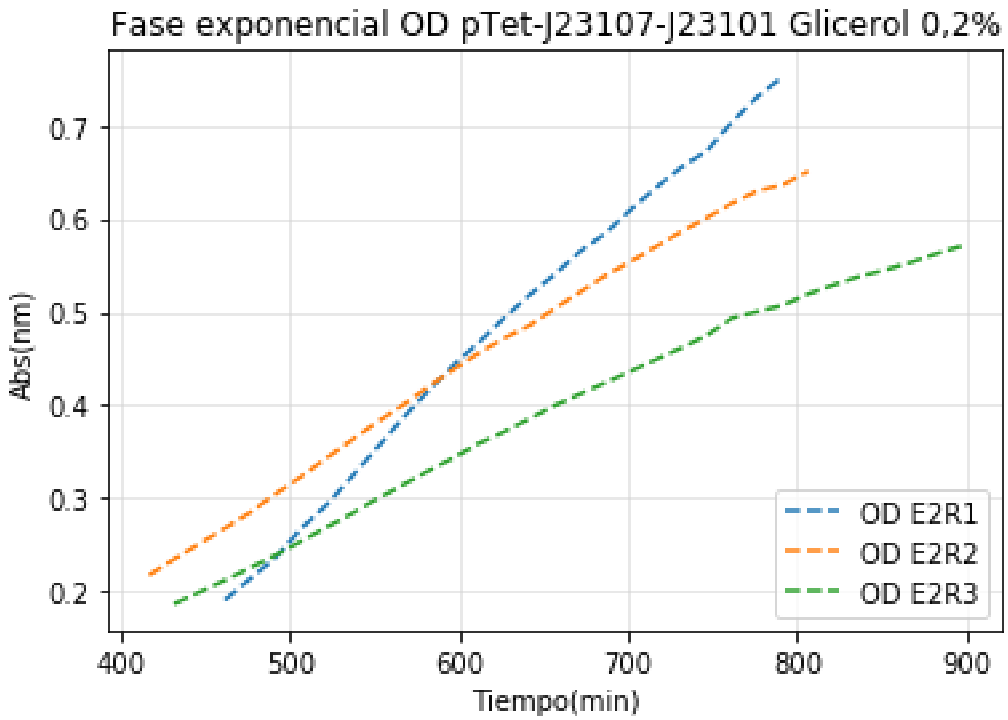
```
l=2.305482e+02
Tm=4.313180e+02
doubpe=1.761193e+02
ext=3.522387e+02
Tfinal=7.835566e+02
```

```
Out[38]: <matplotlib.legend.Legend at 0x2365ad0a588>
```



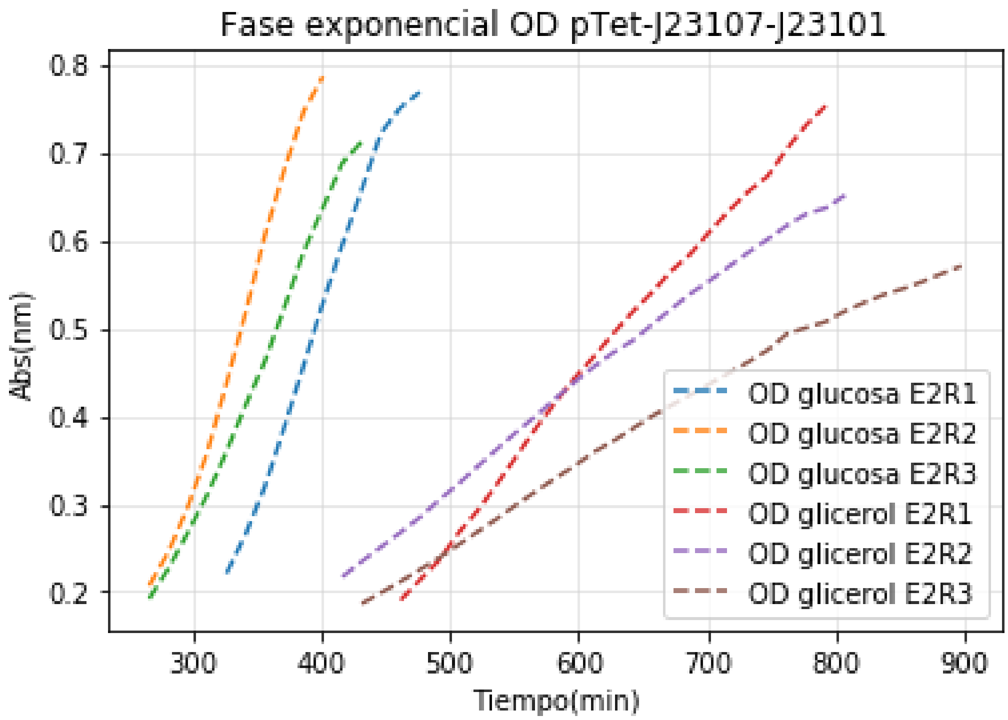



```
In [39]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD pTet-J23107-J23101 Glicerol 0,2%')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[30:53],od1523g1[30:53],'--',label='OD E2R1')
         plt.plot(tt[27:54],od1523g2[27:54],'--',label='OD E2R2')
         plt.plot(tt[28:60],od1523g3[28:60],'--',label='OD E2R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[39]: <matplotlib.legend.Legend at 0x2365b166be0>
```




```
In [40]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD pTet-J23107-J23101')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[21:32],od15231[21:32],'--',label='OD glucosa E2R1')
         plt.plot(tt[17:27],od15232[17:27],'--',label='OD glucosa E2R2')
         plt.plot(tt[17:29],od15233[17:29],'--',label='OD glucosa E2R3')
         plt.plot(tt[30:53],od1523g1[30:53],'--',label='OD glicerol E2R1')
         plt.plot(tt[27:54],od1523g2[27:54],'--',label='OD glicerol E2R2')
         plt.plot(tt[28:60],od1523g3[28:60],'--',label='OD glicerol E2R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')
```

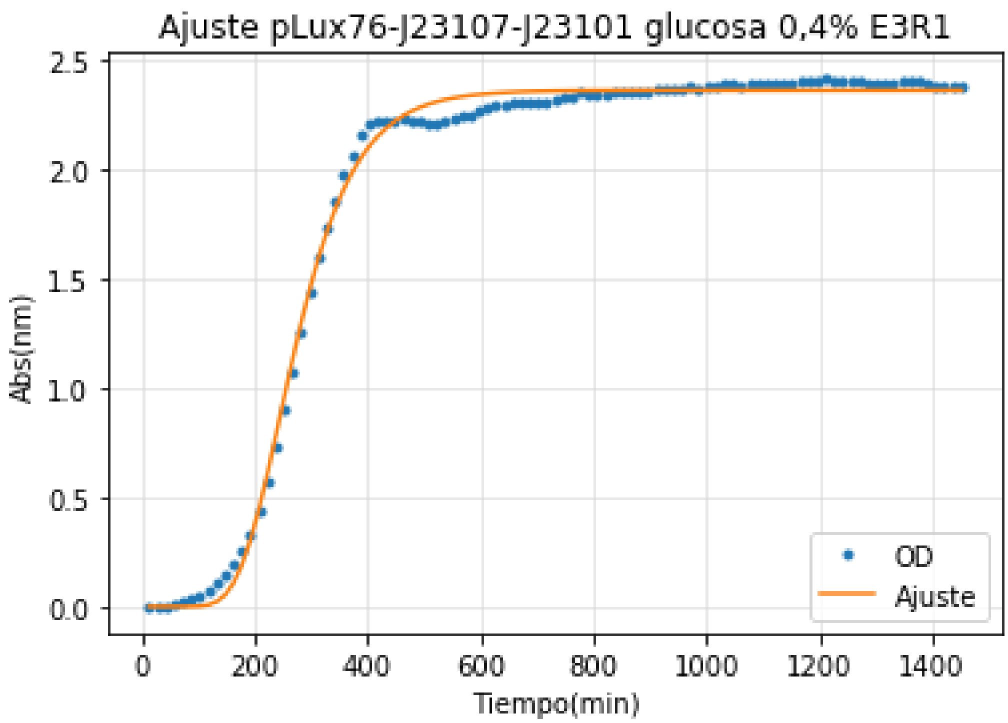
```
Out[40]: <matplotlib.legend.Legend at 0x2365b229fd0>
```



In [41]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#plux-std-std glucosa rep 1
y25= np.log(od18231)-np.log(np.min(od18231))
print('Min OD = %e'%((np.min(od18231))))
evaly, params=Function_fit(tt,y25,0,-1,title = 'Ajuste pLux76-J23107-J23101 glucosa 0,4
A25= params[0]
um25=params[1]
l25=params[2]
print('A=%e'%(A25))
print('um=%e'%(um25))
print('l=%e'%(l25))

#Cálculo datos para determinar extensión de la fase exponencial
tm25=((A25/(np.exp(1)*um25))+l25)
print('Tm=%e'%(tm25))
t225=((np.log(2))/um25)
print('doubpe=%e'%(t225))
extdp25=2*t225
print('ext=%e'%extdp25)
ttot25=tm25+extdp25
print('Tfinal=%e'%ttot25)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[16]
```

```
y2=tt[25]
plt.figure()
plt.title('pLux76-J23107-J23101 Glucosa 0,4% E3R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od18231,label='OD pLux76-J23107-J23101 E3R1')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E3R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[16:26],od18231[16:26],label='OD pLux76-J23107-J23101 E3R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

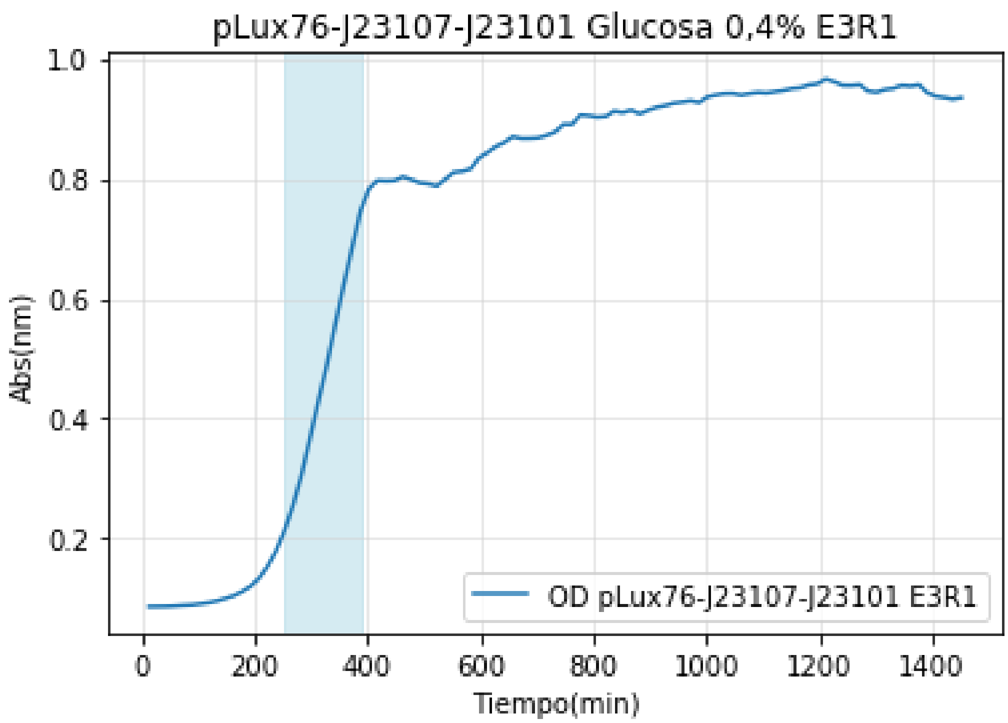
```
Min OD = 8.640000e-02
[  2.36341157e+00   1.18901032e-02   1.70723410e+02]
```

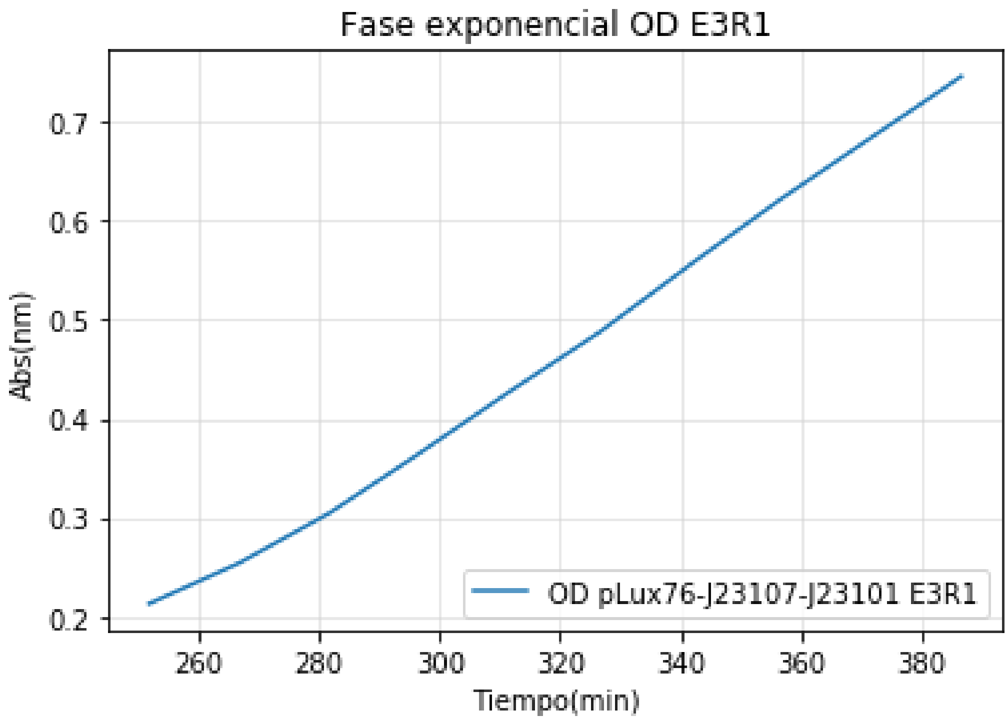



```
A=2.363412e+00
um=1.189010e-02
```

```
l=1.707234e+02
Tm=2.438473e+02
doubpe=5.829614e+01
ext=1.165923e+02
Tfinal=3.604396e+02
```

```
Out[41]: <matplotlib.legend.Legend at 0x2365b3df6d8>
```

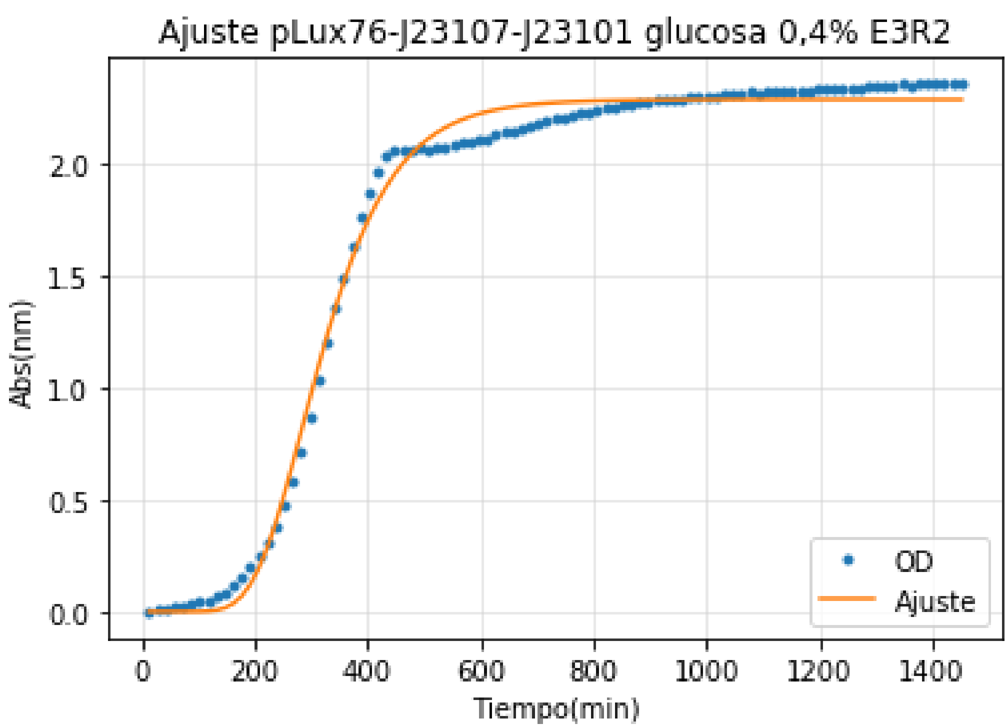




In [42]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#plux-std-std glucosa rep 2
y26= np.log(od18232)-np.log(np.min(od18232))
print('Min OD = %e'%((np.min(od18232))))
evaly, params=Function_fit(tt,y26,0,-1,title = 'Ajuste pLux76-J23107-J23101 glucosa 0,4
A26= params[0]
um26=params[1]
l26=params[2]
print('A=%e'%(A26))
print('um=%e'%(um26))
print('l=%e'%(l26))

#Cálculo datos para determinar extensión de la fase exponencial
tm26=((A26/(np.exp(1)*um26))+l26)
print('Tm=%e'%(tm26))
t226=((np.log(2))/um26)
print('doubpe=%e'%(t226))
extdp26=2*t226
print('ext=%e'%extdp26)
ttot26=tm26+extdp26
print('Tfinal=%e'%ttot26)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[19]
```

```
y2=tt[29]
plt.figure()
plt.title('pLux76-J23107-J23101 Glucosa 0,4% E3R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od18232,label='OD pLux76-J23107-J23101 E3R2')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E3R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[19:30],od18232[19:30],label='OD pLux76-J23107-J23101 E3R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

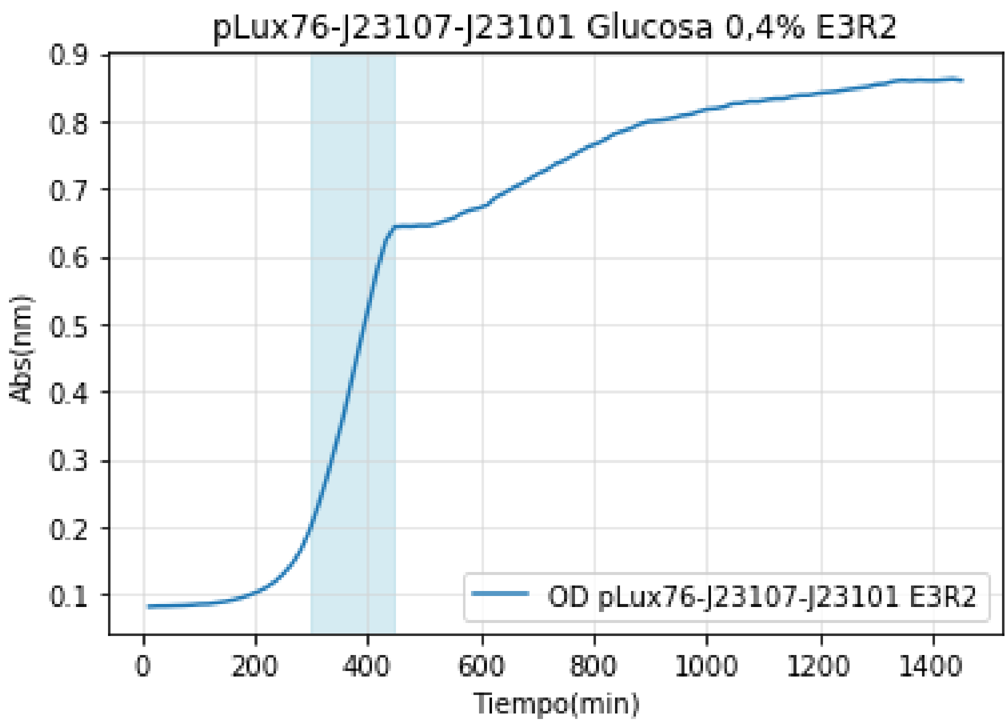
```
Min OD = 8.140000e-02
[  2.29077880e+00   9.63771897e-03   1.97867927e+02]
```

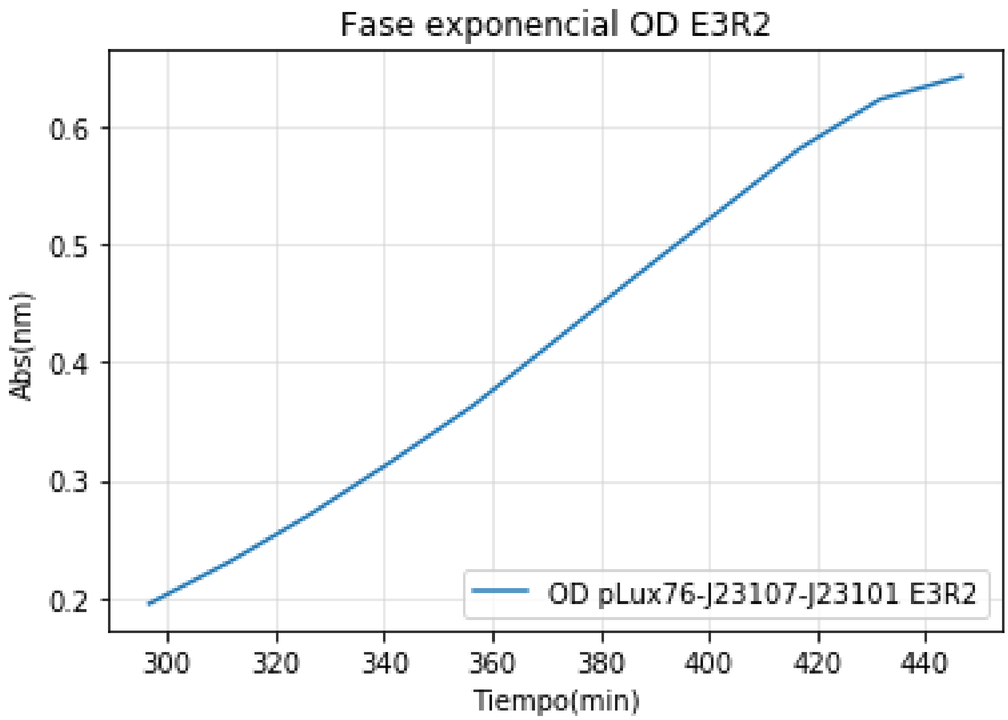



```
A=2.290779e+00
um=9.637719e-03
```

```
l=1.978679e+02
Tm=2.853088e+02
doubpe=7.192025e+01
ext=1.438405e+02
Tfinal=4.291493e+02
```

```
Out[42]: <matplotlib.legend.Legend at 0x2365a672908>
```

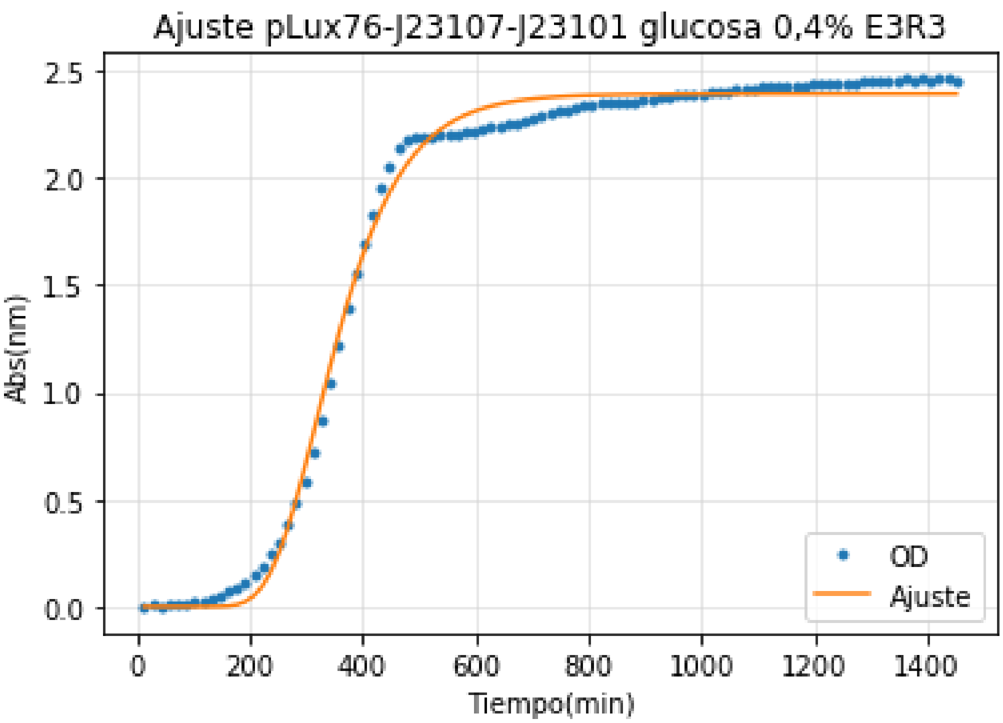





```
In [43]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
         #plux-std-std glucosa rep 3
         y27= np.log(od18233)-np.log(np.min(od18233))
         print('Min OD = %e'%((np.min(od18233))))
         evaly, params=Function_fit(tt,y27,0,-1,title = 'Ajuste pLux76-J23107-J23101 glucosa 0,4
         A27= params[0]
         um27=params[1]
         l27=params[2]
         print('A=%e'%(A27))
         print('um=%e'%(um27))
         print('l=%e'%(l27))

         #Cálculo datos para determinar extensión de la fase exponencial
         tm27=((A27/(np.exp(1)*um27))+l27)
         print('Tm=%e'%(tm27))
         t227=((np.log(2))/um27)
         print('doubpe=%e'%(t227))
         extdp27=2*t227
         print('ext=%e'%extdp27)
         ttot27=tm27+extdp27
         print('Tfinal=%e'%ttot27)

         #Delimitación fase exponencial en grafico con OD/tiempo
         y1=tt[17]
```

```
y2=tt[27]
plt.figure()
plt.title('pLux76-J23107-J23101 Glucosa 0,4% E3R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od18233,label='OD pLux76-J23107-J23101 E3R3')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E3R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[17:28],od18233[17:28],label='OD pLux76-J23107-J23101 E3R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

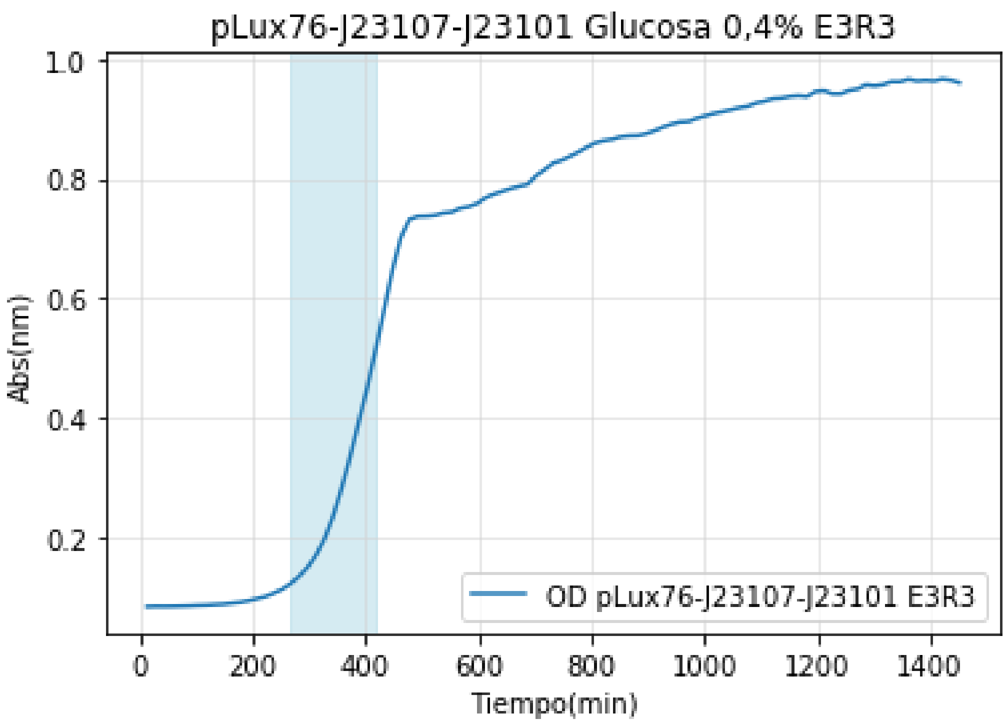
```
Min OD = 8.270000e-02
[ 2.39175683e+00   1.05843087e-02   2.35603435e+02]
```

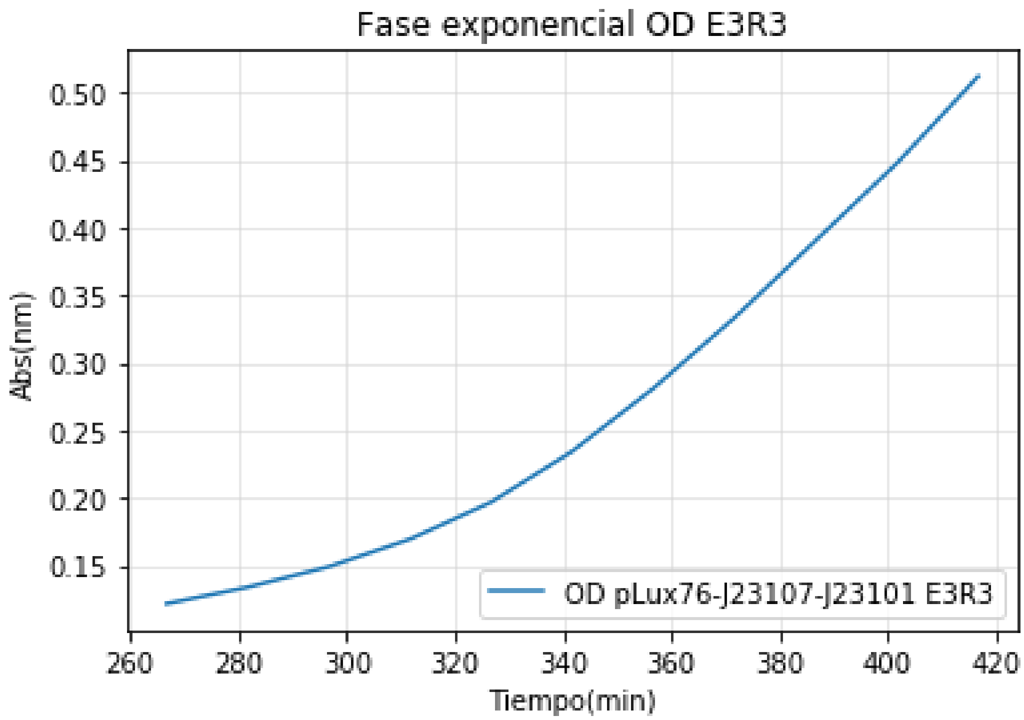



```
A=2.391757e+00
um=1.058431e-02
```

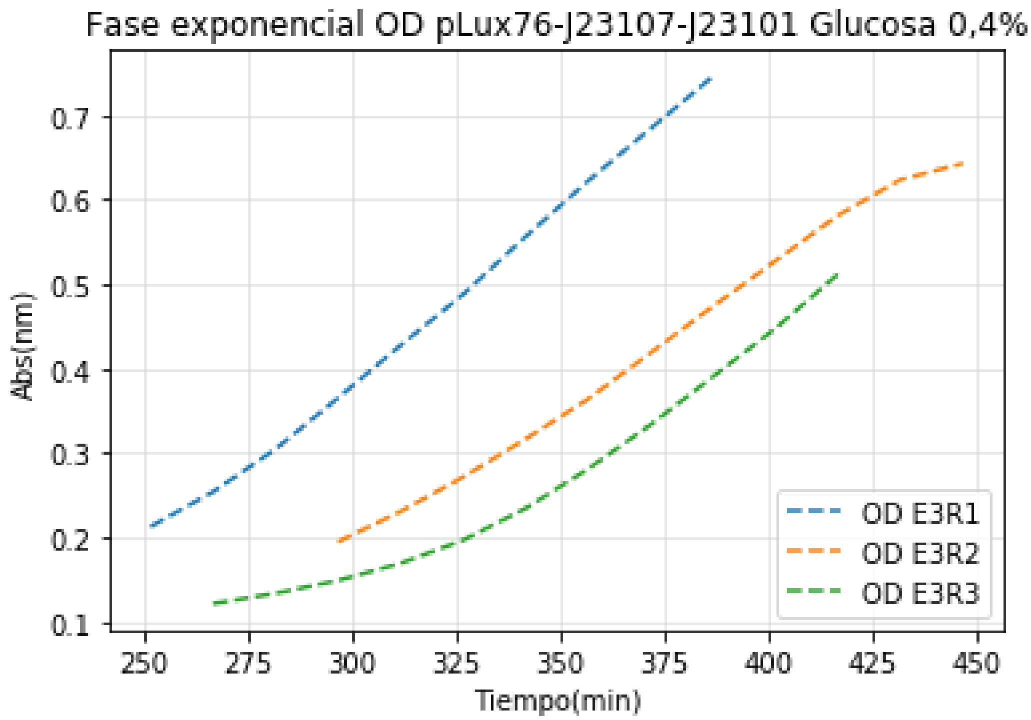
```
l=2.356034e+02
Tm=3.187339e+02
doubpe=6.548819e+01
ext=1.309764e+02
Tfinal=4.497102e+02
```

```
Out[43]: <matplotlib.legend.Legend at 0x2365ad7afd0>
```





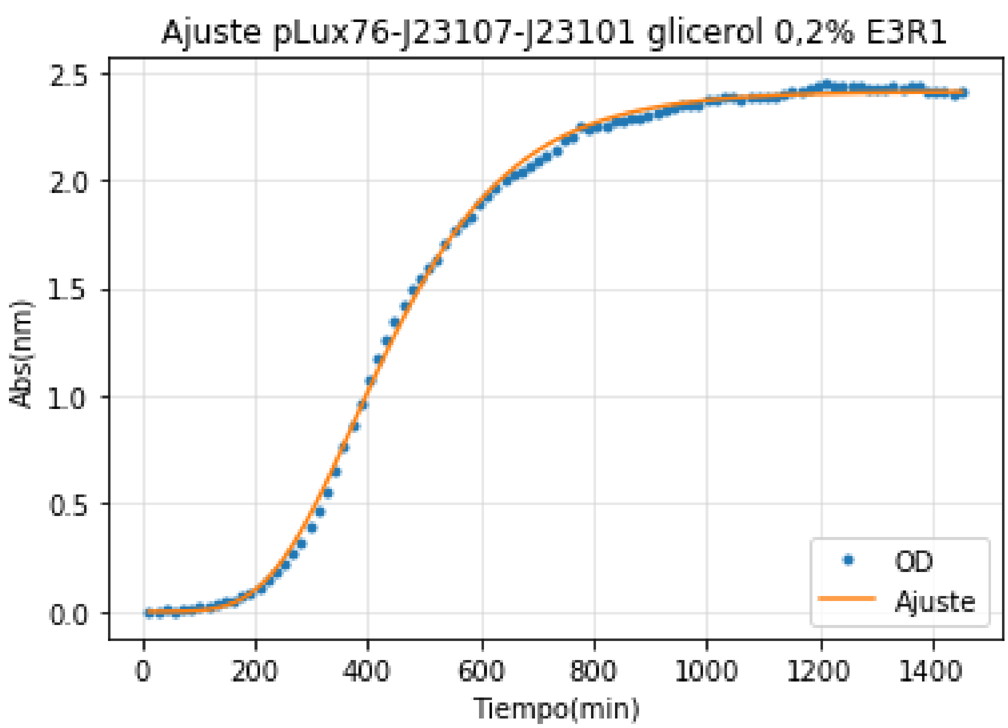

```
In [44]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD pLux76-J23107-J23101 Glucosa 0,4%')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[16:26],od18231[16:26],'--',label='OD E3R1')
         plt.plot(tt[19:30],od18232[19:30],'--',label='OD E3R2')
         plt.plot(tt[17:28],od18233[17:28],'--',label='OD E3R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[44]: <matplotlib.legend.Legend at 0x2365b43ac88>
```




```
In [45]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
         #plux-std-std glicerol rep 1
         y28= np.log(od1823g1)-np.log(np.min(od1823g1))
         print('Min OD = %e'%((np.min(od1823g1))))
         evaly, params=Function_fit(tt,y28,0,-1,title = 'Ajuste pLux76-J23107-J23101 glicerol 0,
         A28= params[0]
         um28=params[1]
         l28=params[2]
         print('A=%e'%(A28))
         print('um=%e'%(um28))
         print('l=%e'%(l28))

         #Cálculo datos para determinar extensión de la fase exponencial
         tm28=((A28/(np.exp(1)*um28))+l28)
         print('Tm=%e'%(tm28))
         t228=((np.log(2))/um28)
         print('doubpe=%e'%(t228))
         extdp28=2.5*t228
         print('ext=%e'%extdp28)
         ttot28=tm28+extdp28
         print('Tfinal=%e'%ttot28)

         #Delimitación fase exponencial en grafico con OD/tiempo
         y1=tt[25]
```

```
y2=tt[46]
plt.figure()
plt.title('pLux76-J23107-J23101 Glicerol 0,2% E3R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od1823g1,label='OD pLux76-J23107-J23101 E3R1')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E3R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[25:47],od1823g1[25:47],label='OD pLux76-J23107-J23101 E3R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

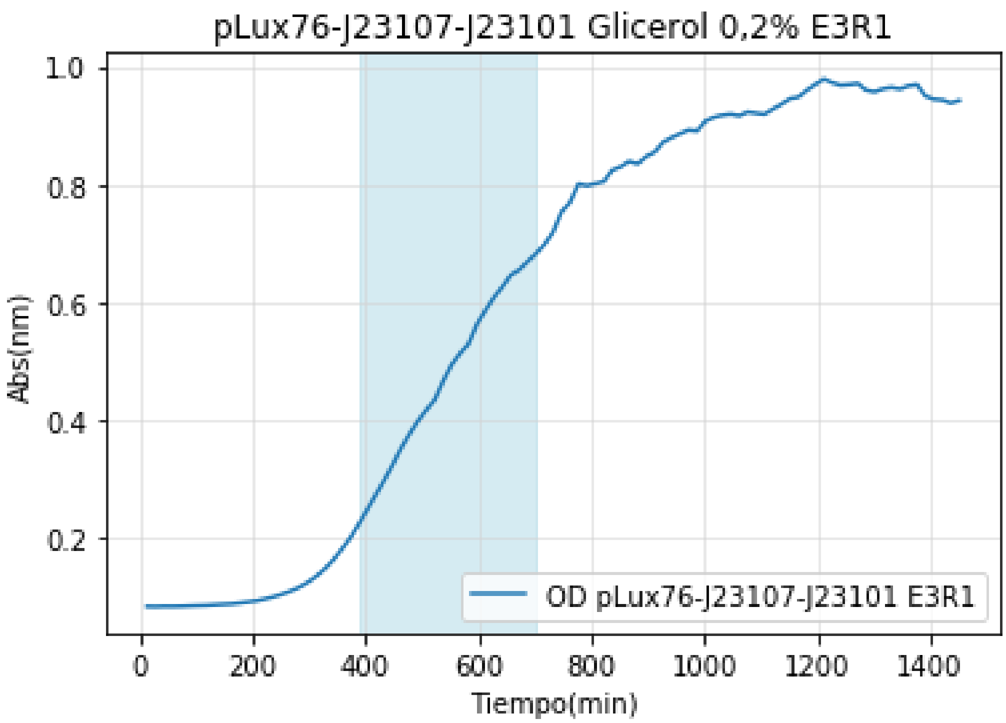
```
Min OD = 8.500000e-02
[  2.40986015e+00   5.77973374e-03   2.23325401e+02]
```

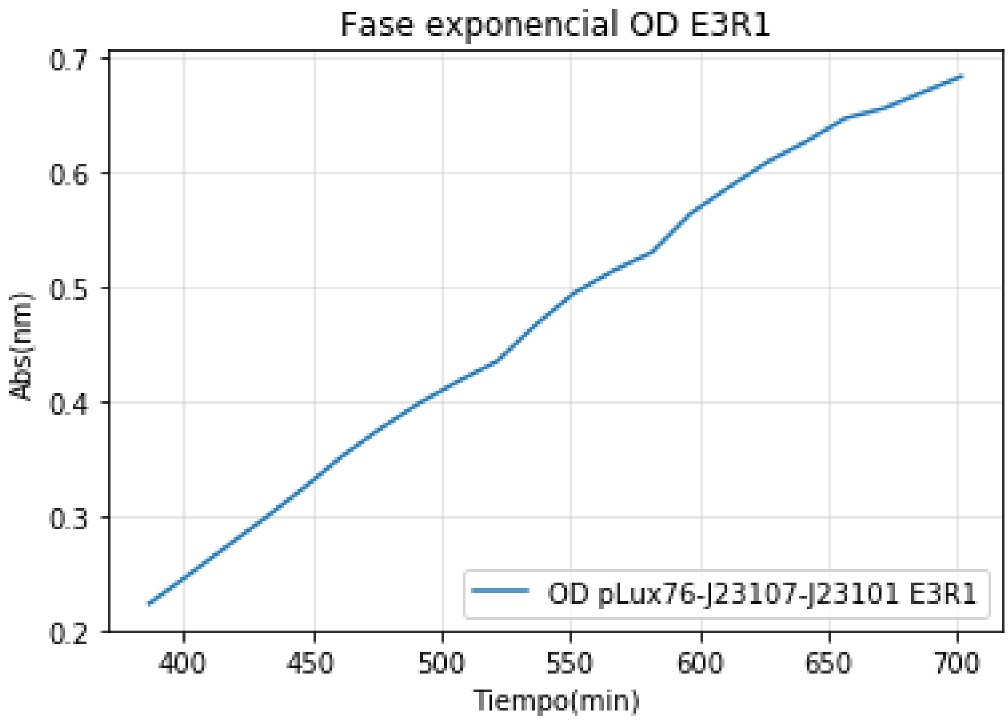



```
A=2.409860e+00
um=5.779734e-03
```

```
l=2.233254e+02
Tm=3.767127e+02
doubpe=1.199272e+02
ext=2.998180e+02
Tfinal=6.765307e+02
```

```
Out[45]: <matplotlib.legend.Legend at 0x2365c5b5fd0>
```

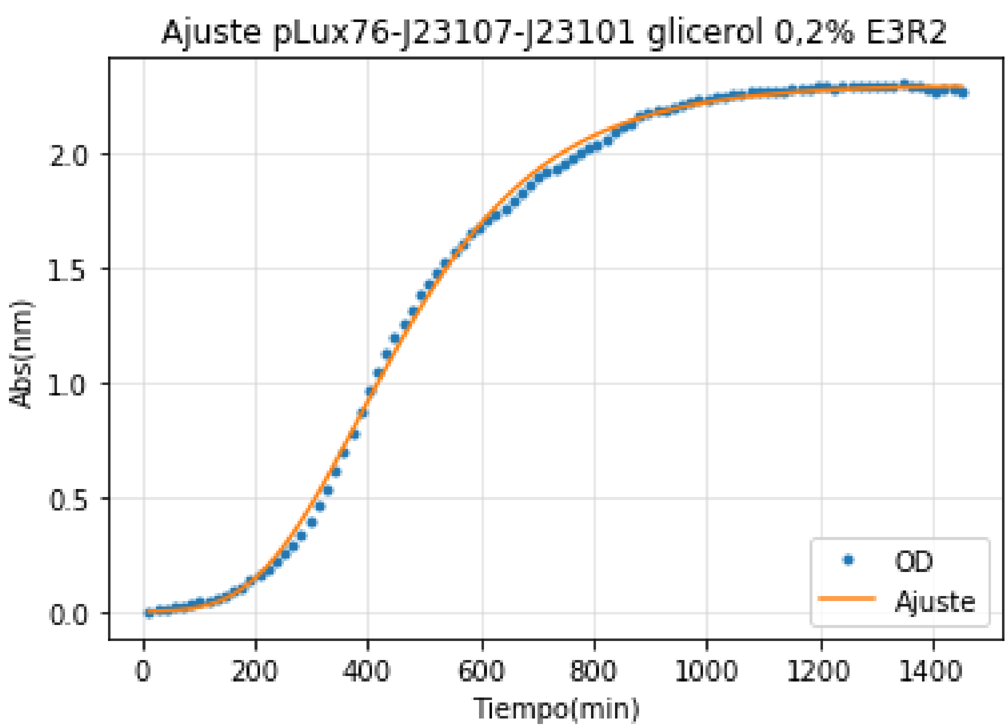




In [46]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#plux-std-std glicerol rep 2
y29= np.log(od1823g2)-np.log(np.min(od1823g2))
print('Min OD = %e'%((np.min(od1823g2))))
evaly, params=Function_fit(tt,y29,0,-1,title = 'Ajuste pLux76-J23107-J23101 glicerol 0,
A29= params[0]
um29=params[1]
l29=params[2]
print('A=%e'%(A29))
print('um=%e'%(um29))
print('l=%e'%(l29))

#Cálculo datos para determinar extensión de la fase exponencial
tm29=((A29/(np.exp(1)*um29))+l29)
print('Tm=%e'%(tm29))
t229=((np.log(2))/um29)
print('doubpe=%e'%(t229))
extdp29=2.5*t229
print('ext=%e'%extdp29)
ttot29=tm29+extdp29
print('Tfinal=%e'%ttot29)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[25]
```

```
y2=tt[51]
plt.figure()
plt.title('pLux76-J23107-J23101 Glicerol 0,2% E3R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od1823g2,label='OD pLux76-J23107-J23101 E3R2')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E3R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[25:52],od1823g2[25:52],label='OD pLux76-J23107-J23101 E3R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

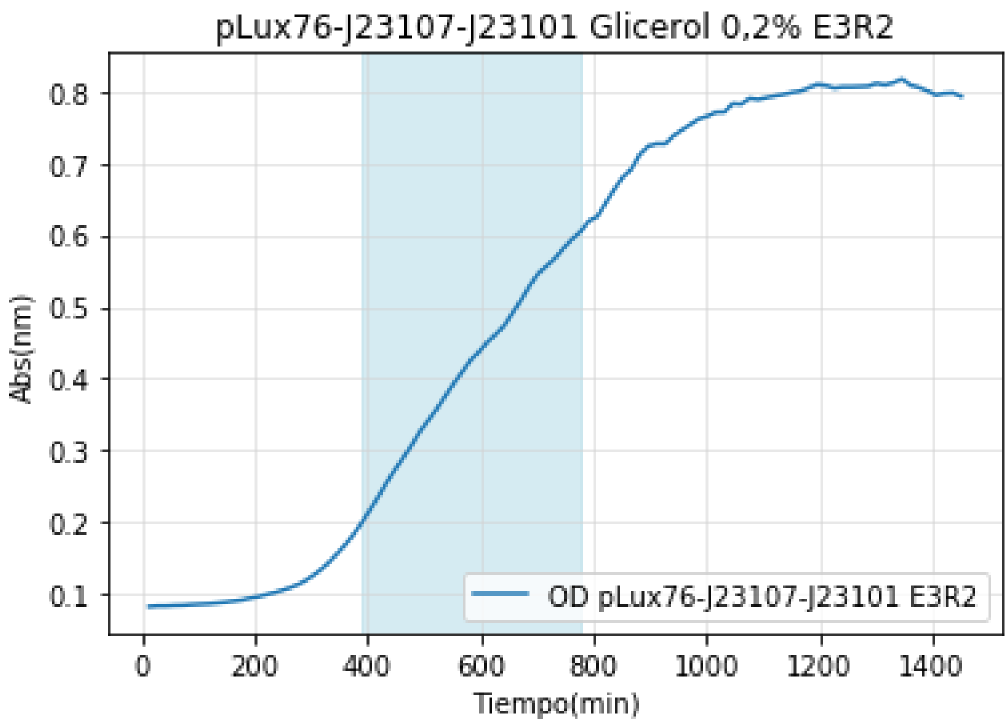
```
Min OD = 8.230000e-02
[  2.29194044e+00   4.63599113e-03   2.02332658e+02]
```

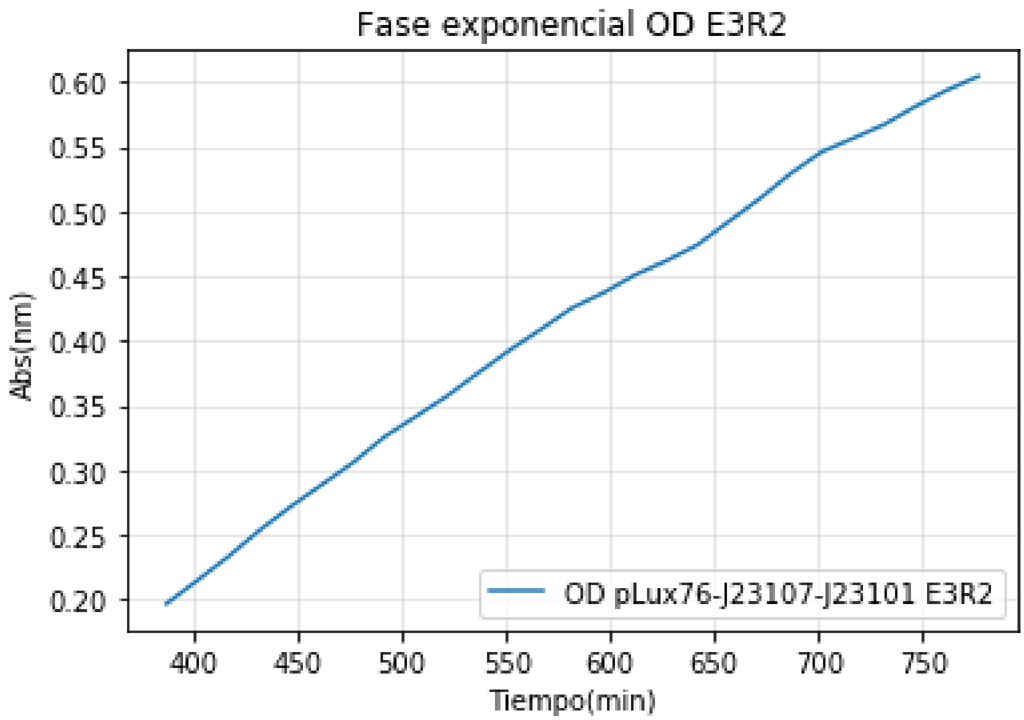



```
A=2.291940e+00
um=4.635991e-03
```

```
l=2.023327e+02
Tm=3.842048e+02
doubpe=1.495143e+02
ext=3.737859e+02
Tfinal=7.579907e+02
```

Out[46]: <matplotlib.legend.Legend at 0x2365c7b37b8>

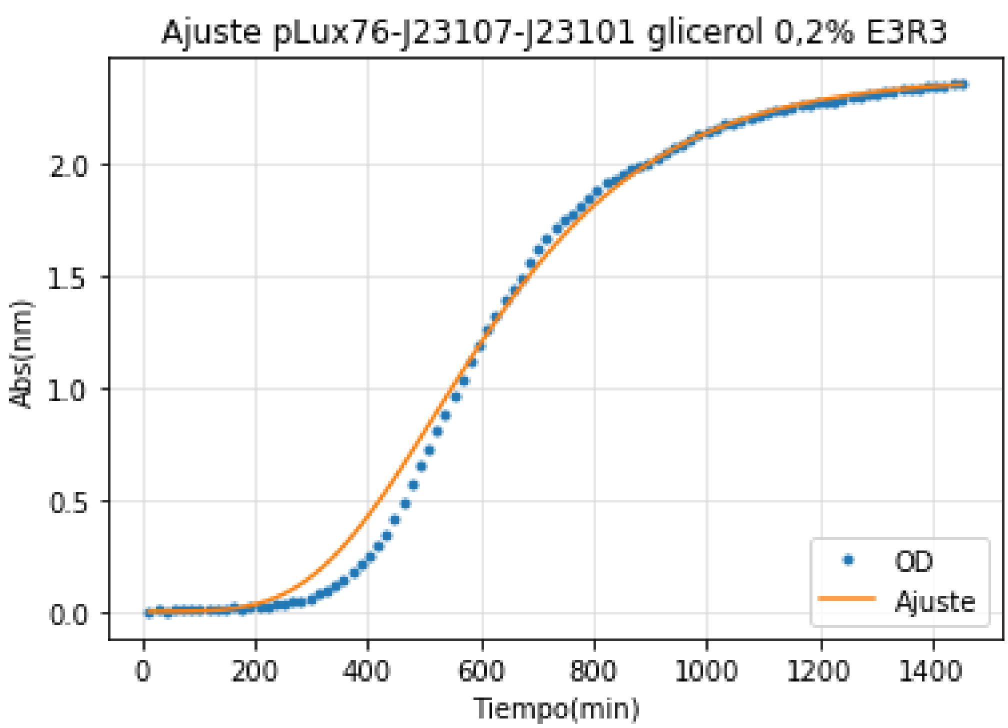




In [47]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#plux-std-std glicerol rep 3
y30= np.log(od1823g3)-np.log(np.min(od1823g3))
print('Min OD = %e'%((np.min(od1823g3))))
evaly, params=Function_fit(tt,y30,0,-1,title = 'Ajuste pLux76-J23107-J23101 glicerol 0,
A30= params[0]
um30=params[1]
l30=params[2]
print('A=%e'%(A30))
print('um=%e'%(um30))
print('l=%e'%(l30))

#Cálculo datos para determinar extensión de la fase exponencial
tm30=((A30/(np.exp(1)*um30))+l30)
print('Tm=%e'%(tm30))
t230=((np.log(2))/um30)
print('doubpe=%e'%(t230))
extdp30=2*t230
print('ext=%e'%extdp30)
ttot30=tm30+extdp30
print('Tfinal=%e'%ttot30)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[25]
```

```python
y2=tt[52]
plt.figure()
plt.title('pLux76-J23107-J23101 Glicerol 0,2% E3R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od1823g3,label='OD pLux76-J23107-J23101 E3R3')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E3R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[25:53],od1823g3[25:53],label='OD pLux76-J23107-J23101 E3R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

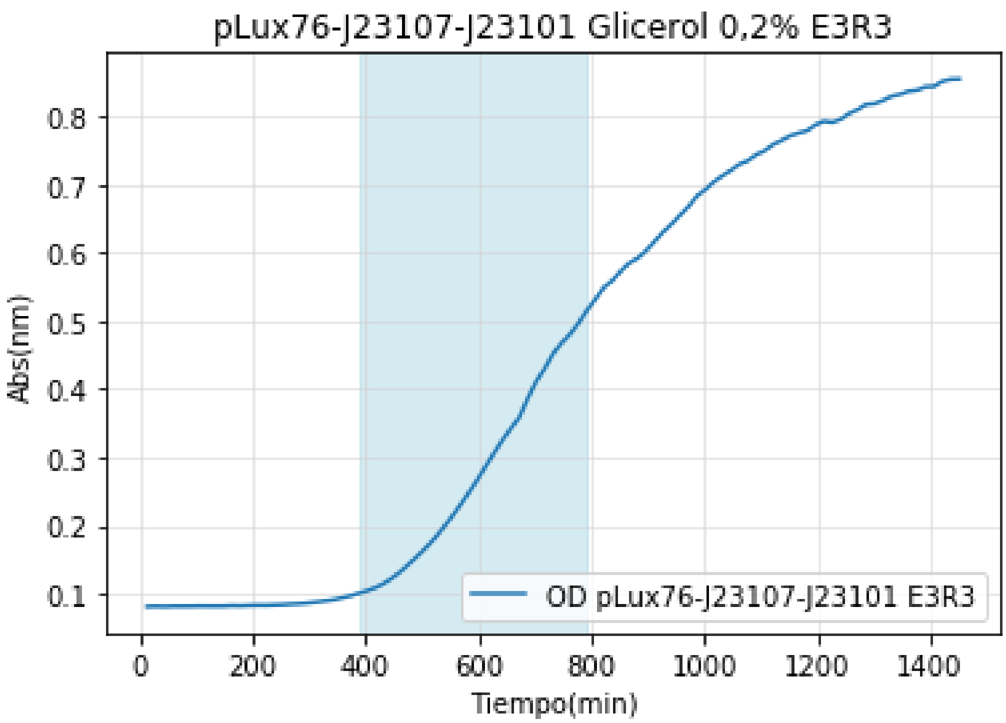
```
Min OD = 8.140000e-02
[  2.38222296e+00   4.01274714e-03   3.00000000e+02]
```

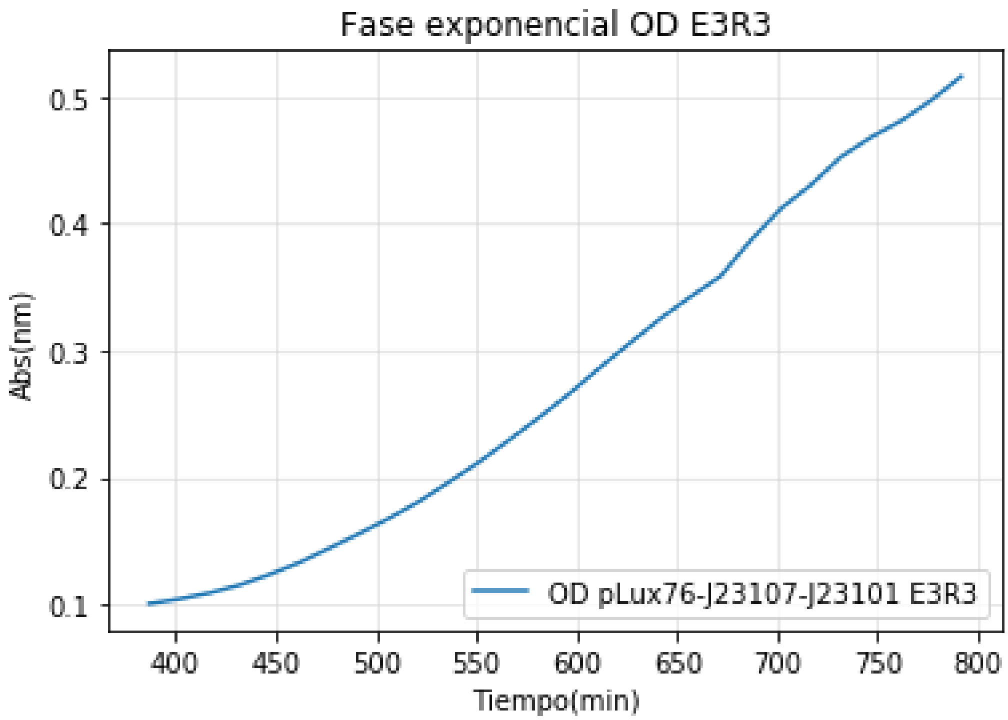



```
A=2.382223e+00
um=4.012747e-03
```

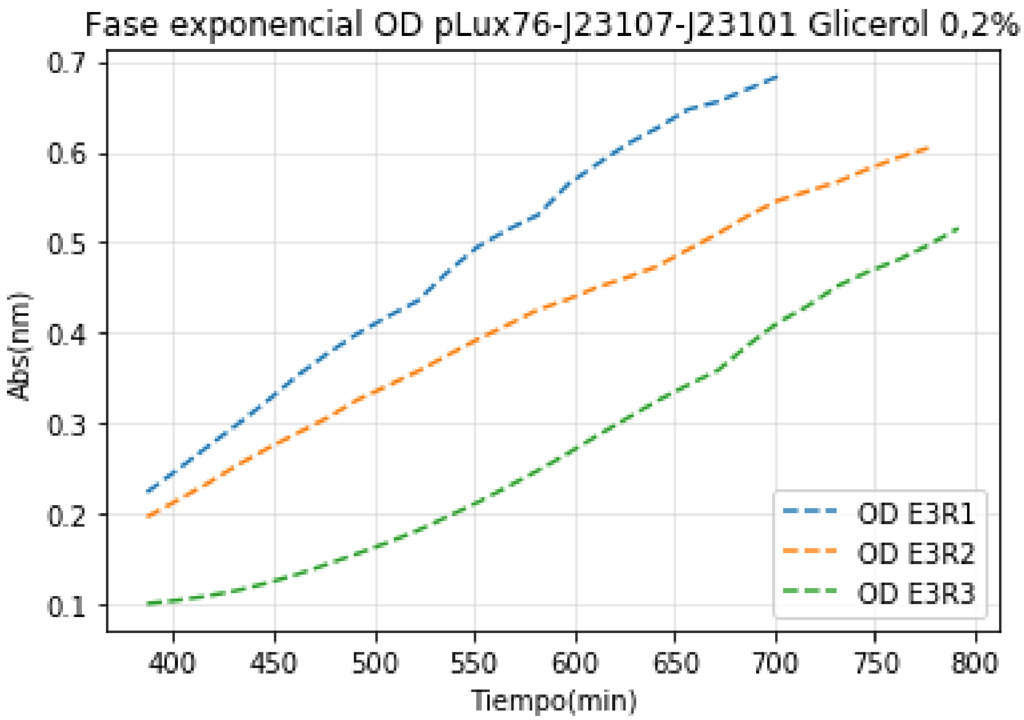
```
l=3.000000e+02
Tm=5.183967e+02
doubpe=1.727363e+02
ext=3.454726e+02
Tfinal=8.638694e+02
```

```
Out[47]: <matplotlib.legend.Legend at 0x2365c51f6a0>
```

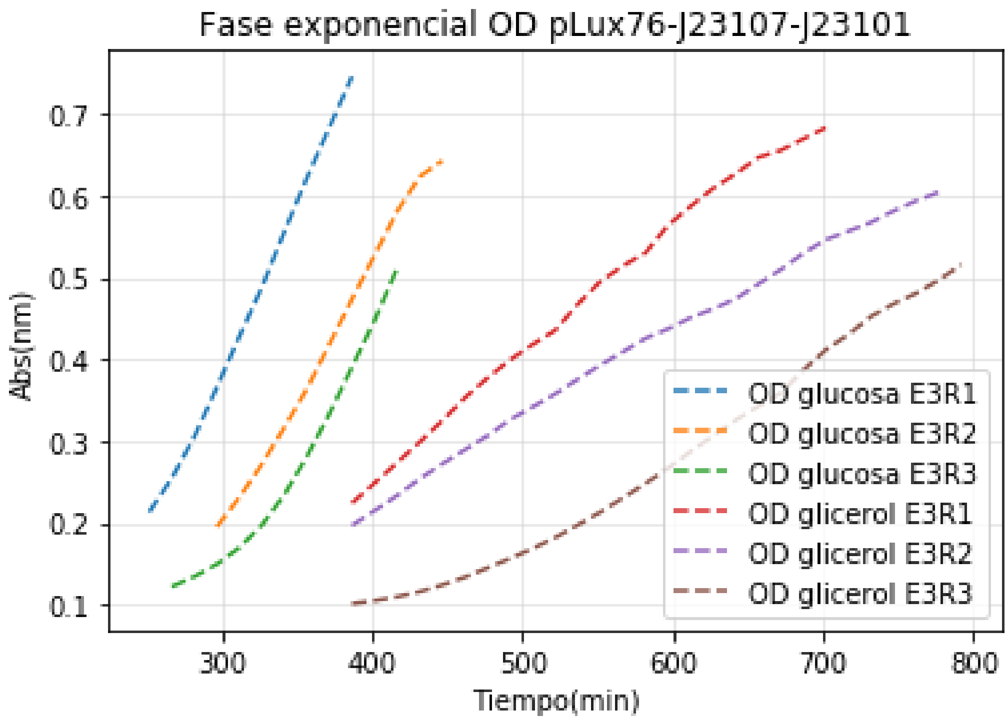





```
In [48]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD pLux76-J23107-J23101 Glicerol 0,2%')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[25:47],od1823g1[25:47],'--',label='OD E3R1')
         plt.plot(tt[25:52],od1823g2[25:52],'--',label='OD E3R2')
         plt.plot(tt[25:53],od1823g3[25:53],'--',label='OD E3R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[48]: <matplotlib.legend.Legend at 0x2365a8e34e0>
```



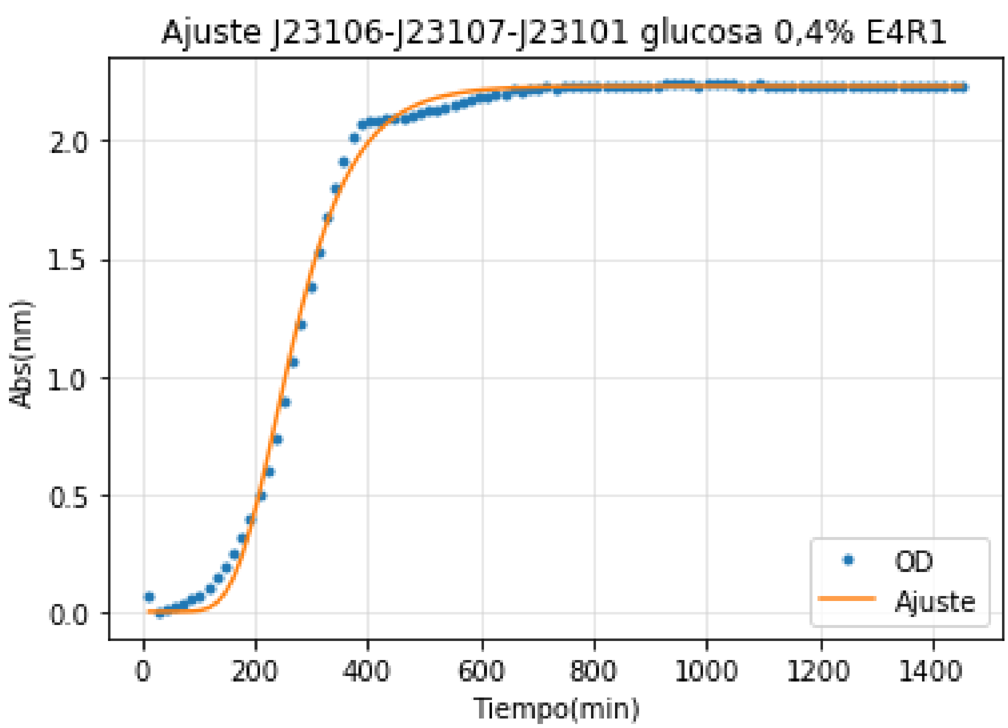

```
In [49]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD pLux76-J23107-J23101')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[16:26],od18231[16:26],'--',label='OD glucosa E3R1')
         plt.plot(tt[19:30],od18232[19:30],'--',label='OD glucosa E3R2')
         plt.plot(tt[17:28],od18233[17:28],'--',label='OD glucosa E3R3')
         plt.plot(tt[25:47],od1823g1[25:47],'--',label='OD glicerol E3R1')
         plt.plot(tt[25:52],od1823g2[25:52],'--',label='OD glicerol E3R2')
         plt.plot(tt[25:53],od1823g3[25:53],'--',label='OD glicerol E3R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[49]: <matplotlib.legend.Legend at 0x2365b1942b0>
```



In [50]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#106-std-std glucosa rep 1
y31= np.log(od12231)-np.log(np.min(od12231))
print('Min OD = %e'%((np.min(od12231))))
evaly, params=Function_fit(tt,y31,0,-1,title = 'Ajuste J23106-J23107-J23101 glucosa 0,4
A31 = params[0]
um31=params[1]
l31=params[2]
print('A=%e'%(A31))
print('um=%e'%(um31))
print('l=%e'%(l31))

#Cálculo datos para determinar extensión de la fase exponencial
tm31=((A31/(np.exp(1)*um31))+l31)
print('Tm=%e'%(tm31))
t231=((np.log(2))/um31)
print('doubpe=%e'%(t231))
extdp31=2*t231
print('ext=%e'%extdp31)
ttot31=tm31+extdp31
print('Tfinal=%e'%ttot31)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[16]
```

```
y2=tt[25]
plt.figure()
plt.title('J23106-J23107-J23101 Glucosa 0,4% E4R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od12231,label='OD J23106-J23107-J23101 E4R1')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E4R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[16:26],od12231[16:26],label='OD J23106-J23107-J23101 E4R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

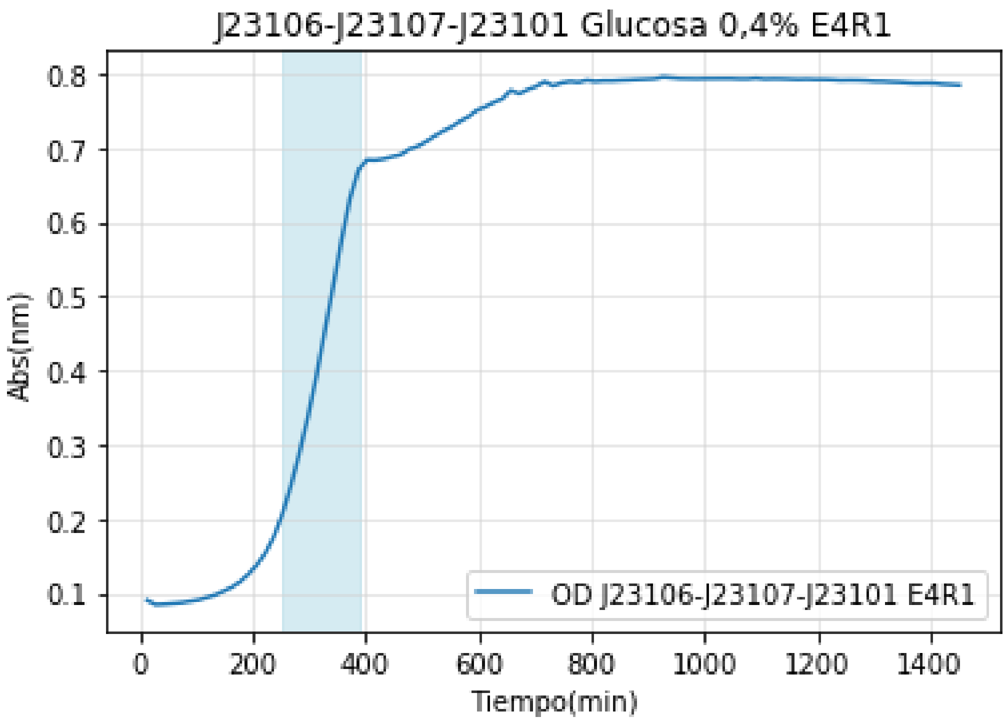
```
Min OD = 8.460000e-02
[  2.23226361e+00   1.09506306e-02   1.62099465e+02]
```

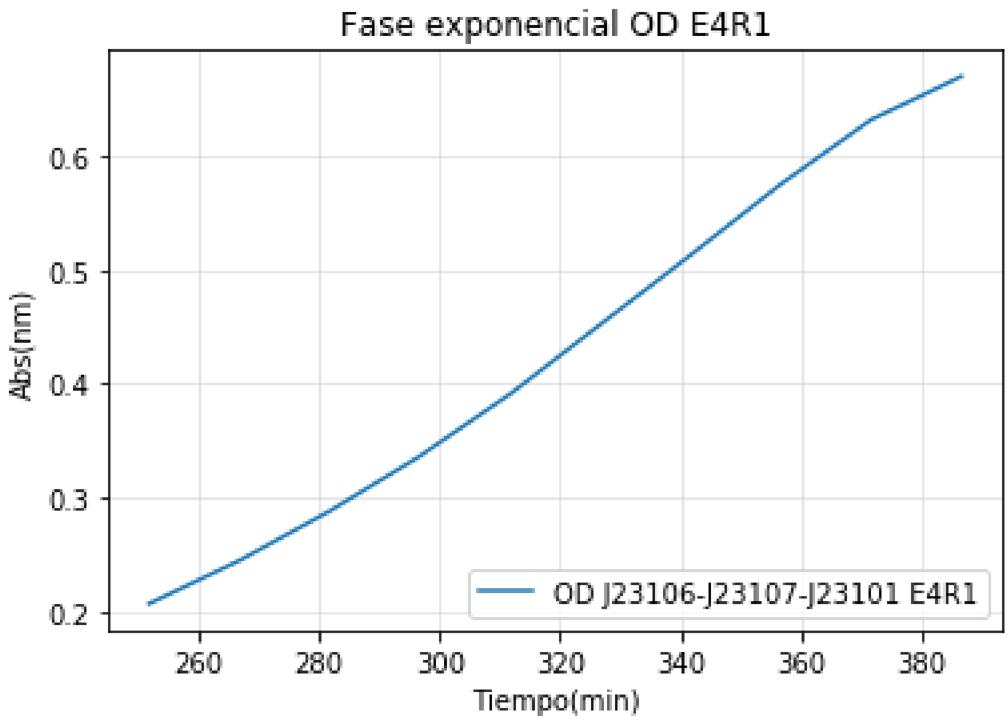



```
A=2.232264e+00
um=1.095063e-02
```

```
l=1.620995e+02
Tm=2.370909e+02
doubpe=6.329747e+01
ext=1.265949e+02
Tfinal=3.636859e+02
```

```
Out[50]: <matplotlib.legend.Legend at 0x2365c625cf8>
```

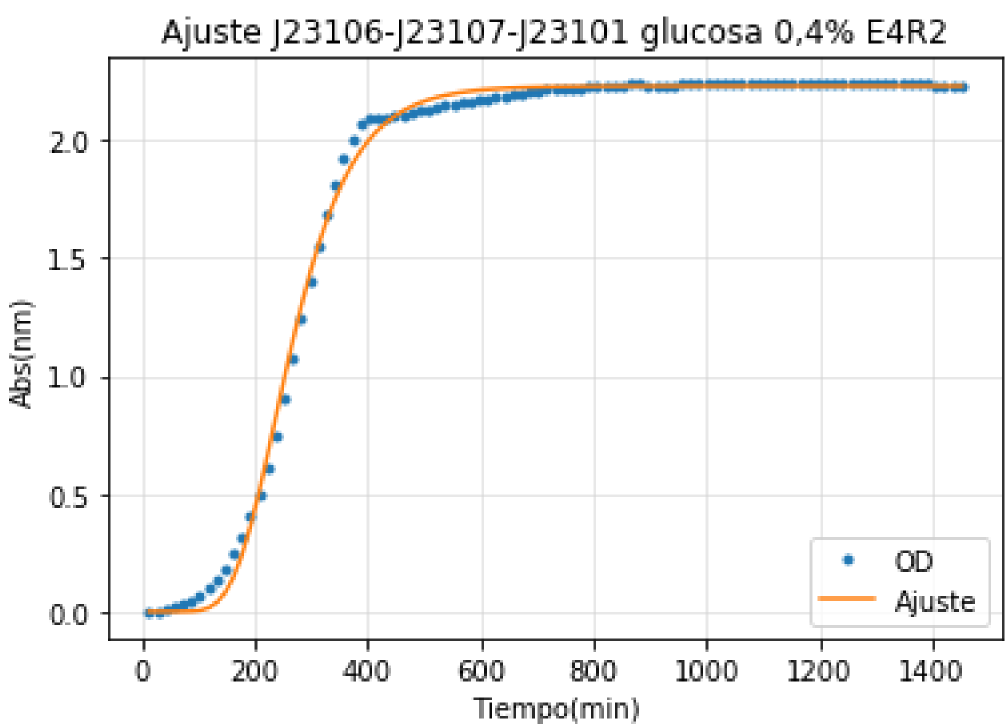





```
In [51]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
         #106-std-std glucosa rep 2
         y32= np.log(od12232)-np.log(np.min(od12232))
         print('Min OD = %e'%((np.min(od12232))))
         evaly, params=Function_fit(tt,y32,0,-1,title = 'Ajuste J23106-J23107-J23101 glucosa 0,4
         A32= params[0]
         um32=params[1]
         l32=params[2]
         print('A=%e'%(A32))
         print('um=%e'%(um32))
         print('l=%e'%(l32))

         #Cálculo datos para determinar extensión de la fase exponencial
         tm32=((A32/(np.exp(1)*um32))+l32)
         print('Tm=%e'%(tm32))
         t232=((np.log(2))/um32)
         print('doubpe=%e'%(t232))
         extdp32=2*t232
         print('ext=%e'%extdp32)
         ttot32=tm32+extdp32
         print('Tfinal=%e'%ttot32)

         #Delimitación fase exponencial en grafico con OD/tiempo
         y1=tt[15]
```

```python
y2=tt[25]
plt.figure()
plt.title('J23106-J23107-J23101 Glucosa 0,4% E4R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od12232,label='OD J23106-J23107-J23101 E4R2')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E4R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[15:26],od12232[15:26],label='OD pLux76-J23107-J23101 E4R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

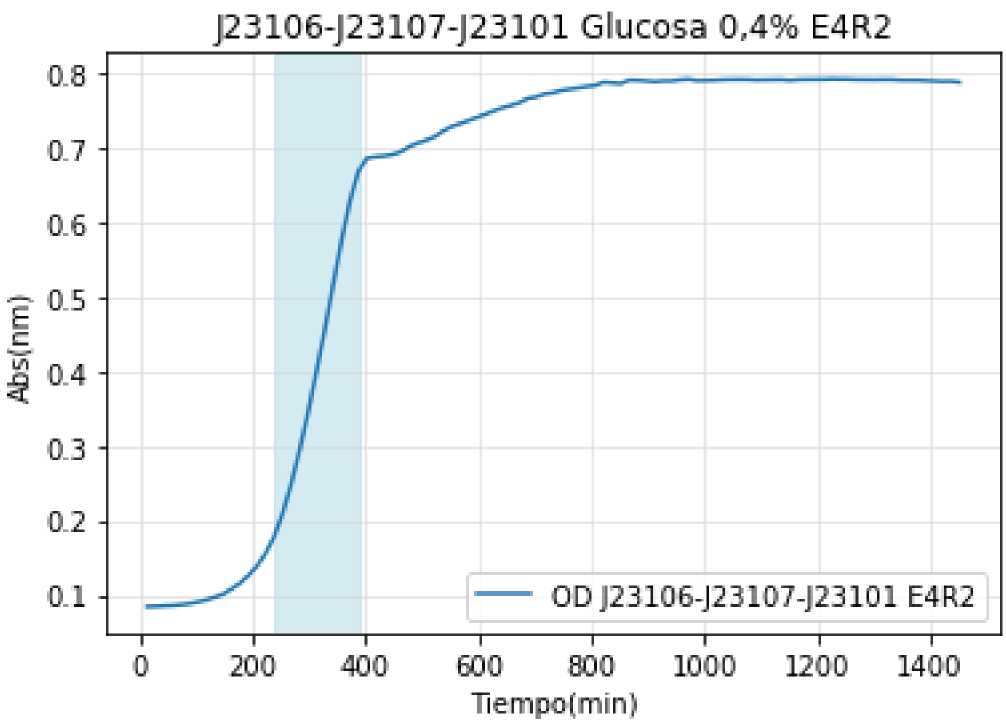
```
Min OD = 8.450000e-02
[  2.22943164e+00   1.10186847e-02   1.61533256e+02]
```

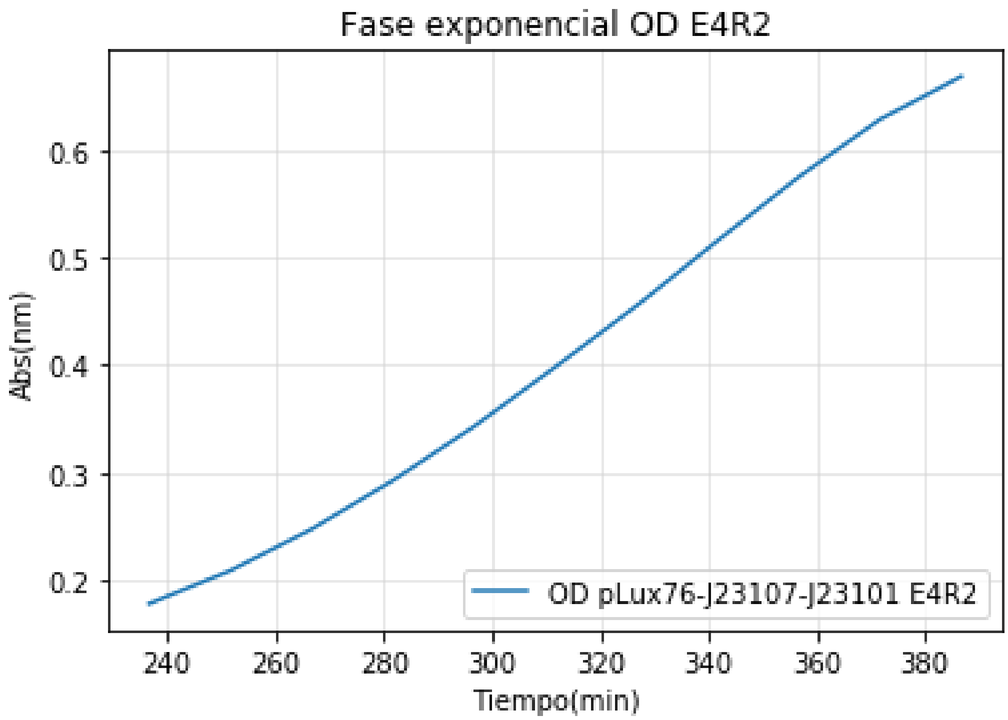



```
A=2.229432e+00
um=1.101868e-02
```

```
l=1.615333e+02
Tm=2.359670e+02
doubpe=6.290653e+01
ext=1.258131e+02
Tfinal=3.617801e+02
```

```
Out[51]: <matplotlib.legend.Legend at 0x2365c9db160>
```

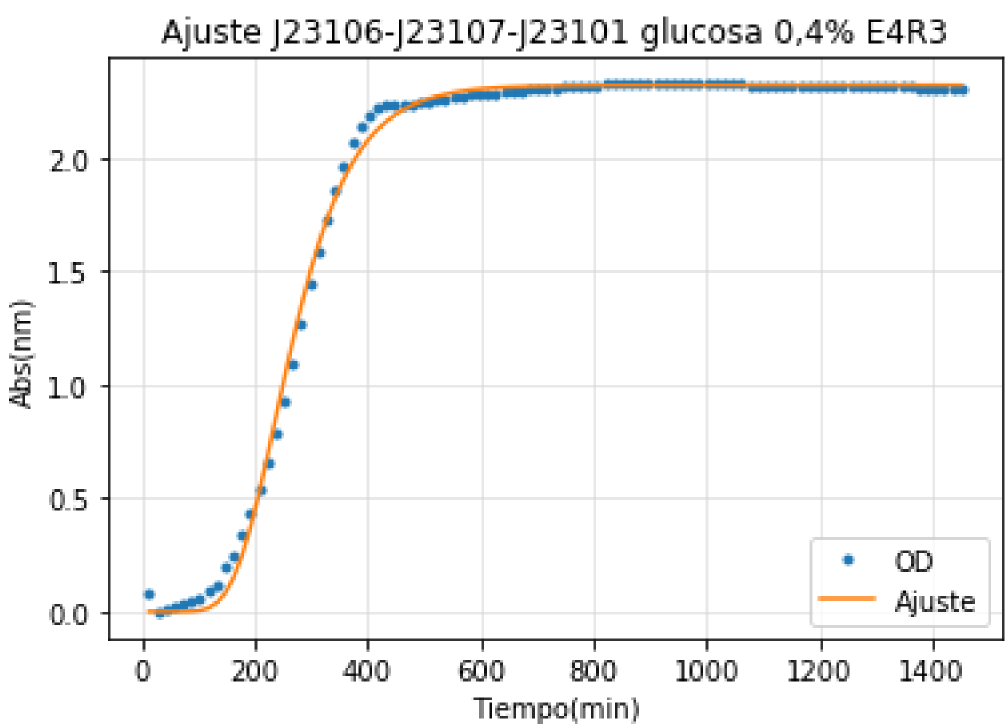




In [52]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#106-std-std glucosa rep 3
y33= np.log(od12233)-np.log(np.min(od12233))
print('Min OD = %e'%((np.min(od12233))))
evaly, params=Function_fit(tt,y33,0,-1,title = 'Ajuste J23106-J23107-J23101 glucosa 0,4
A33= params[0]
um33=params[1]
l33=params[2]
print('A=%e'%(A33))
print('um=%e'%(um33))
print('l=%e'%(l33))

#Cálculo datos para determinar extensión de la fase exponencial
tm33=((A33/(np.exp(1)*um33))+l33)
print('Tm=%e'%(tm33))
t233=((np.log(2))/um33)
print('doubpe=%e'%(t233))
extdp33=2*t233
print('ext=%e'%extdp33)
ttot33=tm33+extdp33
print('Tfinal=%e'%ttot33)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[15]
```

```python
y2=tt[25]
plt.figure()
plt.title('J23106-J23107-J23101 Glucosa 0,4% E4R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od12233,label='OD J23106-J23107-J23101 E4R3')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E4R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[15:26],od12233[15:26],label='OD J23106-J23107-J23101 E4R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

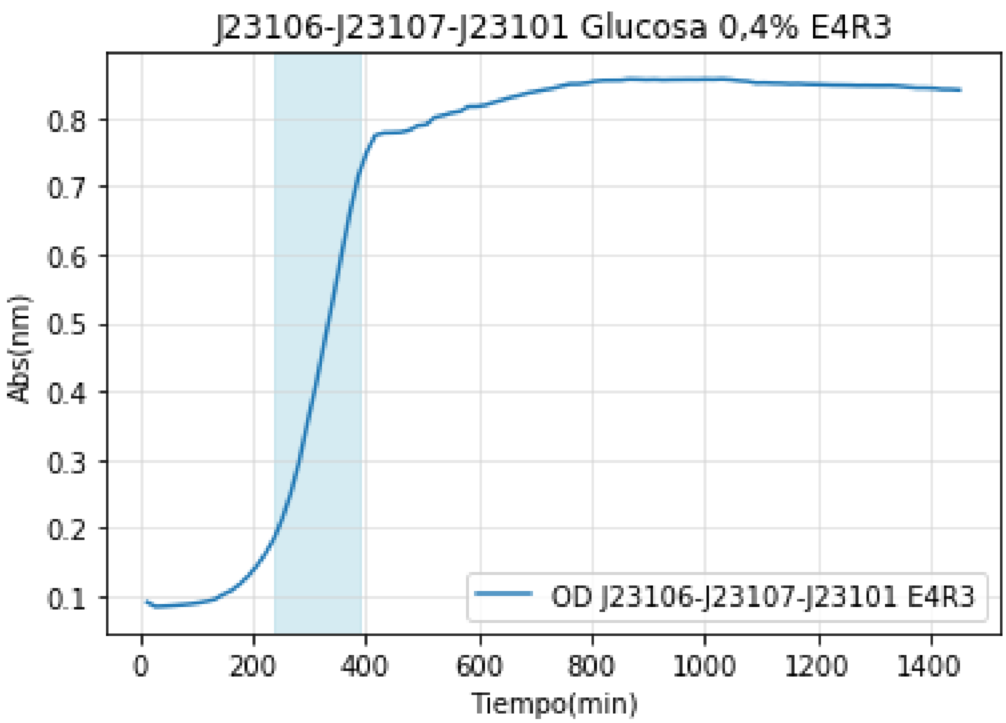
```
Min OD = 8.380000e-02
[  2.32067118e+00   1.15080749e-02   1.62138074e+02]
```

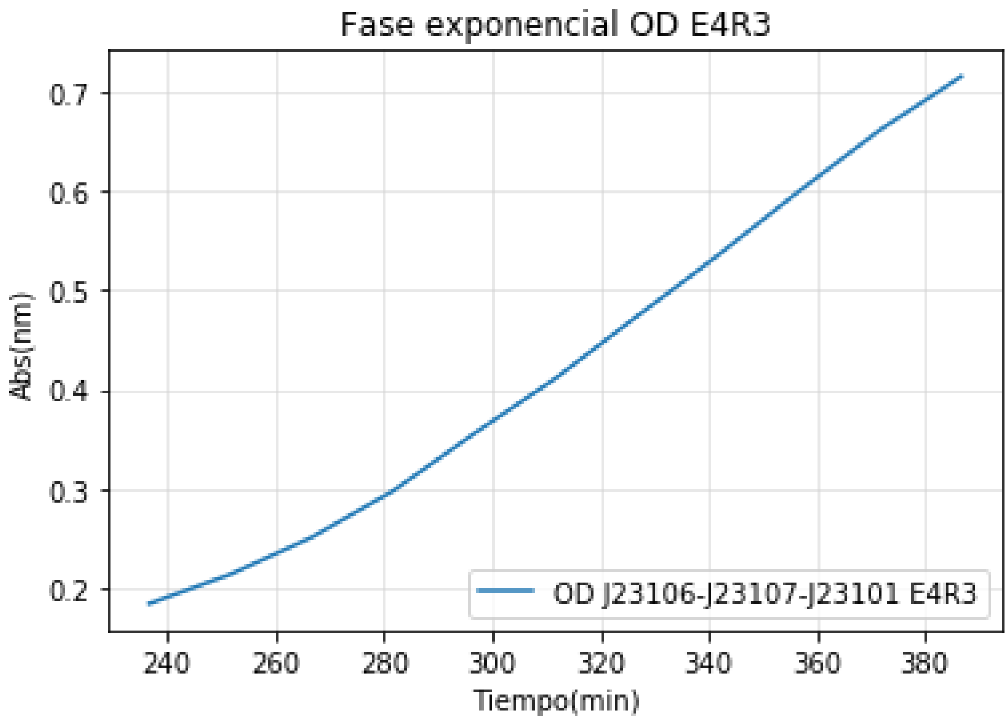



```
A=2.320671e+00
um=1.150807e-02
```

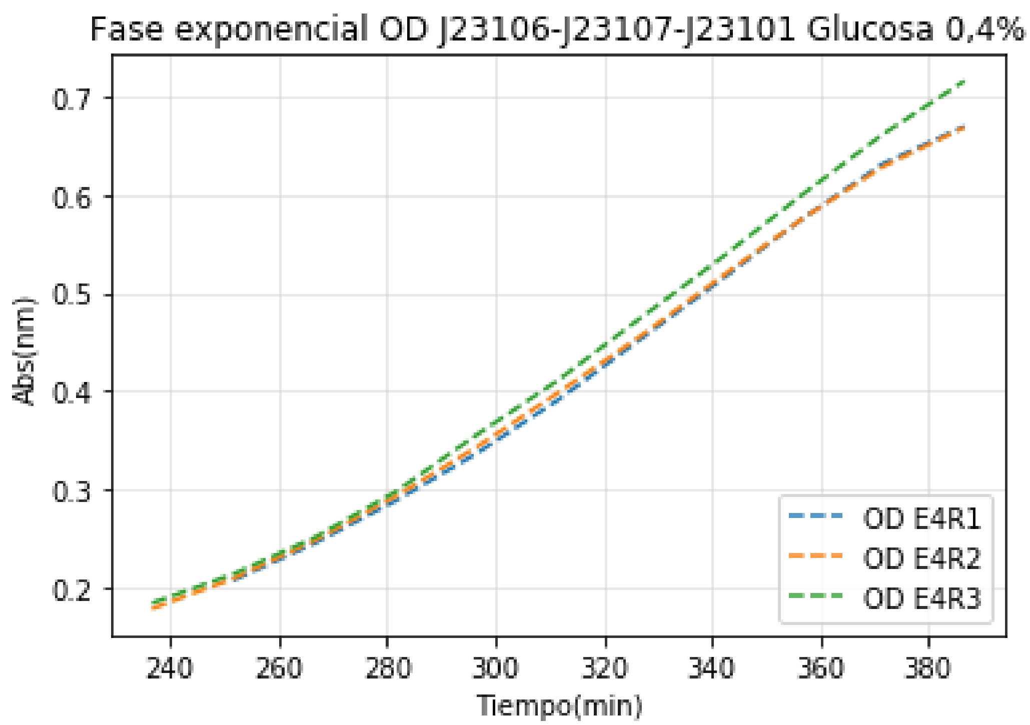
```
l=1.621381e+02
Tm=2.363231e+02
doubpe=6.023138e+01
ext=1.204628e+02
Tfinal=3.567859e+02
```

```
Out[52]: <matplotlib.legend.Legend at 0x2365cbe07f0>
```





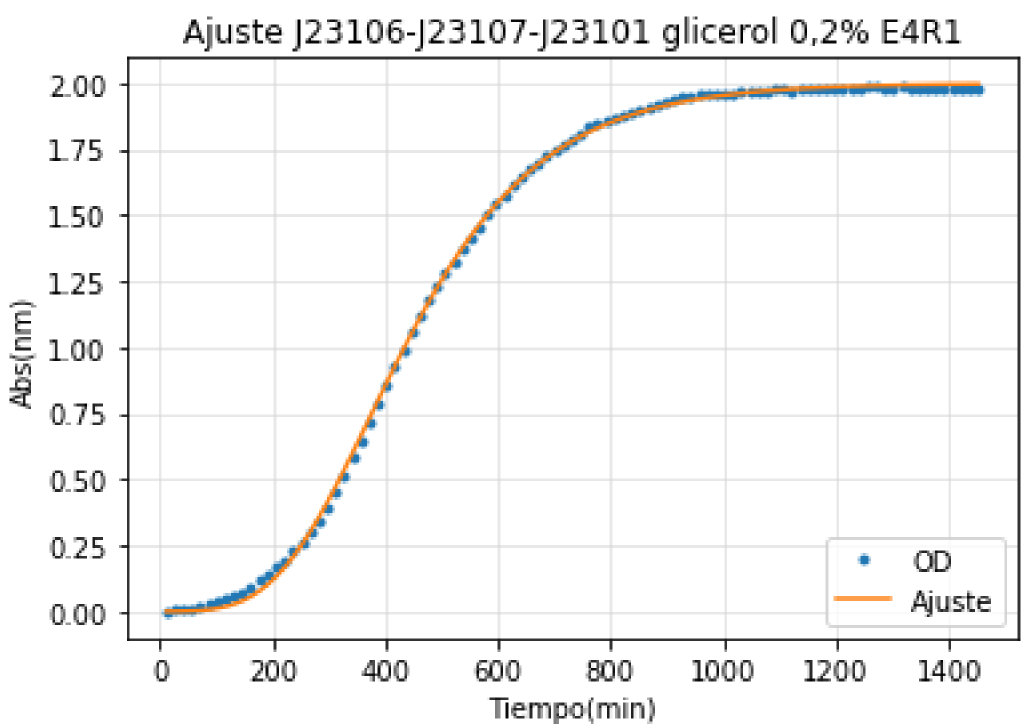

```
In [53]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD J23106-J23107-J23101 Glucosa 0,4%')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[16:26],od12231[16:26],'--',label='OD E4R1')
         plt.plot(tt[15:26],od12232[15:26],'--',label='OD E4R2')
         plt.plot(tt[15:26],od12233[15:26],'--',label='OD E4R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[53]: <matplotlib.legend.Legend at 0x2365cabdf28>
```



In [54]:
```
#Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
#106-std-std glicerol rep 1
y34= np.log(od1223g1)-np.log(np.min(od1223g1))
print('Min OD = %e'%((np.min(od1223g1))))
evaly, params=Function_fit(tt,y34,0,-1,title = 'Ajuste J23106-J23107-J23101 glicerol 0,
A34= params[0]
um34=params[1]
l34=params[2]
print('A=%e'%(A34))
print('um=%e'%(um34))
print('l=%e'%(l34))

#Cálculo datos para determinar extensión de la fase exponencial
tm34=((A34/(np.exp(1)*um34))+l34)
print('Tm=%e'%(tm34))
t234=((np.log(2))/um34)
print('doubpe=%e'%(t234))
extdp34=2.5*t234
print('ext=%e'%extdp34)
ttot34=tm34+extdp34
print('Tfinal=%e'%ttot34)

#Delimitación fase exponencial en grafico con OD/tiempo
y1=tt[25]
```

```
y2=tt[52]
plt.figure()
plt.title('J23106-J23107-J23101 Glicerol 0,2% E4R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od1223g1,label='OD J23106-J23107-J23101 E4R1')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E4R1')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[25:53],od1223g1[25:53],label='OD J23106-J23107-J23101 E4R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

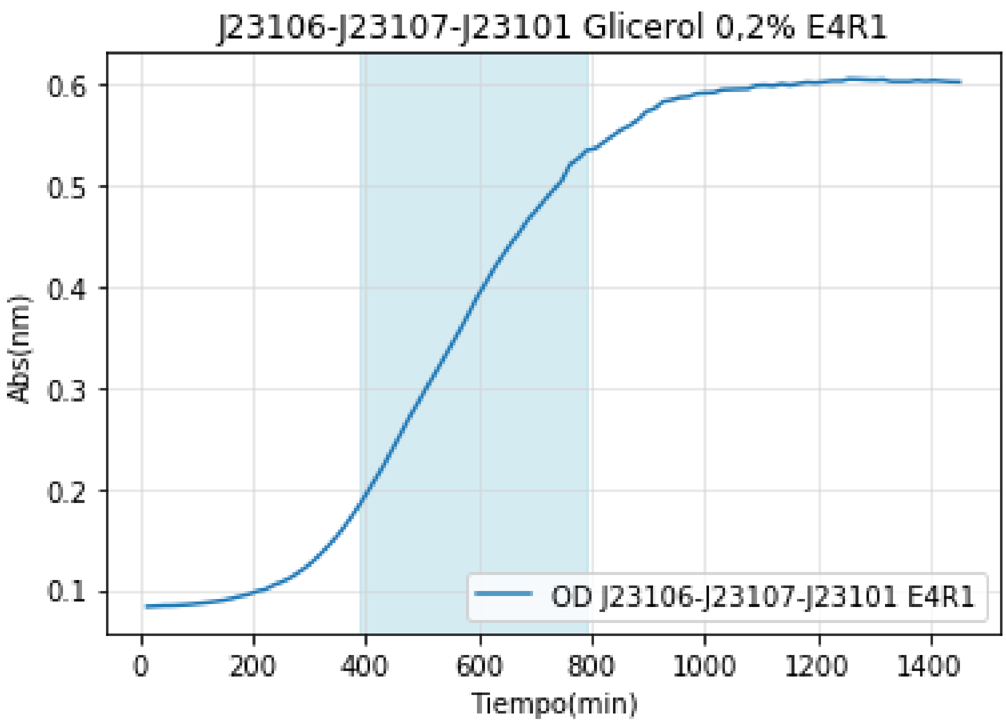
```
Min OD = 8.320000e-02
[  1.99917733e+00   4.41715628e-03   2.06073712e+02]
```

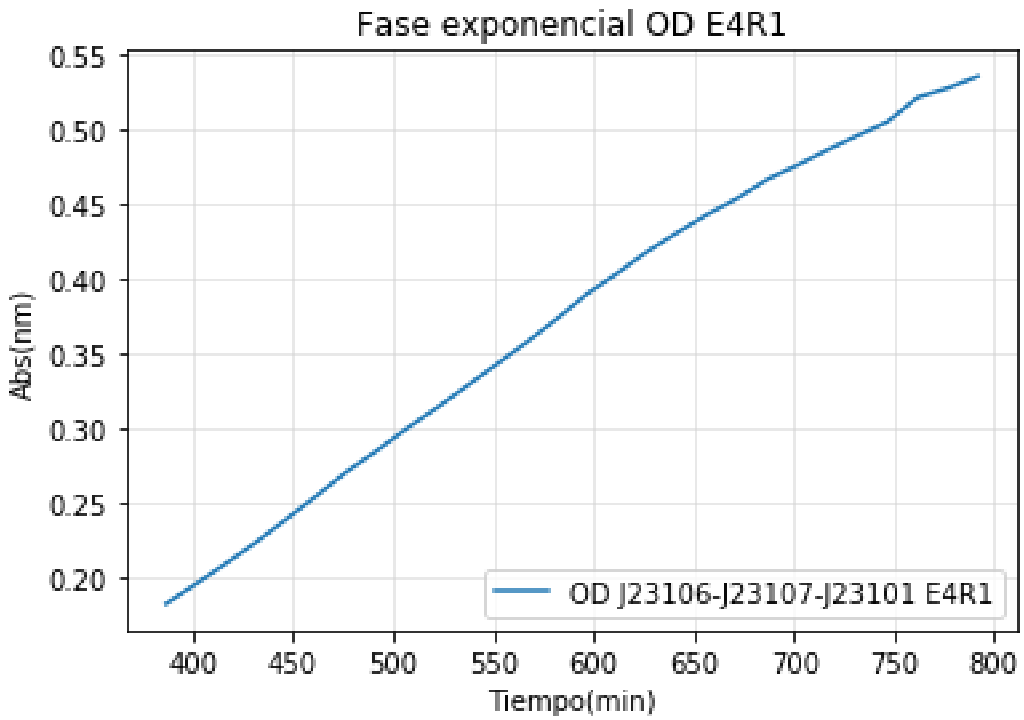



```
A=1.999177e+00
um=4.417156e-03
```

```
l=2.060737e+02
Tm=3.725736e+02
doubpe=1.569216e+02
ext=3.923040e+02
Tfinal=7.648776e+02
```

```
Out[54]: <matplotlib.legend.Legend at 0x2365b302780>
```

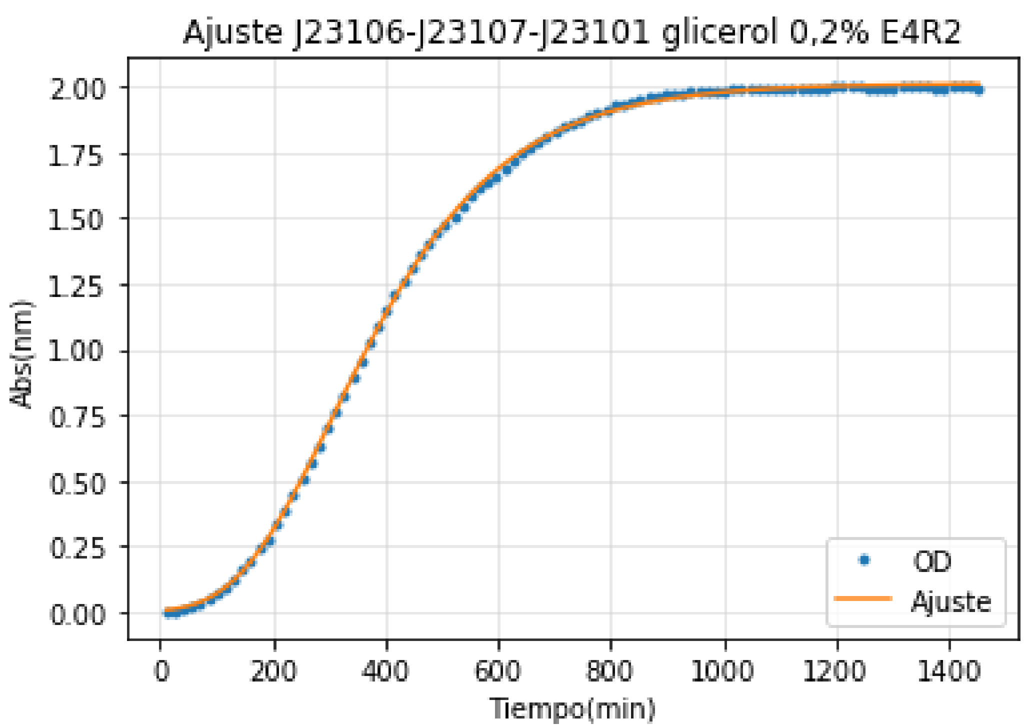





```
In [55]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
         #106-std-std glicerol rep 2
         y35= np.log(od1223g2)-np.log(np.min(od1223g2))
         print('Min OD = %e'%((np.min(od1223g2))))
         evaly, params=Function_fit(tt,y35,0,-1,title = 'Ajuste J23106-J23107-J23101 glicerol 0,
         A35= params[0]
         um35=params[1]
         l35=params[2]
         print('A=%e'%(A35))
         print('um=%e'%(um35))
         print('l=%e'%(l35))

         #Cálculo datos para determinar extensión de la fase exponencial
         tm35=((A35/(np.exp(1)*um35))+l35)
         print('Tm=%e'%(tm35))
         t235=((np.log(2))/um35)
         print('doubpe=%e'%(t235))
         extdp35=2.5*t235
         print('ext=%e'%extdp35)
         ttot35=tm35+extdp35
         print('Tfinal=%e'%ttot35)

         #Delimitación fase exponencial en grafico con OD/tiempo
         y1=tt[20]
```

```
y2=tt[48]
plt.figure()
plt.title('J23106-J23107-J23101 Glicerol 0,2% E4R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od1223g2,label='OD J23106-J23107-J23101 E4R2')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E4R2')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[20:49],od1223g2[20:49],label='OD J23106-J23107-J23101 E4R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

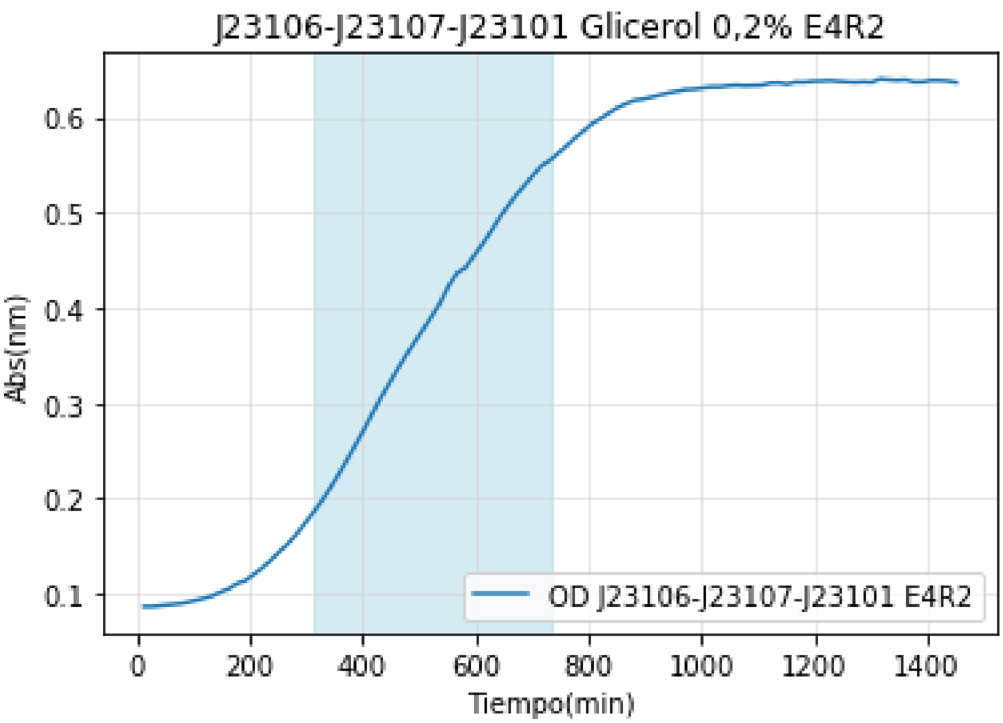
```
Min OD = 8.660000e-02
[  2.01084440e+00   4.37332701e-03   1.37075188e+02]
```

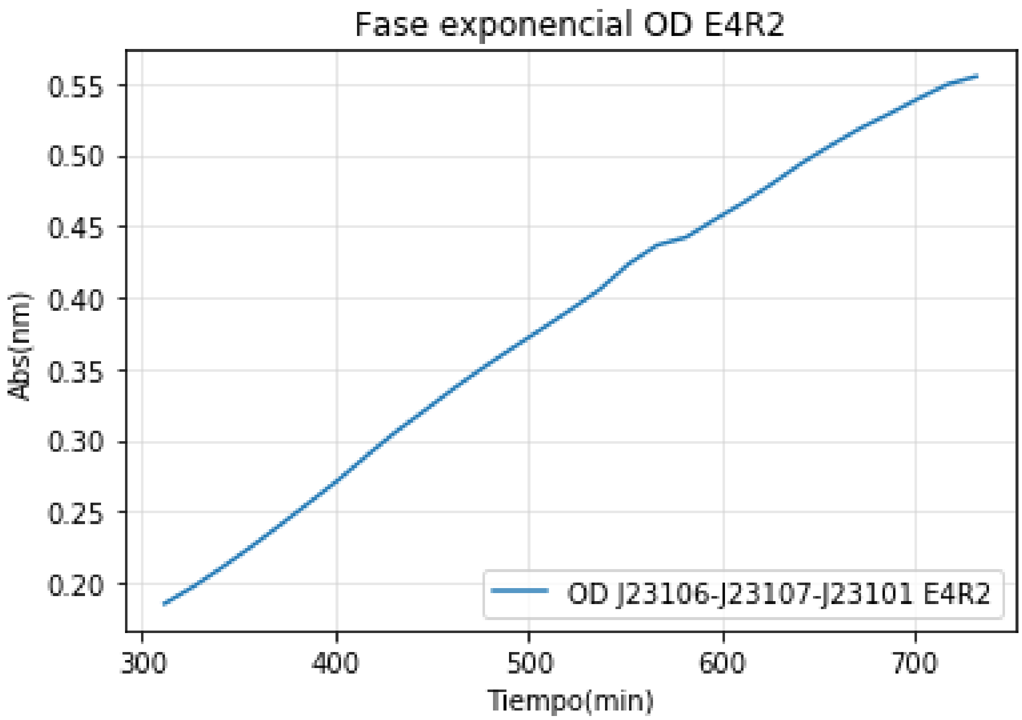



```
A=2.010844e+00
um=4.373327e-03
```

```
l=1.370752e+02
Tm=3.062252e+02
doubpe=1.584942e+02
ext=3.962356e+02
Tfinal=7.024608e+02
```

Out[55]: `<matplotlib.legend.Legend at 0x2365cc52550>`

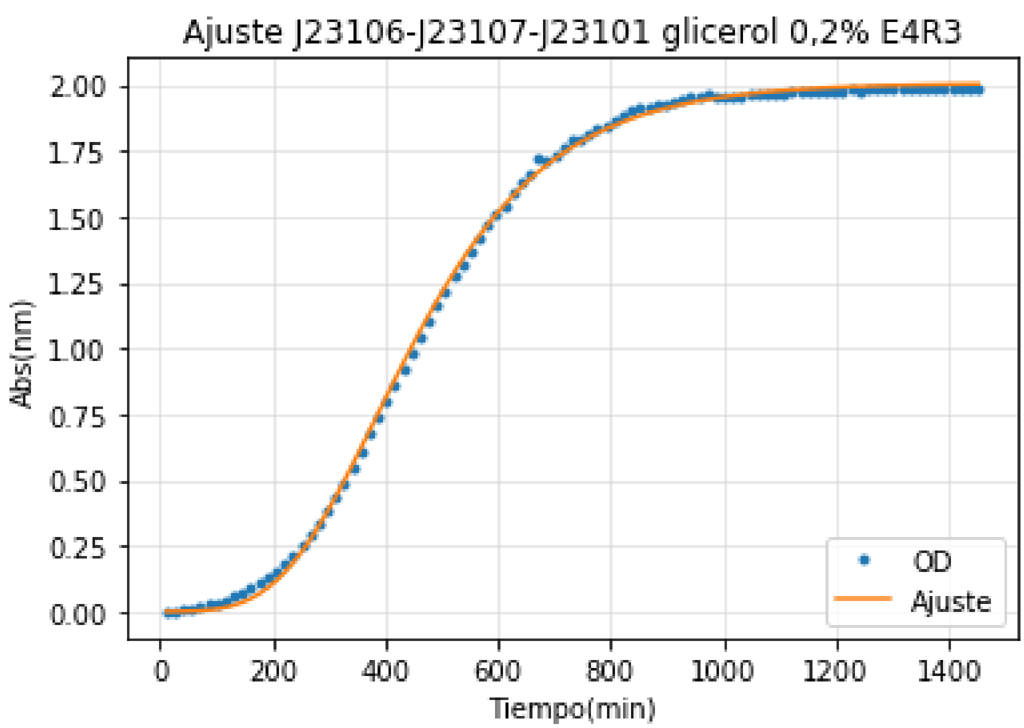





```
In [56]: #Ajuste de datos con modelo Gompertz y obtención de parámetros para el ajuste
         #106-std-std glicerol rep 3
         y36= np.log(od1223g3)-np.log(np.min(od1223g3))
         print('Min OD = %e'%((np.min(od1223g3))))
         evaly, params=Function_fit(tt,y36,0,-1,title = 'Ajuste J23106-J23107-J23101 glicerol 0,
         A36= params[0]
         um36=params[1]
         l36=params[2]
         print('A=%e'%(A36))
         print('um=%e'%(um36))
         print('l=%e'%(l36))

         #Cálculo datos para determinar extensión de la fase exponencial
         tm36=((A36/(np.exp(1)*um36))+l36)
         print('Tm=%e'%(tm36))
         t236=((np.log(2))/um36)
         print('doubpe=%e'%(t236))
         extdp36=2*t236
         print('ext=%e'%extdp36)
         ttot36=tm36+extdp36
         print('Tfinal=%e'%ttot36)

         #Delimitación fase exponencial en grafico con OD/tiempo
         y1=tt[25]
```

```
y2=tt[53]
plt.figure()
plt.title('J23106-J23107-J23101 Glicerol 0,2% E4R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt,od1223g3,label='OD J23106-J23107-J23101 E4R3')
plt.axvspan(y1,y2, color='lightblue', alpha=0.5)
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')

#Fase exponencial OD/tiempo
plt.figure()
plt.title('Fase exponencial OD E4R3')
plt.xlabel('Tiempo(min)')
plt.ylabel('Abs(nm)')
plt.plot(tt[25:54],od1223g3[25:54],label='OD J23106-J23107-J23101 E4R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
plt.legend(loc='lower right')
```

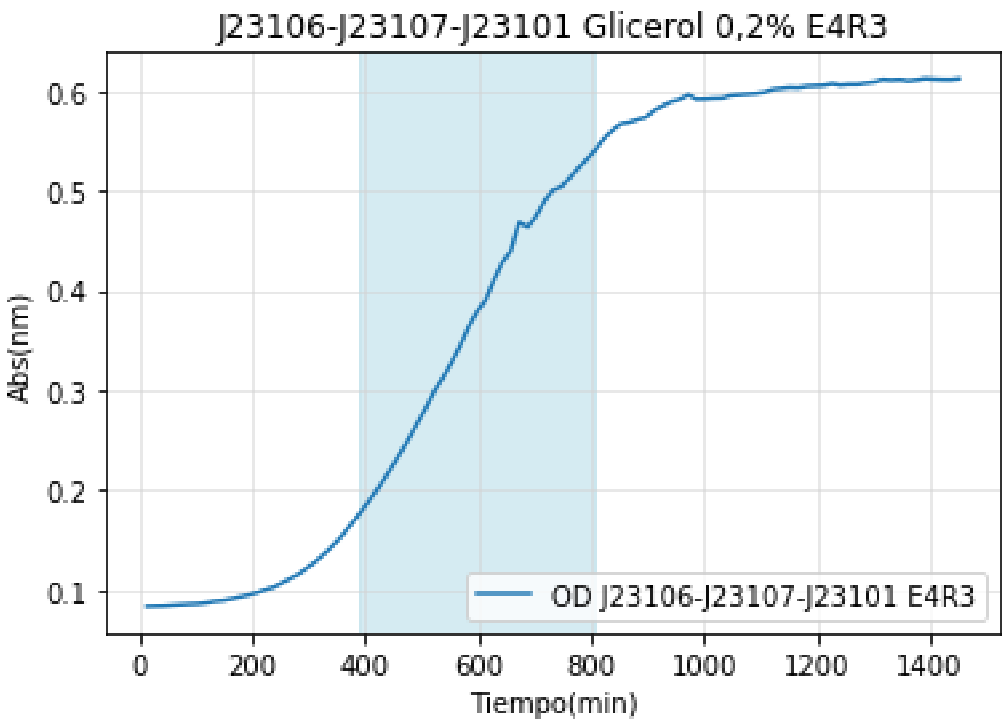
```
Min OD = 8.370000e-02
[  2.00705977e+00   4.34500193e-03   2.13821510e+02]
```

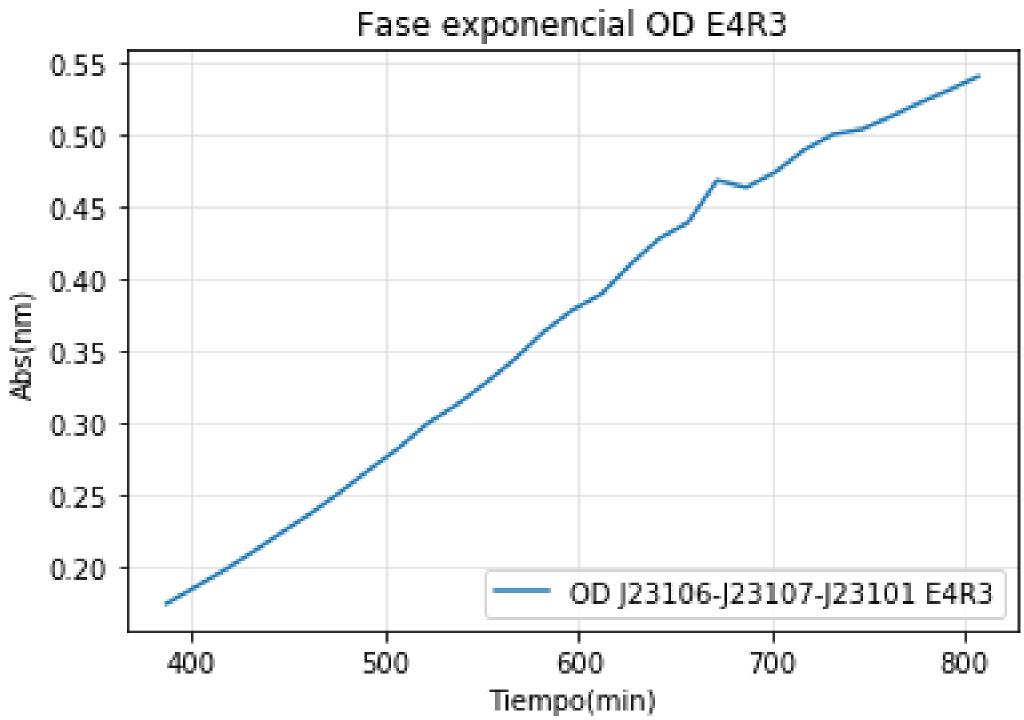



```
A=2.007060e+00
um=4.345002e-03
```

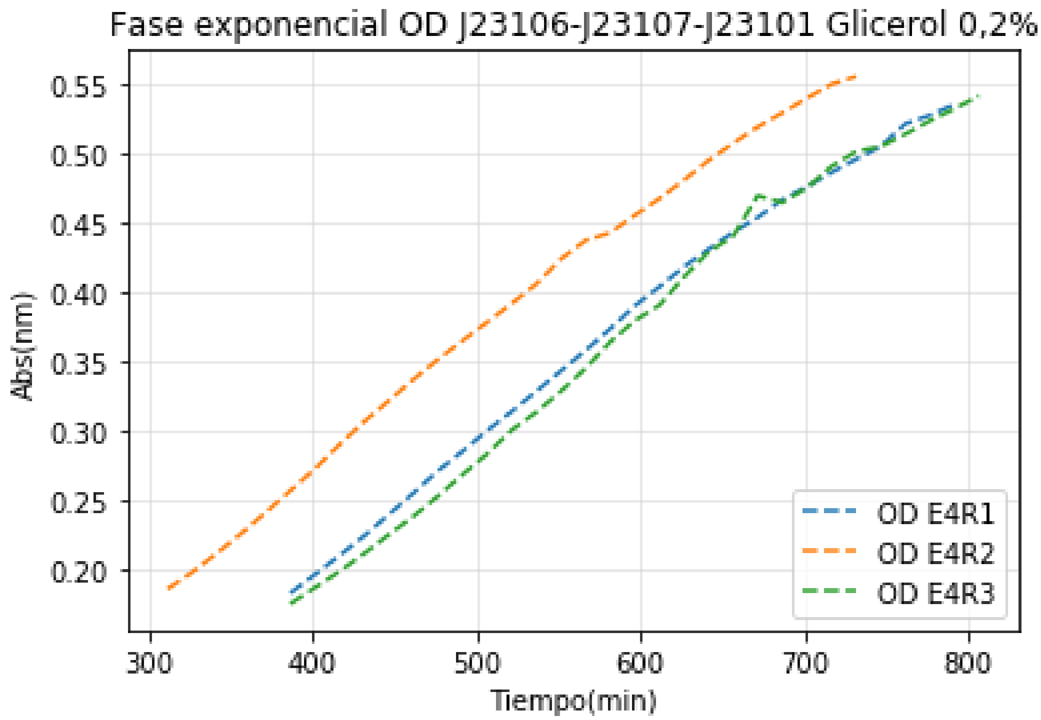
```
l=2.138215e+02
Tm=3.837538e+02
doubpe=1.595275e+02
ext=3.190549e+02
Tfinal=7.028087e+02
```

```
Out[56]: <matplotlib.legend.Legend at 0x2365cd5a0b8>
```

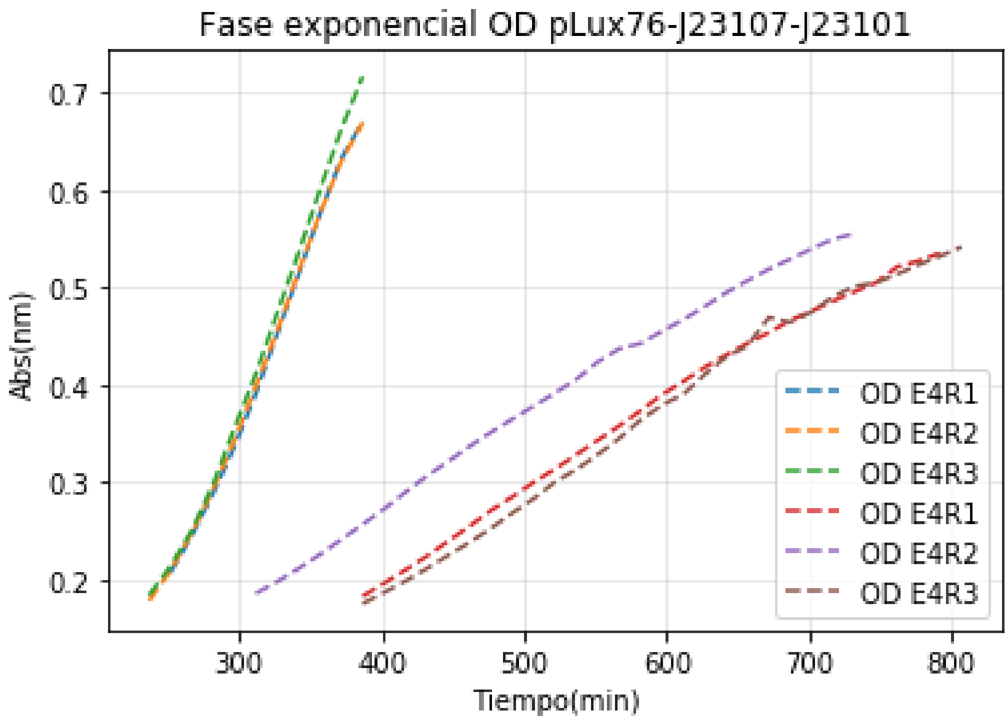





```
In [57]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD J23106-J23107-J23101 Glicerol 0,2%')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[25:53],od1223g1[25:53],'--',label='OD E4R1')
         plt.plot(tt[20:49],od1223g2[20:49],'--',label='OD E4R2')
         plt.plot(tt[25:54],od1223g3[25:54],'--',label='OD E4R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[57]: <matplotlib.legend.Legend at 0x2365ce91d68>
```




```
In [58]: #Fase exponencial OD/tiempo
         plt.figure()
         plt.title('Fase exponencial OD pLux76-J23107-J23101')
         plt.xlabel('Tiempo(min)')
         plt.ylabel('Abs(nm)')
         plt.plot(tt[16:26],od12231[16:26],'--',label='OD E4R1')
         plt.plot(tt[15:26],od12232[15:26],'--',label='OD E4R2')
         plt.plot(tt[15:26],od12233[15:26],'--',label='OD E4R3')
         plt.plot(tt[25:53],od1223g1[25:53],'--',label='OD E4R1')
         plt.plot(tt[20:49],od1223g2[20:49],'--',label='OD E4R2')
         plt.plot(tt[25:54],od1223g3[25:54],'--',label='OD E4R3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5)
         plt.legend(loc='lower right')

Out[58]: <matplotlib.legend.Legend at 0x2365cf62a90>
```



In [59]:
```
#Selección de datos en arrays, según lo determinado
#controles glucosa 15
o1=odcg151[19:30]
c1=cfpcg151[19:30]
r1=rfpcg151[19:30]
y1=yfpcg151[19:30]

o2=odcg152[19:30]
c2=cfpcg152[19:30]
r2=rfpcg152[19:30]
y2=yfpcg152[19:30]

o3=odcg153[15:27]
c3=cfpcg153[15:27]
r3=rfpcg153[15:27]
y3=yfpcg153[15:27]

#controles glicerol 15
o4=odcgl151[24:45]
c4=cfpcgl151[24:45]
r4=rfpcgl151[24:45]
y4=yfpcgl151[24:45]

o5=odcgl152[23:46]
```

```
c5=cfpcgl152[23:46]
r5=rfpcgl152[23:46]
y5=yfpcgl152[23:46]

o6=odcgl153[25:57]
c6=cfpcgl153[25:57]
r6=rfpcgl153[25:57]
y6=yfpcgl153[25:57]

#controles glucosa 18
o7=odcg181[16:26]
c7=cfpcg181[16:26]
r7=rfpcg181[16:26]
y7=yfpcg181[16:26]

o8=odcg182[17:30]
c8=cfpcg182[17:30]
r8=rfpcg182[17:30]
y8=yfpcg182[17:30]

o9=odcg183[17:29]
c9=cfpcg183[17:29]
r9=rfpcg183[17:29]
y9=yfpcg183[17:29]

#controles glicerol 18
o10=odcgl181[25:48]
c10=cfpcgl181[25:48]
r10=rfpcgl181[25:48]
y10=yfpcgl181[25:48]

o11=odcgl182[25:53]
c11=cfpcgl182[25:53]
r11=rfpcgl182[25:53]
y11=yfpcgl182[25:53]

o12=odcgl183[24:51]
c12=cfpcgl183[24:51]
r12=rfpcgl183[24:51]
y12=yfpcgl183[24:51]

#controles glucosa 12
o13=odcg121[17:28]
c13=cfpcg121[17:28]
r13=rfpcg121[17:28]
y13=yfpcg121[17:28]

o14=odcg122[14:25]
```

```
c14=cfpcg122[14:25]
r14=rfpcg122[14:25]
y14=yfpcg122[14:25]

o15=odcg123[17:29]
c15=cfpcg123[17:29]
r15=rfpcg123[17:29]
y15=yfpcg123[17:29]

#controles glicerol 12
o16=odcgl121[24:52]
c16=cfpcgl121[24:52]
r16=rfpcgl121[24:52]
y16=yfpcgl121[24:52]

o17=odcgl122[25:53]
c17=cfpcgl122[25:53]
r17=rfpcgl122[25:53]
y17=yfpcgl122[25:53]

o18=odcgl123[25:57]
c18=cfpcgl123[25:57]
r18=rfpcgl123[25:57]
y18=yfpcgl123[25:57]

#ptet-107-std glucosa
o19=od15231[21:32]
c19=cfp15231[21:32]
r19=rfp15231[21:32]
y19=yfp15231[21:32]

o20=od15232[17:27]
c20=cfp15232[17:27]
r20=rfp15232[17:27]
y20=yfp15232[17:27]

o21=od15233[17:29]
c21=cfp15233[17:29]
r21=rfp15233[17:29]
y21=yfp15233[17:29]

#ptet-107-std glicerol
o22=od1523g1[30:53]
c22=cfp1523g1[30:53]
r22=rfp1523g1[30:53]
y22=yfp1523g1[30:53]

o23=od1523g2[27:54]
```

```
c23=cfp1523g2[27:54]
r23=rfp1523g2[27:54]
y23=yfp1523g2[27:54]

o24=od1523g3[28:60]
c24=cfp1523g3[28:60]
r24=rfp1523g3[28:60]
y24=yfp1523g3[28:60]

#pLux-107-std glucosa
o25=od18231[16:26]
c25=cfp18231[16:26]
r25=rfp18231[16:26]
y25=yfp18231[16:26]

o26=od18232[19:30]
c26=cfp18232[19:30]
r26=rfp18232[19:30]
y26=yfp18232[19:30]

o27=od18233[17:28]
c27=cfp18233[17:28]
r27=rfp18233[17:28]
y27=yfp18233[17:28]

#plux-107-std glicerol
o28=od1823g1[25:47]
c28=cfp1823g1[25:47]
r28=rfp1823g1[25:47]
y28=yfp1823g1[25:47]

o29=od1823g2[25:52]
c29=cfp1823g2[25:52]
r29=rfp1823g2[25:52]
y29=yfp1823g2[25:52]

o30=od1823g3[25:53]
c30=cfp1823g3[25:53]
r30=rfp1823g3[25:53]
y30=yfp1823g3[25:53]

#106-107-std glucosa
o31=od12231[16:26]
c31=cfp12231[16:26]
r31=rfp12231[16:26]
y31=yfp12231[16:26]

o32=od12232[15:26]
```

```
c32=cfp12232[15:26]
r32=rfp12232[15:26]
y32=yfp12232[15:26]

o33=od12233[15:26]
c33=cfp12233[15:26]
r33=rfp12233[15:26]
y33=yfp12233[15:26]

#106-std-std glicerol
o34=od1223g1[25:53]
c34=cfp1223g1[25:53]
r34=rfp1223g1[25:53]
y34=yfp1223g1[25:53]

o35=od1223g2[20:49]
c35=cfp1223g2[20:49]
r35=rfp1223g2[20:49]
y35=yfp1223g2[20:49]

o36=od1223g3[25:54]
c36=cfp1223g3[25:54]
r36=rfp1223g3[25:54]
y36=yfp1223g3[25:54]
```

```
In [60]: #regresion lineal de replicas
#Controles glucosa 15
slope, intercept, r_value, p_value,std_err=stats.linregress(o1,c1)
slopec1=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o1,r1)
sloper1=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o1,y1)
slopey1=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o2,c2)
slopec2=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o2,r2)
sloper2=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o2,y2)
slopey2=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o3,c3)
slopec3=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o3,r3)
sloper3=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o3,y3)
slopey3=slope
```

```
#Controles glicerol 15
slope, intercept, r_value, p_value,std_err=stats.linregress(o4,c4)
slopec4=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o4,r4)
sloper4=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o4,y4)
slopey4=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o5,c5)
slopec5=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o5,r5)
sloper5=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o5,y5)
slopey5=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o6,c6)
slopec6=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o6,r6)
sloper6=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o6,y6)
slopey6=slope

#controles glucosa 18
slope, intercept, r_value, p_value,std_err=stats.linregress(o7,c7)
slopec7=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o7,r7)
sloper7=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o7,y7)
slopey7=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o8,c8)
slopec8=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o8,r8)
sloper8=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o8,y8)
slopey8=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o9,c9)
slopec9=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o9,r9)
sloper9=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o9,y9)
slopey9=slope

#controles glicerol 18
slope, intercept, r_value, p_value,std_err=stats.linregress(o10,c10)
slopec10=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o10,r10)
```

```
sloper10=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o10,y10)
slopey10=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o11,c11)
slopec11=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o11,r11)
sloper11=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o11,y11)
slopey11=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o12,c12)
slopec12=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o12,r12)
sloper12=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o12,y12)
slopey12=slope

#controles glucosa 12
slope, intercept, r_value, p_value,std_err=stats.linregress(o13,c13)
slopec13=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o13,r13)
sloper13=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o13,y13)
slopey13=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o14,c14)
slopec14=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o14,r14)
sloper14=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o14,y14)
slopey14=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o15,c15)
slopec15=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o15,r15)
sloper15=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o15,y15)
slopey15=slope

#controles glicerol 12
slope, intercept, r_value, p_value,std_err=stats.linregress(o16,c16)
slopec16=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o16,r16)
sloper16=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o16,y16)
slopey16=slope
```

```
slope, intercept, r_value, p_value,std_err=stats.linregress(o17,c17)
slopec17=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o17,r17)
sloper17=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o17,y17)
slopey17=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o18,c18)
slopec18=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o18,r18)
sloper18=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o18,y18)
slopey18=slope

#ptet-std-std glucosa
slope, intercept, r_value, p_value,std_err=stats.linregress(o19,c19)
slopec19=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o19,r19)
sloper19=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o19,y19)
slopey19=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o20,c20)
slopec20=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o20,r20)
sloper20=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o20,y20)
slopey20=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o21,c21)
slopec21=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o21,r21)
sloper21=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o21,y21)
slopey21=slope

#ptet-std-std glicerol
slope, intercept, r_value, p_value,std_err=stats.linregress(o22,c22)
slopec22=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o22,r22)
sloper22=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o22,y22)
slopey22=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o23,c23)
slopec23=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o23,r23)
sloper23=slope
```

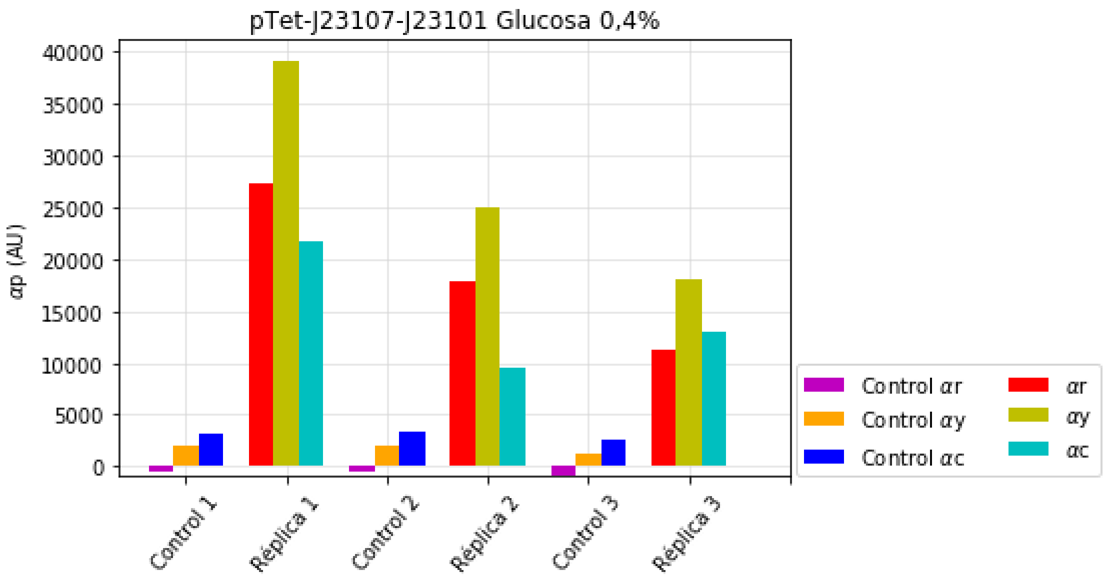
```
slope, intercept, r_value, p_value,std_err=stats.linregress(o23,y23)
slopey23=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o24,c24)
slopec24=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o24,r24)
sloper24=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o24,y24)
slopey24=slope

#plux-107-std glucosa
slope, intercept, r_value, p_value,std_err=stats.linregress(o25,c25)
slopec25=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o25,r25)
sloper25=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o25,y25)
slopey25=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o26,c26)
slopec26=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o26,r26)
sloper26=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o26,y26)
slopey26=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o27,c27)
slopec27=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o27,r27)
sloper27=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o27,y27)
slopey27=slope

#plux-107-std glicerol
slope, intercept, r_value, p_value,std_err=stats.linregress(o28,c28)
slopec28=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o28,r28)
sloper28=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o28,y28)
slopey28=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o29,c29)
slopec29=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o29,r29)
sloper29=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o29,y29)
slopey29=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o30,c30)
```

```
slopec30=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o30,r30)
sloper30=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o30,y30)
slopey30=slope

#106-107-std glucosa
slope, intercept, r_value, p_value,std_err=stats.linregress(o31,c31)
slopec31=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o31,r31)
sloper31=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o31,y31)
slopey31=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o32,c32)
slopec32=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o32,r32)
sloper32=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o32,y32)
slopey32=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o33,c33)
slopec33=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o33,r33)
sloper33=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o33,y33)
slopey33=slope

#106-107-std glicerol
slope, intercept, r_value, p_value,std_err=stats.linregress(o34,c34)
slopec34=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o34,r34)
sloper34=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o34,y34)
slopey34=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o35,c35)
slopec35=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o35,r35)
sloper35=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o35,y35)
slopey35=slope

slope, intercept, r_value, p_value,std_err=stats.linregress(o36,c36)
slopec36=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o36,r36)
sloper36=slope
slope, intercept, r_value, p_value,std_err=stats.linregress(o36,y36)
```

```
slopey36=slope
```

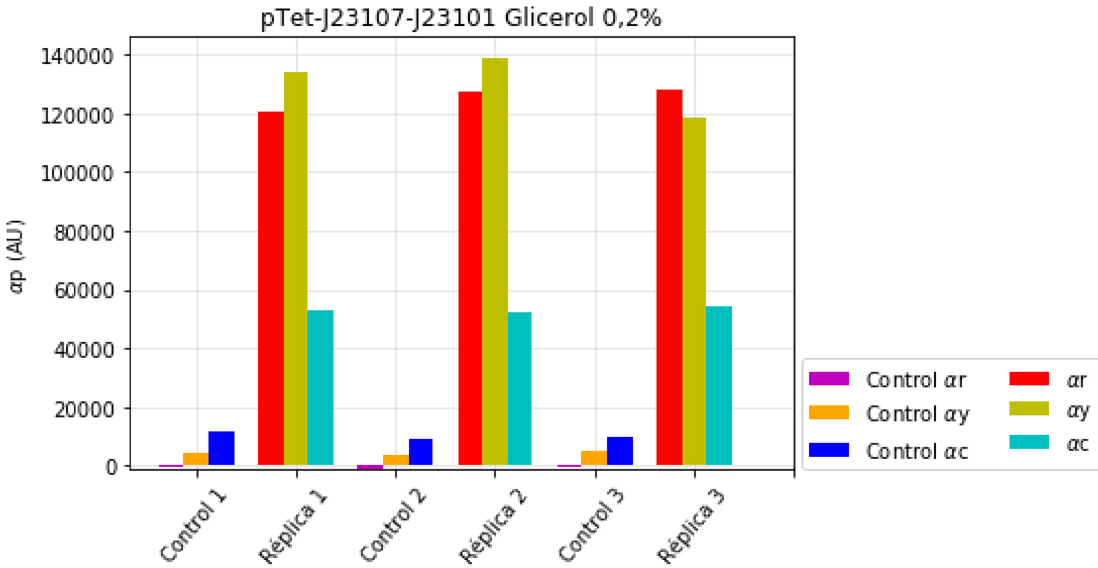
In [61]:
```
pendientescc=[slopec1,slopec2,slopec3,slopec4,slopec5,slopec6,slopec7,slopec8,slopec9,s
pendientesc=[slopec19,slopec20,slopec21,slopec22,slopec23,slopec24,slopec25,slopec26,sl
pendientescr=[sloper1,sloper2,sloper3,sloper4,sloper5,sloper6,sloper7,sloper8,sloper9,s
pendientesr=[sloper19,sloper20,sloper21,sloper22,sloper23,sloper24,sloper25,sloper26,sl
pendientescy=[slopey1,slopey2,slopey3,slopey4,slopey5,slopey6,slopey7,slopey8,slopey9,s
pendientesy=[slopey19,slopey20,slopey21,slopey22,slopey23,slopey24,slopey25,slopey26,sl
#Grafico pendientes ptet-std-std Glucosa
X = np.arange(7)
plt.figure()
plt.title('pTet-J23107-J23101 Glucosa 0,4%')
plt.ylabel(r'$\alpha$p (AU)')
plt.bar(X[0]-0.25,pendientescr[0],color='m',width=0.25,label='Control'+' '+ r'$\alpha$r
plt.bar(X[0]+0.00,pendientescy[0],color='orange',width=0.25,label='Control'+' '+ r'$\al
plt.bar(X[0]+0.25,pendientescc[0],color='b',width=0.25,label='Control'+' '+ r'$\alpha$c
plt.bar(X[1]-0.25,pendientesr[0],color='r',width=0.25,label=r'$\alpha$r',zorder=3)
plt.bar(X[1]+0.00,pendientesy[0],color='y',width=0.25,label=r'$\alpha$y',zorder=3)
plt.bar(X[1]+0.25,pendientesc[0],color='c',width=0.25,label= r'$\alpha$c',zorder=3)
plt.bar(X[2]-0.25,pendientescr[1],color='m',width=0.25,zorder=3)
plt.bar(X[2]+0.00,pendientescy[1],color='orange',width=0.25,zorder=3)
plt.bar(X[2]+0.25,pendientescc[1],color='b',width=0.25,zorder=3)
plt.bar(X[3]-0.25,pendientesr[1],color='r',width=0.25,zorder=3)
plt.bar(X[3]+0.00,pendientesy[1],color='y',width=0.25,zorder=3)
plt.bar(X[3]+0.25,pendientesc[1],color='c',width=0.25,zorder=3)
plt.bar(X[4]-0.25,pendientescr[2],color='m',width=0.25,zorder=3)
plt.bar(X[4]+0.00,pendientescy[2],color='orange',width=0.25,zorder=3)
plt.bar(X[4]+0.25,pendientescc[2],color='b',width=0.25,zorder=3)
plt.bar(X[5]-0.25,pendientesr[2],color='r',width=0.25,zorder=3)
plt.bar(X[5]+0.00,pendientesy[2],color='y',width=0.25,zorder=3)
plt.bar(X[5]+0.25,pendientesc[2],color='c',width=0.25,zorder=3)
plt.xticks(X, ['Control 1',"Réplica 1",'Control 2',"Réplica 2",'Control 3',"Réplica 3"]
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

Out[61]:
```
<matplotlib.legend.Legend at 0x236564e1cf8>
```




```
In [62]: #Grafico pendientes ptet-std-std Glicerol
         X = np.arange(7)
         plt.figure()
         plt.title('pTet-J23107-J23101 Glicerol 0,2%')
         plt.ylabel(r'$\alpha$p (AU)')
         plt.bar(X[0]-0.25,pendientescr[3],color='m',width=0.25,label='Control'+' '+ r'$\alpha$r
         plt.bar(X[0]+0.00,pendientescy[3],color='orange',width=0.25,label='Control'+' '+ r'$\al
         plt.bar(X[0]+0.25,pendientescc[3],color='b',width=0.25,label='Control'+' '+ r'$\alpha$c
         plt.bar(X[1]-0.25,pendientesr[3],color='r',width=0.25,label=r'$\alpha$r',zorder=3)
         plt.bar(X[1]+0.00,pendientesy[3],color='y',width=0.25,label=r'$\alpha$y',zorder=3)
         plt.bar(X[1]+0.25,pendientesc[3],color='c',width=0.25,label=r'$\alpha$c',zorder=3)
         plt.bar(X[2]-0.25,pendientescr[4],color='m',width=0.25,zorder=3)
         plt.bar(X[2]+0.00,pendientescy[4],color='orange',width=0.25,zorder=3)
         plt.bar(X[2]+0.25,pendientescc[4],color='b',width=0.25,zorder=3)
         plt.bar(X[3]-0.25,pendientesr[4],color='r',width=0.25,zorder=3)
         plt.bar(X[3]+0.00,pendientesy[4],color='y',width=0.25,zorder=3)
         plt.bar(X[3]+0.25,pendientesc[4],color='c',width=0.25,zorder=3)
         plt.bar(X[4]-0.25,pendientescr[5],color='m',width=0.25,zorder=3)
         plt.bar(X[4]+0.00,pendientescy[5],color='orange',width=0.25,zorder=3)
         plt.bar(X[4]+0.25,pendientescc[5],color='b',width=0.25,zorder=3)
         plt.bar(X[5]-0.25,pendientesr[5],color='r',width=0.25,zorder=3)
         plt.bar(X[5]+0.00,pendientesy[5],color='y',width=0.25,zorder=3)
         plt.bar(X[5]+0.25,pendientesc[5],color='c',width=0.25,zorder=3)
         plt.xticks(X, ['Control 1',"Réplica 1",'Control 2',"Réplica 2",'Control 3',"Réplica 3"]

         plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
         plt.legend(loc=(1.01,0.0),ncol=2)
```

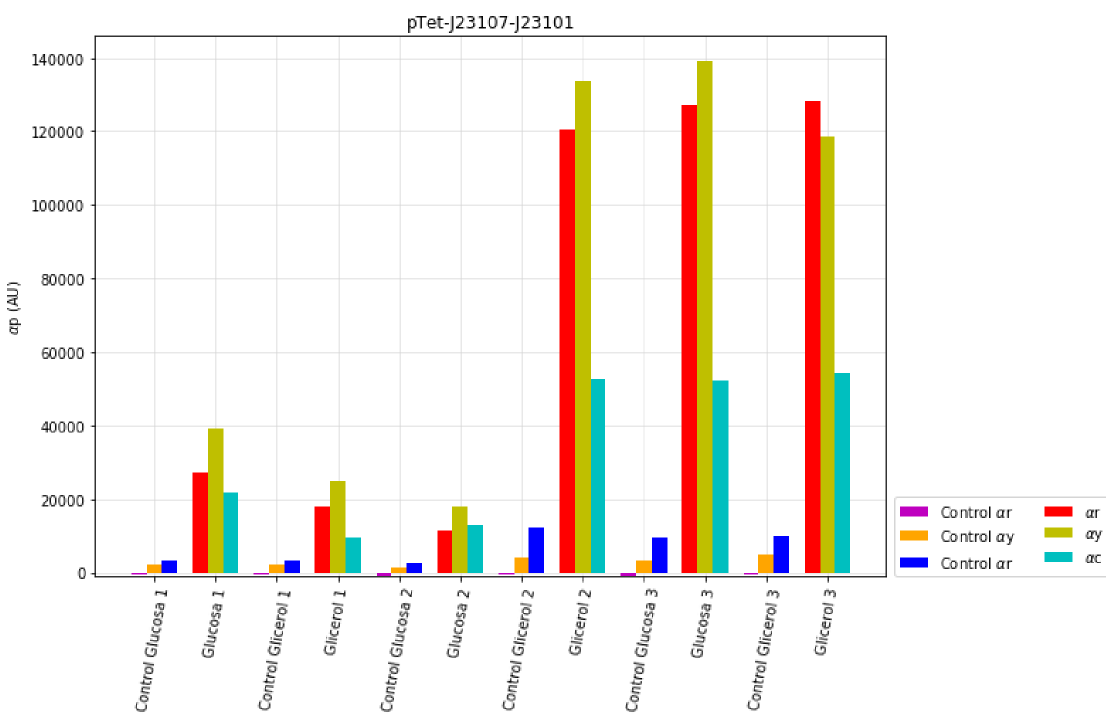
Out[62]: <matplotlib.legend.Legend at 0x2365c886550>




```
In [63]: #Grafico pendientes ptet-std-std
         X = np.arange(12)
         plt.figure(figsize=(10,7))
         plt.title('pTet-J23107-J23101')
         plt.ylabel(r'$\alpha$p (AU)')
         plt.bar(X[0]-0.25,pendientescr[0],color='m',width=0.25,label='Control'+' '+ r'$\alpha$r
         plt.bar(X[0]+0.00,pendientescy[0],color='orange',width=0.25,label='Control'+' '+ r'$\al
         plt.bar(X[0]+0.25,pendientescc[0],color='b',width=0.25,label='Control'+' '+ r'$\alpha$r
         plt.bar(X[1]-0.25,pendientesr[0],color='r',width=0.25,label=r'$\alpha$r',zorder=3)
         plt.bar(X[1]+0.00,pendientesy[0],color='y',width=0.25,label= r'$\alpha$y',zorder=3)
         plt.bar(X[1]+0.25,pendientesc[0],color='c',width=0.25,label=r'$\alpha$c',zorder=3)
         plt.bar(X[2]-0.25,pendientescr[1],color='m',width=0.25,zorder=3)
         plt.bar(X[2]+0.00,pendientescy[1],color='orange',width=0.25,zorder=3)
         plt.bar(X[2]+0.25,pendientescc[1],color='b',width=0.25,zorder=3)
         plt.bar(X[3]-0.25,pendientesr[1],color='r',width=0.25,zorder=3)
         plt.bar(X[3]+0.00,pendientesy[1],color='y',width=0.25,zorder=3)
         plt.bar(X[3]+0.25,pendientesc[1],color='c',width=0.25,zorder=3)
         plt.bar(X[4]-0.25,pendientescr[2],color='m',width=0.25,zorder=3)
         plt.bar(X[4]+0.00,pendientescy[2],color='orange',width=0.25,zorder=3)
         plt.bar(X[4]+0.25,pendientescc[2],color='b',width=0.25,zorder=3)
         plt.bar(X[5]-0.25,pendientesr[2],color='r',width=0.25,zorder=3)
         plt.bar(X[5]+0.00,pendientesy[2],color='y',width=0.25,zorder=3)
         plt.bar(X[5]+0.25,pendientesc[2],color='c',width=0.25,zorder=3)
         plt.bar(X[6]-0.25,pendientescr[3],color='m',width=0.25,zorder=3)
         plt.bar(X[6]+0.00,pendientescy[3],color='orange',width=0.25,zorder=3)
         plt.bar(X[6]+0.25,pendientescc[3],color='b',width=0.25,zorder=3)
```

```
plt.bar(X[7]-0.25,pendientesr[3],color='r',width=0.25,zorder=3)
plt.bar(X[7]+0.00,pendientesy[3],color='y',width=0.25,zorder=3)
plt.bar(X[7]+0.25,pendientesc[3],color='c',width=0.25,zorder=3)
plt.bar(X[8]-0.25,pendientescr[4],color='m',width=0.25,zorder=3)
plt.bar(X[8]+0.00,pendientescy[4],color='orange',width=0.25,zorder=3)
plt.bar(X[8]+0.25,pendientescc[4],color='b',width=0.25,zorder=3)
plt.bar(X[9]-0.25,pendientesr[4],color='r',width=0.25,zorder=3)
plt.bar(X[9]+0.00,pendientesy[4],color='y',width=0.25,zorder=3)
plt.bar(X[9]+0.25,pendientesc[4],color='c',width=0.25,zorder=3)
plt.bar(X[10]-0.25,pendientescr[5],color='m',width=0.25,zorder=3)
plt.bar(X[10]+0.00,pendientescy[5],color='orange',width=0.25,zorder=3)
plt.bar(X[10]+0.25,pendientescc[5],color='b',width=0.25,zorder=3)
plt.bar(X[11]-0.25,pendientesr[5],color='r',width=0.25,zorder=3)
plt.bar(X[11]+0.00,pendientesy[5],color='y',width=0.25,zorder=3)
plt.bar(X[11]+0.25,pendientesc[5],color='c',width=0.25,zorder=3)
plt.xticks(X, ['Control Glucosa 1',"Glucosa 1",'Control Glicerol 1',"Glicerol 1",'Contr
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

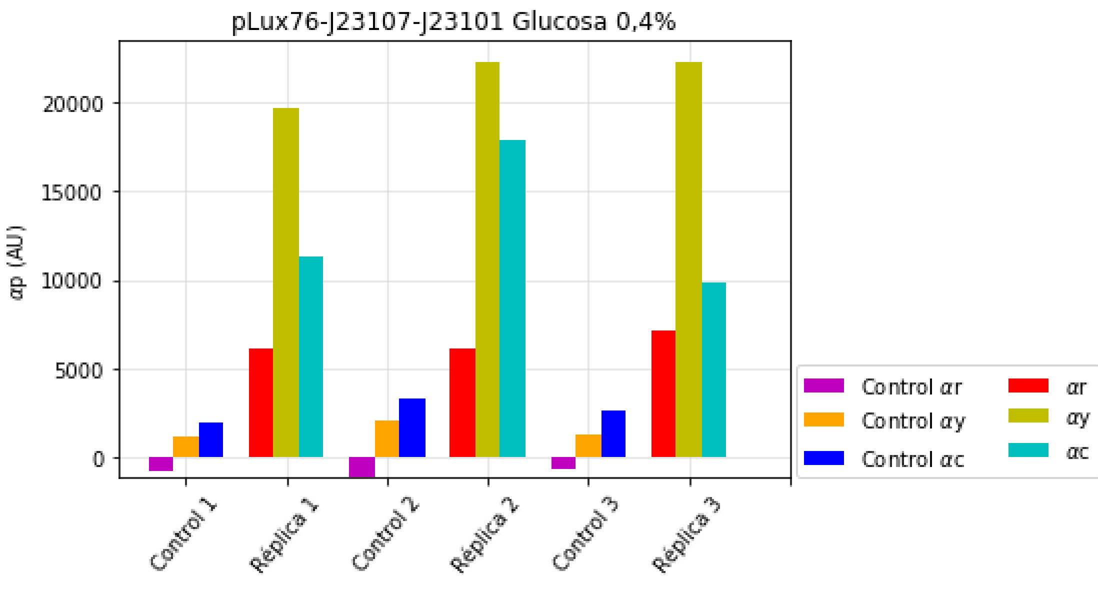
Out[63]: <matplotlib.legend.Legend at 0x2365afe84e0>




```
In [64]: #Grafico pendientes plux-std-std Glucosa
         X = np.arange(7)
         plt.figure()
```

```
plt.title('pLux76-J23107-J23101 Glucosa 0,4%')
plt.ylabel(r'$\alpha$p (AU)')
plt.bar(X[0]-0.25,pendientescr[6],color='m',width=0.25,label='Control'+' '+ r'$\alpha$r
plt.bar(X[0]+0.00,pendientescy[6],color='orange',width=0.25,label='Control'+' '+ r'$\al
plt.bar(X[0]+0.25,pendientescc[6],color='b',width=0.25,label='Control'+' '+ r'$\alpha$c
plt.bar(X[1]-0.25,pendientesr[6],color='r',width=0.25,label=r'$\alpha$r',zorder=3)
plt.bar(X[1]+0.00,pendientesy[6],color='y',width=0.25,label=r'$\alpha$y',zorder=3)
plt.bar(X[1]+0.25,pendientesc[6],color='c',width=0.25,label= r'$\alpha$c',zorder=3)
plt.bar(X[2]-0.25,pendientescr[7],color='m',width=0.25,zorder=3)
plt.bar(X[2]+0.00,pendientescy[7],color='orange',width=0.25,zorder=3)
plt.bar(X[2]+0.25,pendientescc[7],color='b',width=0.25,zorder=3)
plt.bar(X[3]-0.25,pendientesr[7],color='r',width=0.25,zorder=3)
plt.bar(X[3]+0.00,pendientesy[7],color='y',width=0.25,zorder=3)
plt.bar(X[3]+0.25,pendientesc[7],color='c',width=0.25,zorder=3)
plt.bar(X[4]-0.25,pendientescr[8],color='m',width=0.25,zorder=3)
plt.bar(X[4]+0.00,pendientescy[8],color='orange',width=0.25,zorder=3)
plt.bar(X[4]+0.25,pendientescc[8],color='b',width=0.25,zorder=3)
plt.bar(X[5]-0.25,pendientesr[8],color='r',width=0.25,zorder=3)
plt.bar(X[5]+0.00,pendientesy[8],color='y',width=0.25,zorder=3)
plt.bar(X[5]+0.25,pendientesc[8],color='c',width=0.25,zorder=3)
plt.xticks(X, ['Control 1',"Réplica 1",'Control 2',"Réplica 2",'Control 3',"Réplica 3"]
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

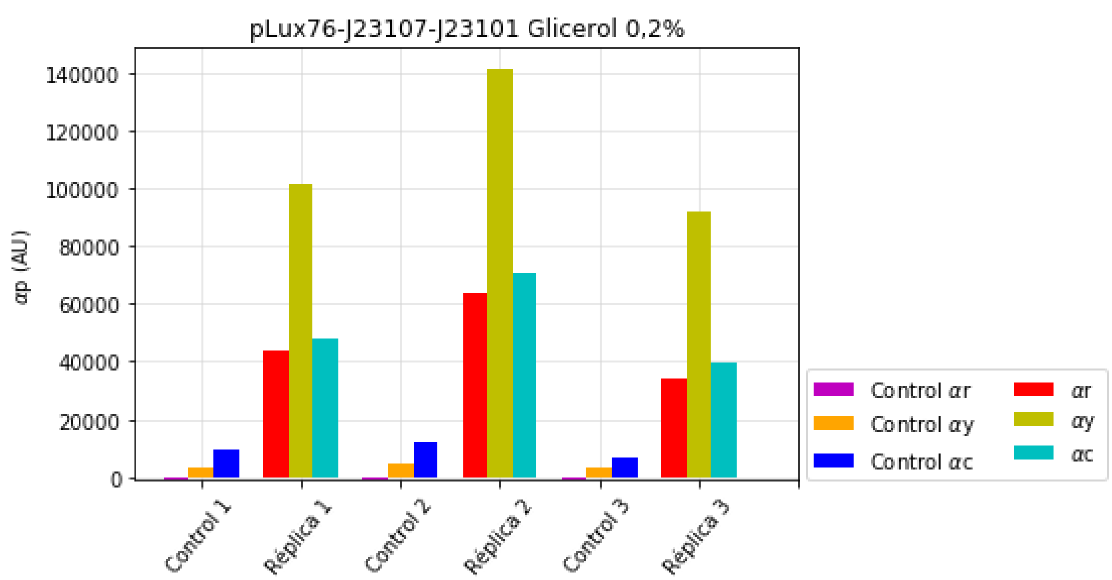
Out[64]: <matplotlib.legend.Legend at 0x2365d59d780>



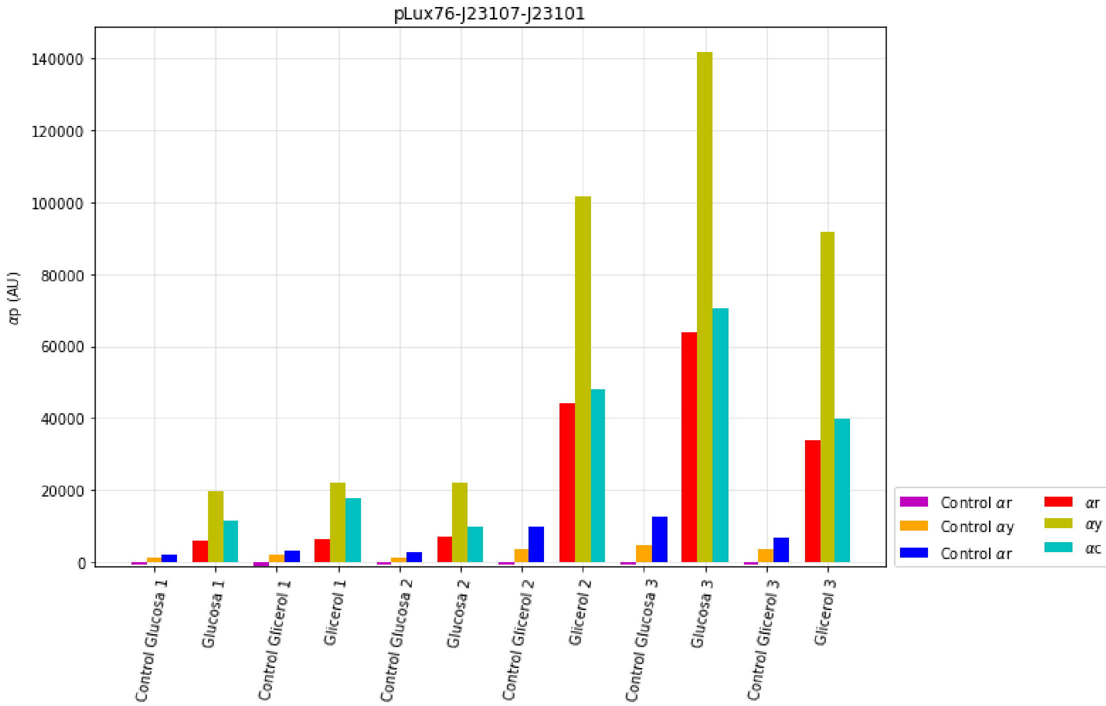

```
In [65]: #Grafico pendientes plux-std-std Glicerol
         X = np.arange(7)
```

```
plt.figure()
plt.title('pLux76-J23107-J23101 Glicerol 0,2%')
plt.ylabel(r'$\alpha$p (AU)')
plt.bar(X[0]-0.25,pendientescr[9],color='m',width=0.25,label='Control'+' '+ r'$\alpha$r
plt.bar(X[0]+0.00,pendientescy[9],color='orange',width=0.25,label='Control'+' '+ r'$\al
plt.bar(X[0]+0.25,pendientescc[9],color='b',width=0.25,label='Control'+' '+ r'$\alpha$c
plt.bar(X[1]-0.25,pendientesr[9],color='r',width=0.25,label=r'$\alpha$r',zorder=3)
plt.bar(X[1]+0.00,pendientesy[9],color='y',width=0.25,label=r'$\alpha$y',zorder=3)
plt.bar(X[1]+0.25,pendientesc[9],color='c',width=0.25,label=r'$\alpha$c',zorder=3)
plt.bar(X[2]-0.25,pendientescr[10],color='m',width=0.25,zorder=3)
plt.bar(X[2]+0.00,pendientescy[10],color='orange',width=0.25,zorder=3)
plt.bar(X[2]+0.25,pendientescc[10],color='b',width=0.25,zorder=3)
plt.bar(X[3]-0.25,pendientesr[10],color='r',width=0.25,zorder=3)
plt.bar(X[3]+0.00,pendientesy[10],color='y',width=0.25,zorder=3)
plt.bar(X[3]+0.25,pendientesc[10],color='c',width=0.25,zorder=3)
plt.bar(X[4]-0.25,pendientescr[11],color='m',width=0.25,zorder=3)
plt.bar(X[4]+0.00,pendientescy[11],color='orange',width=0.25,zorder=3)
plt.bar(X[4]+0.25,pendientescc[11],color='b',width=0.25,zorder=3)
plt.bar(X[5]-0.25,pendientesr[11],color='r',width=0.25,zorder=3)
plt.bar(X[5]+0.00,pendientesy[11],color='y',width=0.25,zorder=3)
plt.bar(X[5]+0.25,pendientesc[11],color='c',width=0.25,zorder=3)
plt.xticks(X, ['Control 1',"Réplica 1",'Control 2',"Réplica 2",'Control 3',"Réplica 3"]

plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

```
Out[65]: <matplotlib.legend.Legend at 0x2365e9b78d0>
```



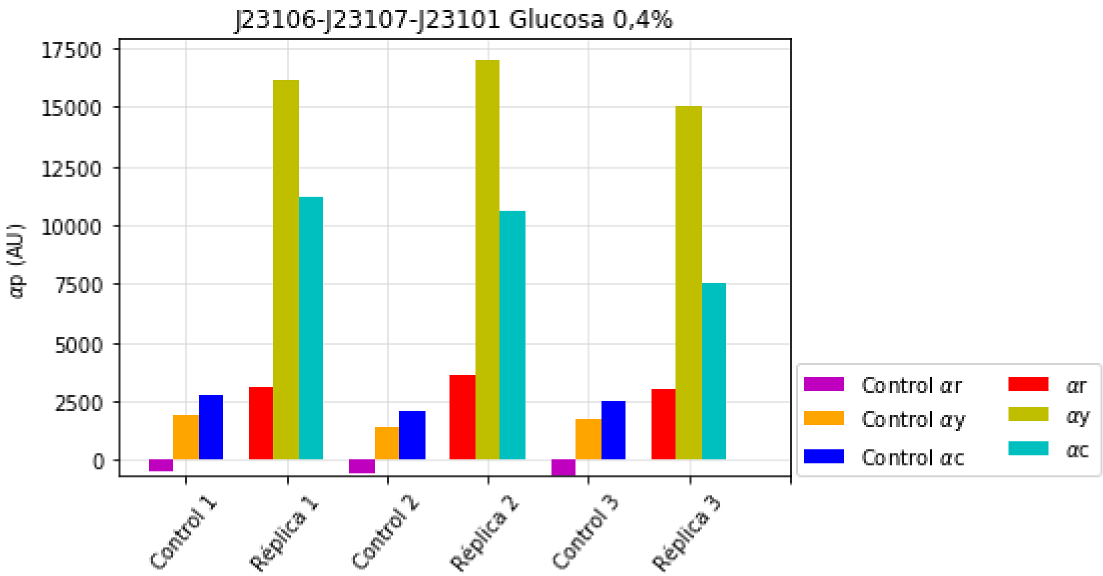
```
In [66]: #Grafico pendientes plux-std-std
         X = np.arange(12)
         plt.figure(figsize=(10,7))
         plt.title('pLux76-J23107-J23101')
         plt.ylabel(r'$\alpha$p (AU)')
         plt.bar(X[0]-0.25,pendientescr[6],color='m',width=0.25,label='Control'+' '+ r'$\alpha$r
         plt.bar(X[0]+0.00,pendientescy[6],color='orange',width=0.25,label='Control'+' '+ r'$\al
         plt.bar(X[0]+0.25,pendientescc[6],color='b',width=0.25,label='Control'+' '+ r'$\alpha$r
         plt.bar(X[1]-0.25,pendientesr[6],color='r',width=0.25,label=r'$\alpha$r',zorder=3)
         plt.bar(X[1]+0.00,pendientesy[6],color='y',width=0.25,label= r'$\alpha$y',zorder=3)
         plt.bar(X[1]+0.25,pendientesc[6],color='c',width=0.25,label=r'$\alpha$c',zorder=3)
         plt.bar(X[2]-0.25,pendientescr[7],color='m',width=0.25,zorder=3)
         plt.bar(X[2]+0.00,pendientescy[7],color='orange',width=0.25,zorder=3)
         plt.bar(X[2]+0.25,pendientescc[7],color='b',width=0.25,zorder=3)
         plt.bar(X[3]-0.25,pendientesr[7],color='r',width=0.25,zorder=3)
         plt.bar(X[3]+0.00,pendientesy[7],color='y',width=0.25,zorder=3)
         plt.bar(X[3]+0.25,pendientesc[7],color='c',width=0.25,zorder=3)
         plt.bar(X[4]-0.25,pendientescr[8],color='m',width=0.25,zorder=3)
         plt.bar(X[4]+0.00,pendientescy[8],color='orange',width=0.25,zorder=3)
         plt.bar(X[4]+0.25,pendientescc[8],color='b',width=0.25,zorder=3)
         plt.bar(X[5]-0.25,pendientesr[8],color='r',width=0.25,zorder=3)
         plt.bar(X[5]+0.00,pendientesy[8],color='y',width=0.25,zorder=3)
         plt.bar(X[5]+0.25,pendientesc[8],color='c',width=0.25,zorder=3)
         plt.bar(X[6]-0.25,pendientescr[9],color='m',width=0.25,zorder=3)
         plt.bar(X[6]+0.00,pendientescy[9],color='orange',width=0.25,zorder=3)
         plt.bar(X[6]+0.25,pendientescc[9],color='b',width=0.25,zorder=3)
         plt.bar(X[7]-0.25,pendientesr[9],color='r',width=0.25,zorder=3)
         plt.bar(X[7]+0.00,pendientesy[9],color='y',width=0.25,zorder=3)
         plt.bar(X[7]+0.25,pendientesc[9],color='c',width=0.25,zorder=3)
         plt.bar(X[8]-0.25,pendientescr[10],color='m',width=0.25,zorder=3)
         plt.bar(X[8]+0.00,pendientescy[10],color='orange',width=0.25,zorder=3)
         plt.bar(X[8]+0.25,pendientescc[10],color='b',width=0.25,zorder=3)
         plt.bar(X[9]-0.25,pendientesr[10],color='r',width=0.25,zorder=3)
         plt.bar(X[9]+0.00,pendientesy[10],color='y',width=0.25,zorder=3)
         plt.bar(X[9]+0.25,pendientesc[10],color='c',width=0.25,zorder=3)
         plt.bar(X[10]-0.25,pendientescr[10],color='m',width=0.25,zorder=3)
         plt.bar(X[10]+0.00,pendientescy[11],color='orange',width=0.25,zorder=3)
         plt.bar(X[10]+0.25,pendientescc[11],color='b',width=0.25,zorder=3)
         plt.bar(X[11]-0.25,pendientesr[11],color='r',width=0.25,zorder=3)
         plt.bar(X[11]+0.00,pendientesy[11],color='y',width=0.25,zorder=3)
         plt.bar(X[11]+0.25,pendientesc[11],color='c',width=0.25,zorder=3)
         plt.xticks(X, ['Control Glucosa 1',"Glucosa 1",'Control Glicerol 1',"Glicerol 1",'Contr
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
         plt.legend(loc=(1.01,0.0),ncol=2)

Out[66]: <matplotlib.legend.Legend at 0x2365eb6b898>
```




```
In [67]: #Grafico pendientes 106-std-std Glucosa
         X = np.arange(7)
         plt.figure()
         plt.title('J23106-J23107-J23101 Glucosa 0,4%')
         plt.ylabel(r'$\alpha$p (AU)')
         plt.bar(X[0]-0.25,pendientescr[12],color='m',width=0.25,label='Control'+' '+ r'$\alpha$
         plt.bar(X[0]+0.00,pendientescy[12],color='orange',width=0.25,label='Control'+' '+ r'$\a
         plt.bar(X[0]+0.25,pendientescc[12],color='b',width=0.25,label='Control'+' '+ r'$\alpha$
         plt.bar(X[1]-0.25,pendientesr[12],color='r',width=0.25,label=r'$\alpha$r',zorder=3)
         plt.bar(X[1]+0.00,pendientesy[12],color='y',width=0.25,label=r'$\alpha$y',zorder=3)
         plt.bar(X[1]+0.25,pendientesc[12],color='c',width=0.25,label= r'$\alpha$c',zorder=3)
         plt.bar(X[2]-0.25,pendientescr[13],color='m',width=0.25,zorder=3)
         plt.bar(X[2]+0.00,pendientescy[13],color='orange',width=0.25,zorder=3)
         plt.bar(X[2]+0.25,pendientescc[13],color='b',width=0.25,zorder=3)
         plt.bar(X[3]-0.25,pendientesr[13],color='r',width=0.25,zorder=3)
         plt.bar(X[3]+0.00,pendientesy[13],color='y',width=0.25,zorder=3)
         plt.bar(X[3]+0.25,pendientesc[13],color='c',width=0.25,zorder=3)
         plt.bar(X[4]-0.25,pendientescr[14],color='m',width=0.25,zorder=3)
         plt.bar(X[4]+0.00,pendientescy[14],color='orange',width=0.25,zorder=3)
         plt.bar(X[4]+0.25,pendientescc[14],color='b',width=0.25,zorder=3)
         plt.bar(X[5]-0.25,pendientesr[14],color='r',width=0.25,zorder=3)
         plt.bar(X[5]+0.00,pendientesy[14],color='y',width=0.25,zorder=3)
         plt.bar(X[5]+0.25,pendientesc[14],color='c',width=0.25,zorder=3)
         plt.xticks(X, ['Control 1',"Réplica 1",'Control 2',"Réplica 2",'Control 3',"Réplica 3"]
```

```
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

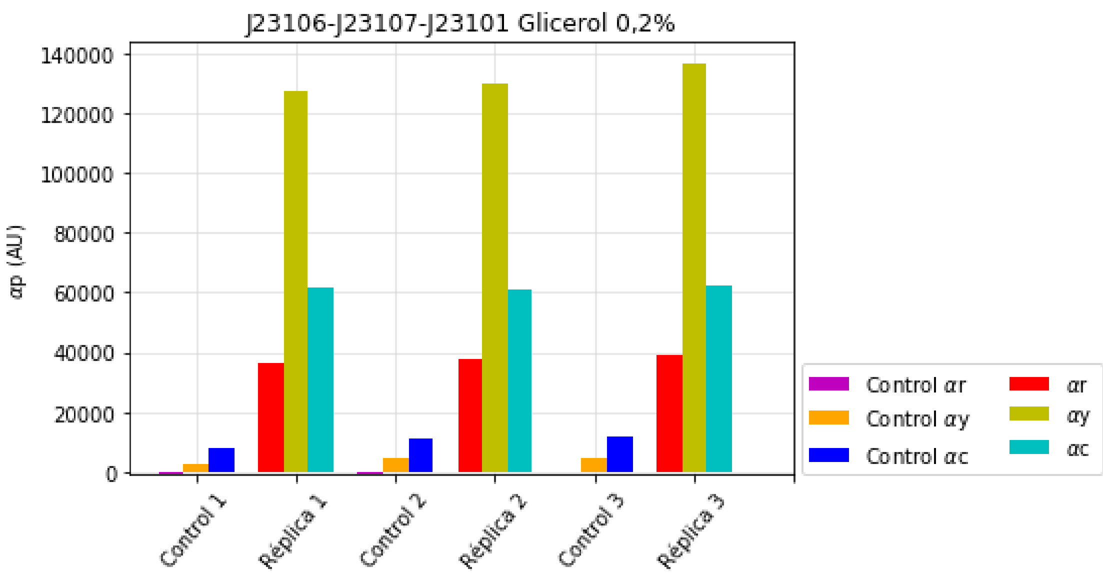
Out[67]: <matplotlib.legend.Legend at 0x2365efd6b70>



In [68]:
```
#Grafico pendientes 106-std-std Glicerol
X = np.arange(7)
plt.figure()
plt.title('J23106-J23107-J23101 Glicerol 0,2%')
plt.ylabel(r'$\alpha$p (AU)')
plt.bar(X[0]-0.25,pendientescr[15],color='m',width=0.25,label='Control'+' '+ r'$\alpha$
plt.bar(X[0]+0.00,pendientescy[15],color='orange',width=0.25,label='Control'+' '+ r'$\a
plt.bar(X[0]+0.25,pendientescc[15],color='b',width=0.25,label='Control'+' '+ r'$\alpha$
plt.bar(X[1]-0.25,pendientesr[15],color='r',width=0.25,label=r'$\alpha$r',zorder=3)
plt.bar(X[1]+0.00,pendientesy[15],color='y',width=0.25,label=r'$\alpha$y',zorder=3)
plt.bar(X[1]+0.25,pendientesc[15],color='c',width=0.25,label=r'$\alpha$c',zorder=3)
plt.bar(X[2]-0.25,pendientescr[16],color='m',width=0.25,zorder=3)
plt.bar(X[2]+0.00,pendientescy[16],color='orange',width=0.25,zorder=3)
plt.bar(X[2]+0.25,pendientescc[16],color='b',width=0.25,zorder=3)
plt.bar(X[3]-0.25,pendientesr[16],color='r',width=0.25,zorder=3)
plt.bar(X[3]+0.00,pendientesy[16],color='y',width=0.25,zorder=3)
plt.bar(X[3]+0.25,pendientesc[16],color='c',width=0.25,zorder=3)
plt.bar(X[4]-0.25,pendientescr[17],color='m',width=0.25,zorder=3)
plt.bar(X[4]+0.00,pendientescy[17],color='orange',width=0.25,zorder=3)
plt.bar(X[4]+0.25,pendientescc[17],color='b',width=0.25,zorder=3)
plt.bar(X[5]-0.25,pendientesr[17],color='r',width=0.25,zorder=3)
plt.bar(X[5]+0.00,pendientesy[17],color='y',width=0.25,zorder=3)
plt.bar(X[5]+0.25,pendientesc[17],color='c',width=0.25,zorder=3)
```

```
plt.xticks(X, ['Control 1',"Réplica 1",'Control 2',"Réplica 2",'Control 3',"Réplica 3"]

plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

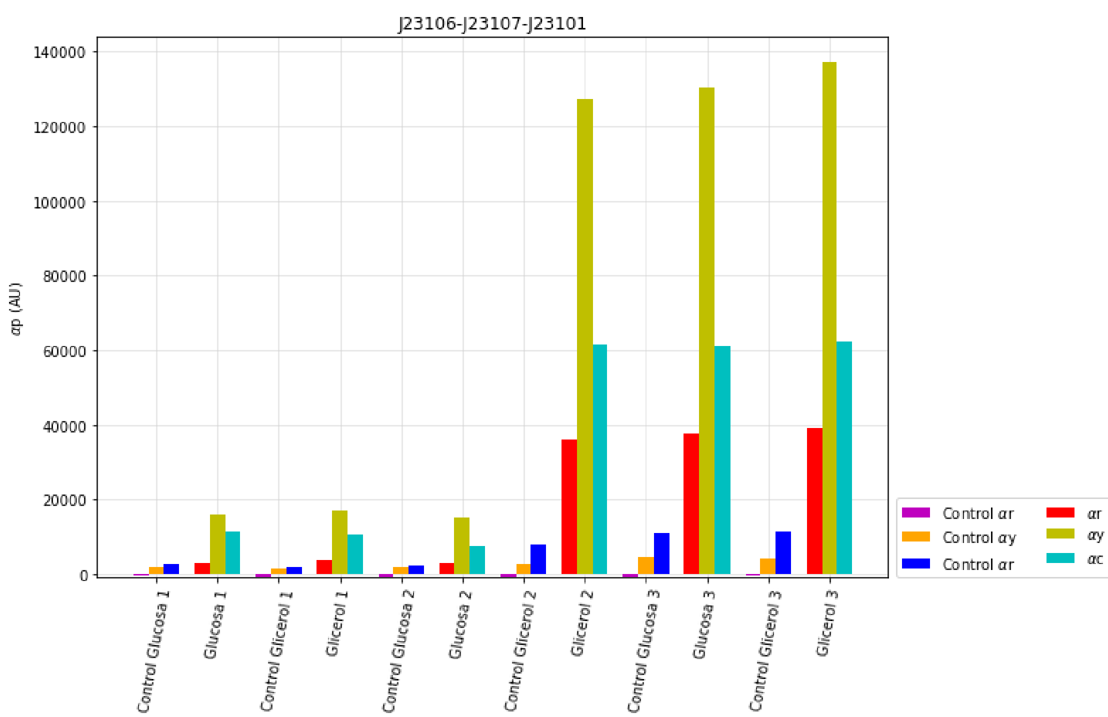
Out[68]: <matplotlib.legend.Legend at 0x2365c9834e0>




```
In [69]: #Grafico pendientes plux-std-std
X = np.arange(12)
plt.figure(figsize=(10,7))
plt.title('J23106-J23107-J23101')
plt.ylabel(r'$\alpha$p (AU)')
plt.bar(X[0]-0.25,pendientescr[12],color='m',width=0.25,label='Control'+' '+ r'$\alpha$
plt.bar(X[0]+0.00,pendientescy[12],color='orange',width=0.25,label='Control'+' '+ r'$\a
plt.bar(X[0]+0.25,pendientescc[12],color='b',width=0.25,label='Control'+' '+ r'$\alpha$
plt.bar(X[1]-0.25,pendientesr[12],color='r',width=0.25,label=r'$\alpha$r',zorder=3)
plt.bar(X[1]+0.00,pendientesy[12],color='y',width=0.25,label= r'$\alpha$y',zorder=3)
plt.bar(X[1]+0.25,pendientesc[12],color='c',width=0.25,label=r'$\alpha$c',zorder=3)
plt.bar(X[2]-0.25,pendientescr[13],color='m',width=0.25,zorder=3)
plt.bar(X[2]+0.00,pendientescy[13],color='orange',width=0.25,zorder=3)
plt.bar(X[2]+0.25,pendientescc[13],color='b',width=0.25,zorder=3)
plt.bar(X[3]-0.25,pendientesr[13],color='r',width=0.25,zorder=3)
plt.bar(X[3]+0.00,pendientesy[13],color='y',width=0.25,zorder=3)
plt.bar(X[3]+0.25,pendientesc[13],color='c',width=0.25,zorder=3)
plt.bar(X[4]-0.25,pendientescr[14],color='m',width=0.25,zorder=3)
plt.bar(X[4]+0.00,pendientescy[14],color='orange',width=0.25,zorder=3)
plt.bar(X[4]+0.25,pendientescc[14],color='b',width=0.25,zorder=3)
plt.bar(X[5]-0.25,pendientesr[14],color='r',width=0.25,zorder=3)
```

```python
plt.bar(X[5]+0.00,pendientesy[14],color='y',width=0.25,zorder=3)
plt.bar(X[5]+0.25,pendientesc[14],color='c',width=0.25,zorder=3)
plt.bar(X[6]-0.25,pendientescr[15],color='m',width=0.25,zorder=3)
plt.bar(X[6]+0.00,pendientescy[15],color='orange',width=0.25,zorder=3)
plt.bar(X[6]+0.25,pendientescc[15],color='b',width=0.25,zorder=3)
plt.bar(X[7]-0.25,pendientesr[15],color='r',width=0.25,zorder=3)
plt.bar(X[7]+0.00,pendientesy[15],color='y',width=0.25,zorder=3)
plt.bar(X[7]+0.25,pendientesc[15],color='c',width=0.25,zorder=3)
plt.bar(X[8]-0.25,pendientescr[16],color='m',width=0.25,zorder=3)
plt.bar(X[8]+0.00,pendientescy[16],color='orange',width=0.25,zorder=3)
plt.bar(X[8]+0.25,pendientescc[16],color='b',width=0.25,zorder=3)
plt.bar(X[9]-0.25,pendientesr[16],color='r',width=0.25,zorder=3)
plt.bar(X[9]+0.00,pendientesy[16],color='y',width=0.25,zorder=3)
plt.bar(X[9]+0.25,pendientesc[16],color='c',width=0.25,zorder=3)
plt.bar(X[10]-0.25,pendientescr[17],color='m',width=0.25,zorder=3)
plt.bar(X[10]+0.00,pendientescy[17],color='orange',width=0.25,zorder=3)
plt.bar(X[10]+0.25,pendientescc[17],color='b',width=0.25,zorder=3)
plt.bar(X[11]-0.25,pendientesr[17],color='r',width=0.25,zorder=3)
plt.bar(X[11]+0.00,pendientesy[17],color='y',width=0.25,zorder=3)
plt.bar(X[11]+0.25,pendientesc[17],color='c',width=0.25,zorder=3)
plt.xticks(X, ['Control Glucosa 1',"Glucosa 1",'Control Glicerol 1',"Glicerol 1",'Contr
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

Out[69]: <matplotlib.legend.Legend at 0x2365d69eac8>

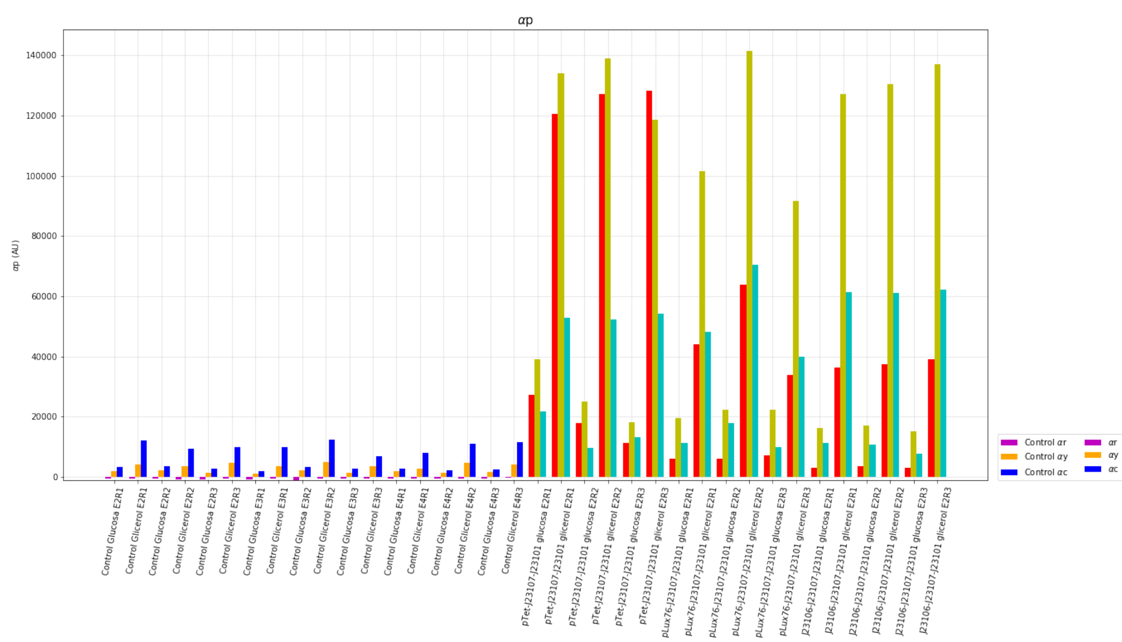


In [70]:
```
#Grafico pendientes todo
X = np.arange(36)
plt.figure(figsize=(20,10))
plt.title(r'$\alpha$p',fontsize=15.0)
plt.ylabel(r'$\alpha$p (AU)')
plt.bar(X[0]-0.25,pendientescr[0],color='m',width=0.25,label='Control'+' '+ r'$\alpha$r
plt.bar(X[0]+0.00,pendientescy[0],color='orange',width=0.25,label='Control'+' '+ r'$\al
plt.bar(X[0]+0.25,pendientescc[0],color='b',width=0.25,label='Control'+' '+ r'$\alpha$c
plt.bar(X[1]-0.25,pendientescr[3],color='m',width=0.25,zorder=3)
plt.bar(X[1]+0.00,pendientescy[3],color='orange',width=0.25,zorder=3)
plt.bar(X[1]+0.25,pendientescc[3],color='b',width=0.25,zorder=3)
plt.bar(X[2]-0.25,pendientescr[1],color='m',width=0.25,zorder=3)
plt.bar(X[2]+0.00,pendientescy[1],color='orange',width=0.25,zorder=3)
plt.bar(X[2]+0.25,pendientescc[1],color='b',width=0.25,zorder=3)
plt.bar(X[3]-0.25,pendientescr[4],color='m',width=0.25,zorder=3)
plt.bar(X[3]+0.00,pendientescy[4],color='orange',width=0.25,zorder=3)
plt.bar(X[3]+0.25,pendientescc[4],color='b',width=0.25,zorder=3)
plt.bar(X[4]-0.25,pendientescr[2],color='m',width=0.25,zorder=3)
plt.bar(X[4]+0.00,pendientescy[2],color='orange',width=0.25,zorder=3)
plt.bar(X[4]+0.25,pendientescc[2],color='b',width=0.25,zorder=3)
plt.bar(X[5]-0.25,pendientescr[5],color='m',width=0.25,zorder=3)
plt.bar(X[5]+0.00,pendientescy[5],color='orange',width=0.25,zorder=3)
plt.bar(X[5]+0.25,pendientescc[5],color='b',width=0.25,zorder=3)
plt.bar(X[6]-0.25,pendientescr[6],color='m',width=0.25,label=r'$\alpha$r',zorder=3)
plt.bar(X[6]+0.00,pendientescy[6],color='orange',width=0.25,label=r'$\alpha$y',zorder=3
plt.bar(X[6]+0.25,pendientescc[6],color='blue',width=0.25,label=r'$\alpha$c',zorder=3)
plt.bar(X[7]-0.25,pendientescr[9],color='m',width=0.25,zorder=3)
plt.bar(X[7]+0.00,pendientescy[9],color='orange',width=0.25,zorder=3)
plt.bar(X[7]+0.25,pendientescc[9],color='b',width=0.25,zorder=3)
plt.bar(X[8]-0.25,pendientescr[7],color='m',width=0.25,zorder=3)
plt.bar(X[8]+0.00,pendientescy[7],color='orange',width=0.25,zorder=3)
plt.bar(X[8]+0.25,pendientescc[7],color='b',width=0.25,zorder=3)
plt.bar(X[9]-0.25,pendientescr[10],color='m',width=0.25,zorder=3)
plt.bar(X[9]+0.00,pendientescy[10],color='orange',width=0.25,zorder=3)
plt.bar(X[9]+0.25,pendientescc[10],color='b',width=0.25,zorder=3)
plt.bar(X[10]-0.25,pendientescr[8],color='m',width=0.25,zorder=3)
plt.bar(X[10]+0.00,pendientescy[8],color='orange',width=0.25,zorder=3)
plt.bar(X[10]+0.25,pendientescc[8],color='b',width=0.25,zorder=3)
plt.bar(X[11]-0.25,pendientescr[11],color='m',width=0.25,zorder=3)
plt.bar(X[11]+0.00,pendientescy[11],color='orange',width=0.25,zorder=3)
plt.bar(X[11]+0.25,pendientescc[11],color='b',width=0.25,zorder=3)
plt.bar(X[12]-0.25,pendientescr[12],color='m',width=0.25,zorder=3)
plt.bar(X[12]+0.00,pendientescy[12],color='orange',width=0.25,zorder=3)
plt.bar(X[12]+0.25,pendientescc[12],color='b',width=0.25,zorder=3)
plt.bar(X[13]-0.25,pendientescr[15],color='m',width=0.25,zorder=3)
plt.bar(X[13]+0.00,pendientescy[15],color='orange',width=0.25,zorder=3)
plt.bar(X[13]+0.25,pendientescc[15],color='b',width=0.25,zorder=3)
plt.bar(X[14]-0.25,pendientescr[13],color='m',width=0.25,zorder=3)
```

```
plt.bar(X[14]+0.00,pendientescy[13],color='orange',width=0.25,zorder=3)
plt.bar(X[14]+0.25,pendientescc[13],color='b',width=0.25,zorder=3)
plt.bar(X[15]-0.25,pendientescr[16],color='m',width=0.25,zorder=3)
plt.bar(X[15]+0.00,pendientescy[16],color='orange',width=0.25,zorder=3)
plt.bar(X[15]+0.25,pendientescc[16],color='b',width=0.25,zorder=3)
plt.bar(X[16]-0.25,pendientescr[14],color='m',width=0.25,zorder=3)
plt.bar(X[16]+0.00,pendientescy[14],color='orange',width=0.25,zorder=3)
plt.bar(X[16]+0.25,pendientescc[14],color='b',width=0.25,zorder=3)
plt.bar(X[17]-0.25,pendientescr[17],color='m',width=0.25,zorder=3)
plt.bar(X[17]+0.00,pendientescy[17],color='orange',width=0.25,zorder=3)
plt.bar(X[17]+0.25,pendientescc[17],color='b',width=0.25,zorder=3)
plt.bar(X[18]-0.25,pendientesr[0],color='r',width=0.25,zorder=3)
plt.bar(X[18]+0.00,pendientesy[0],color='y',width=0.25,zorder=3)
plt.bar(X[18]+0.25,pendientesc[0],color='c',width=0.25,zorder=3)
plt.bar(X[19]-0.25,pendientesr[3],color='r',width=0.25,zorder=3)
plt.bar(X[19]+0.00,pendientesy[3],color='y',width=0.25,zorder=3)
plt.bar(X[19]+0.25,pendientesc[3],color='c',width=0.25,zorder=3)
plt.bar(X[20]-0.25,pendientesr[1],color='r',width=0.25,zorder=3)
plt.bar(X[20]+0.00,pendientesy[1],color='y',width=0.25,zorder=3)
plt.bar(X[20]+0.25,pendientesc[1],color='c',width=0.25,zorder=3)
plt.bar(X[21]-0.25,pendientesr[4],color='r',width=0.25,zorder=3)
plt.bar(X[21]+0.00,pendientesy[4],color='y',width=0.25,zorder=3)
plt.bar(X[21]+0.25,pendientesc[4],color='c',width=0.25,zorder=3)
plt.bar(X[22]-0.25,pendientesr[2],color='r',width=0.25,zorder=3)
plt.bar(X[22]+0.00,pendientesy[2],color='y',width=0.25,zorder=3)
plt.bar(X[22]+0.25,pendientesc[2],color='c',width=0.25,zorder=3)
plt.bar(X[23]-0.25,pendientesr[5],color='r',width=0.25,zorder=3)
plt.bar(X[23]+0.00,pendientesy[5],color='y',width=0.25,zorder=3)
plt.bar(X[23]+0.25,pendientesc[5],color='c',width=0.25,zorder=3)
plt.bar(X[24]-0.25,pendientesr[6],color='r',width=0.25,zorder=3)
plt.bar(X[24]+0.00,pendientesy[6],color='y',width=0.25,zorder=3)
plt.bar(X[24]+0.25,pendientesc[6],color='c',width=0.25,zorder=3)
plt.bar(X[25]-0.25,pendientesr[9],color='r',width=0.25,zorder=3)
plt.bar(X[25]+0.00,pendientesy[9],color='y',width=0.25,zorder=3)
plt.bar(X[25]+0.25,pendientesc[9],color='c',width=0.25,zorder=3)
plt.bar(X[26]-0.25,pendientesr[7],color='r',width=0.25,zorder=3)
plt.bar(X[26]+0.00,pendientesy[7],color='y',width=0.25,zorder=3)
plt.bar(X[26]+0.25,pendientesc[7],color='c',width=0.25,zorder=3)
plt.bar(X[27]-0.25,pendientesr[10],color='r',width=0.25,zorder=3)
plt.bar(X[27]+0.00,pendientesy[10],color='y',width=0.25,zorder=3)
plt.bar(X[27]+0.25,pendientesc[10],color='c',width=0.25,zorder=3)
plt.bar(X[28]-0.25,pendientesr[8],color='r',width=0.25,zorder=3)
plt.bar(X[28]+0.00,pendientesy[8],color='y',width=0.25,zorder=3)
plt.bar(X[28]+0.25,pendientesc[8],color='c',width=0.25,zorder=3)
plt.bar(X[29]-0.25,pendientesr[11],color='r',width=0.25,zorder=3)
plt.bar(X[29]+0.00,pendientesy[11],color='y',width=0.25,zorder=3)
plt.bar(X[29]+0.25,pendientesc[11],color='c',width=0.25,zorder=3)
plt.bar(X[30]-0.25,pendientesr[12],color='r',width=0.25,zorder=3)
```

```
plt.bar(X[30]+0.00,pendientesy[12],color='y',width=0.25,zorder=3)
plt.bar(X[30]+0.25,pendientesc[12],color='c',width=0.25,zorder=3)
plt.bar(X[31]-0.25,pendientesr[15],color='r',width=0.25,zorder=3)
plt.bar(X[31]+0.00,pendientesy[15],color='y',width=0.25,zorder=3)
plt.bar(X[31]+0.25,pendientesc[15],color='c',width=0.25,zorder=3)
plt.bar(X[32]-0.25,pendientesr[13],color='r',width=0.25,zorder=3)
plt.bar(X[32]+0.00,pendientesy[13],color='y',width=0.25,zorder=3)
plt.bar(X[32]+0.25,pendientesc[13],color='c',width=0.25,zorder=3)
plt.bar(X[33]-0.25,pendientesr[16],color='r',width=0.25,zorder=3)
plt.bar(X[33]+0.00,pendientesy[16],color='y',width=0.25,zorder=3)
plt.bar(X[33]+0.25,pendientesc[16],color='c',width=0.25,zorder=3)
plt.bar(X[34]-0.25,pendientesr[14],color='r',width=0.25,zorder=3)
plt.bar(X[34]+0.00,pendientesy[14],color='y',width=0.25,zorder=3)
plt.bar(X[34]+0.25,pendientesc[14],color='c',width=0.25,zorder=3)
plt.bar(X[35]-0.25,pendientesr[17],color='r',width=0.25,zorder=3)
plt.bar(X[35]+0.00,pendientesy[17],color='y',width=0.25,zorder=3)
plt.bar(X[35]+0.25,pendientesc[17],color='c',width=0.25,zorder=3)
plt.xticks(X, ['Control Glucosa E2R1','Control Glicerol E2R1','Control Glucosa E2R2','C
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

Out[70]: <matplotlib.legend.Legend at 0x2365f25a0f0>

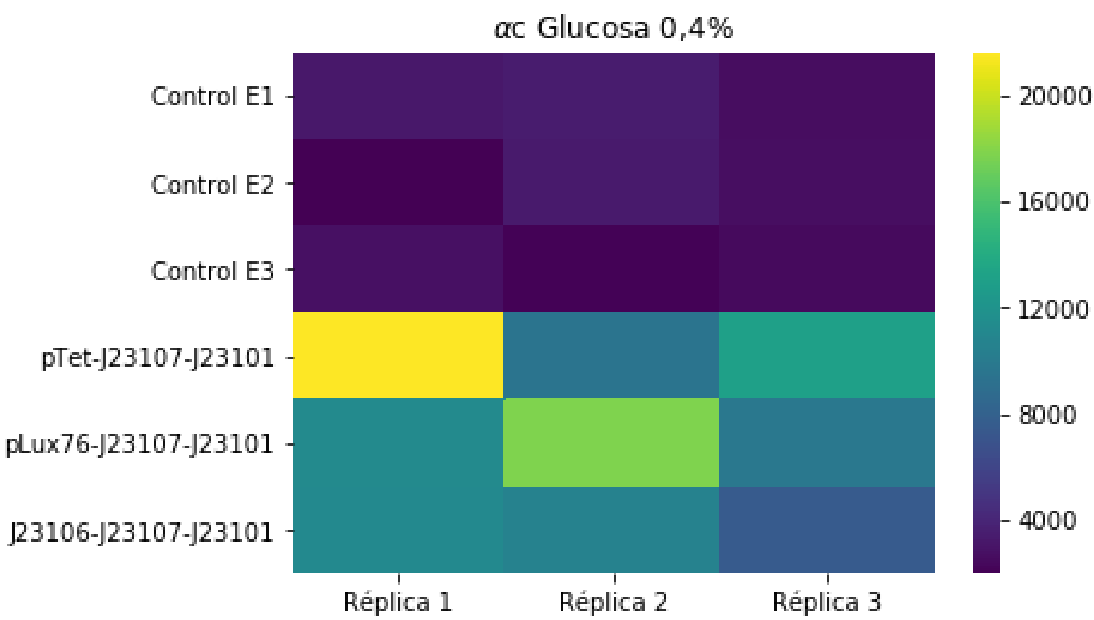


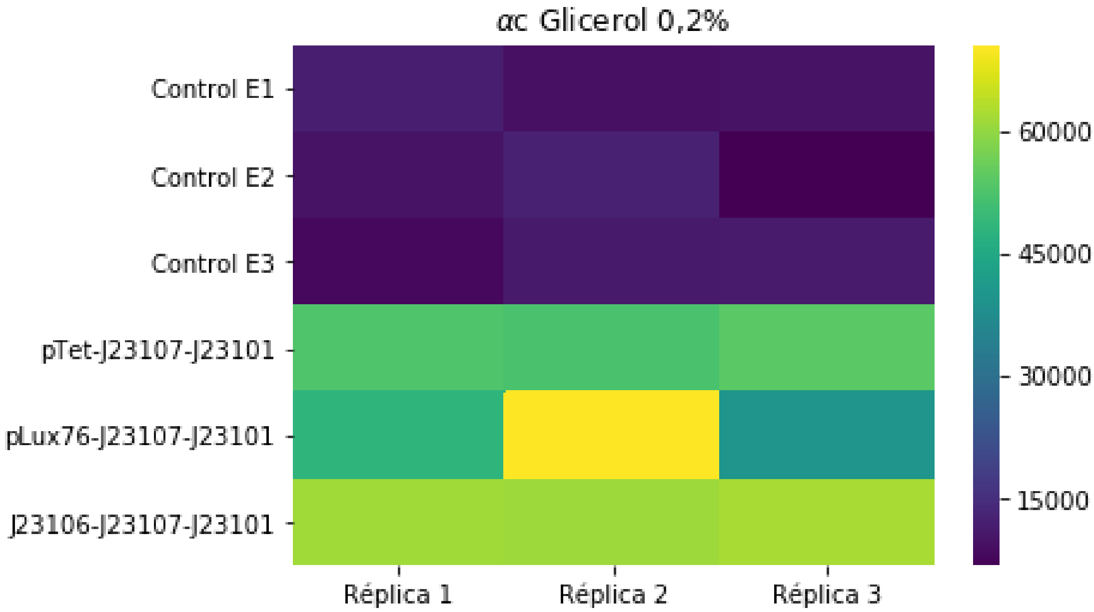

```
In [71]: cglu=[[slopec1,slopec2,slopec3],[slopec7,slopec8,slopec9],[slopec13,slopec14,slopec15],
         cgli=[[slopec4,slopec5,slopec6],[slopec10,slopec11,slopec12],[slopec16,slopec17,slopec1

         rglu=[[sloper1,sloper2,sloper3],[sloper7,sloper8,sloper9],[sloper13,sloper14,sloper15],
```

```
rgli=[[sloper4,sloper5,sloper6],[sloper10,sloper11,sloper12],[sloper16,sloper17,sloper1

yglu=[[slopey1,slopey2,slopey3],[slopey7,slopey8,slopey9],[slopey13,slopey14,slopey15],
ygli=[[slopey4,slopey5,slopey6],[slopey10,slopey11,slopey12],[slopey16,slopey17,slopey1
```

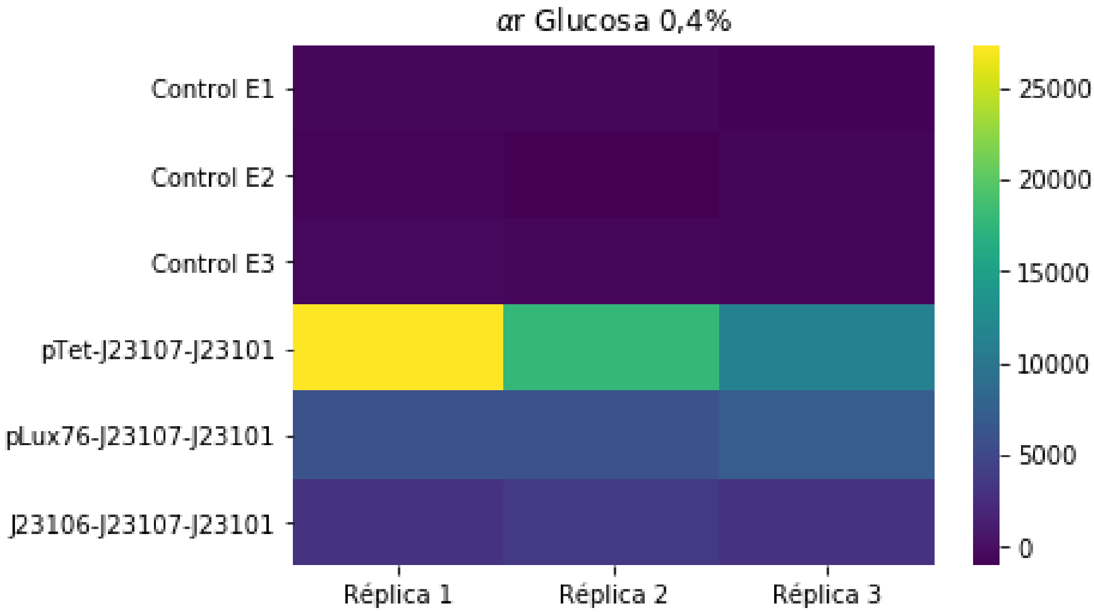
```
In [72]: xlabel=['Réplica 1','Réplica 2','Réplica 3']
         ylabel=['Control E1','Control E2','Control E3','pTet-J23107-J23101','pLux76-J23107-J231

         plt.figure()
         plt.title(r'$\alpha$c Glucosa 0,4%')
         sns.heatmap(cglu,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)

         plt.figure()
         plt.title(r'$\alpha$c Glicerol 0,2%')
         sns.heatmap(cgli,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)
```

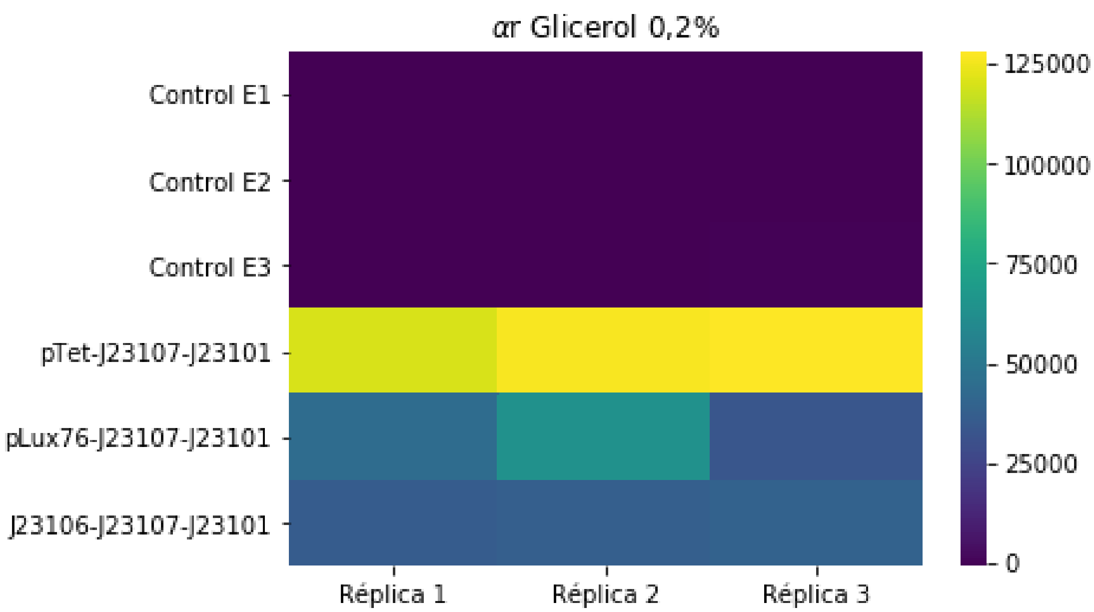
```
Out[72]: <matplotlib.axes._subplots.AxesSubplot at 0x2365fcc76a0>
```






```
In [73]: xlabel=['Réplica 1','Réplica 2','Réplica 3']
         ylabel=['Control E1','Control E2','Control E3','pTet-J23107-J23101','pLux76-J23107-J231


         plt.figure()
         plt.title(r'$\alpha$r Glucosa 0,4%')
         sns.heatmap(rglu,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)

         plt.figure()
         plt.title(r'$\alpha$r Glicerol 0,2%')
         sns.heatmap(rgli,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)

Out[73]: <matplotlib.axes._subplots.AxesSubplot at 0x2365f40e780>
```

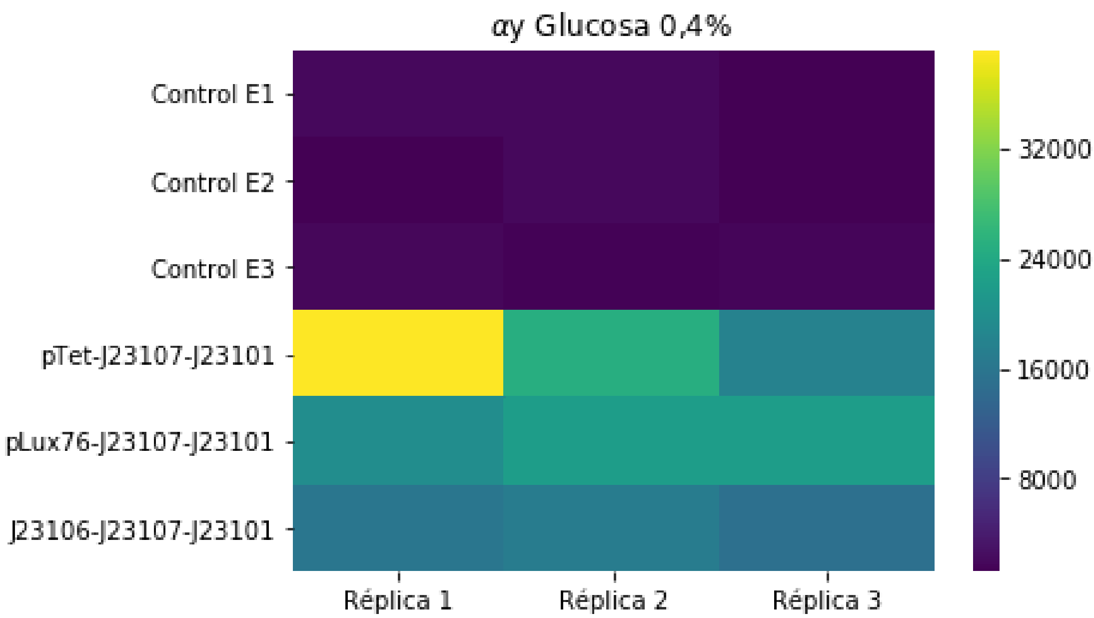


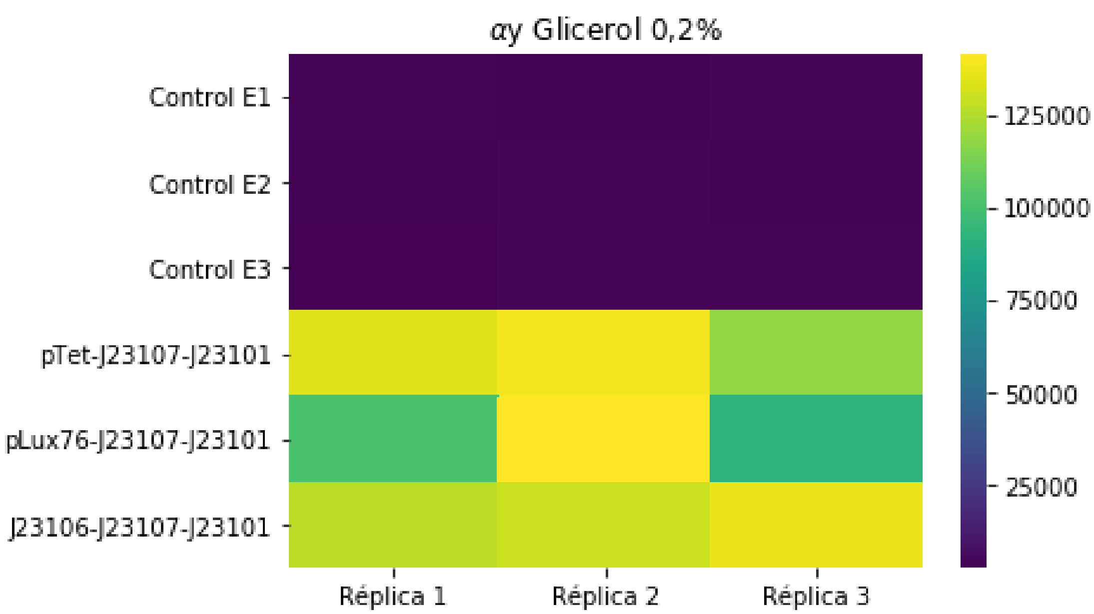



```
In [74]: xlabel=['Réplica 1','Réplica 2','Réplica 3']
         ylabel=['Control E1','Control E2','Control E3','pTet-J23107-J23101','pLux76-J23107-J231

         plt.figure()
         plt.title(r'$\alpha$y Glucosa 0,4%')
```

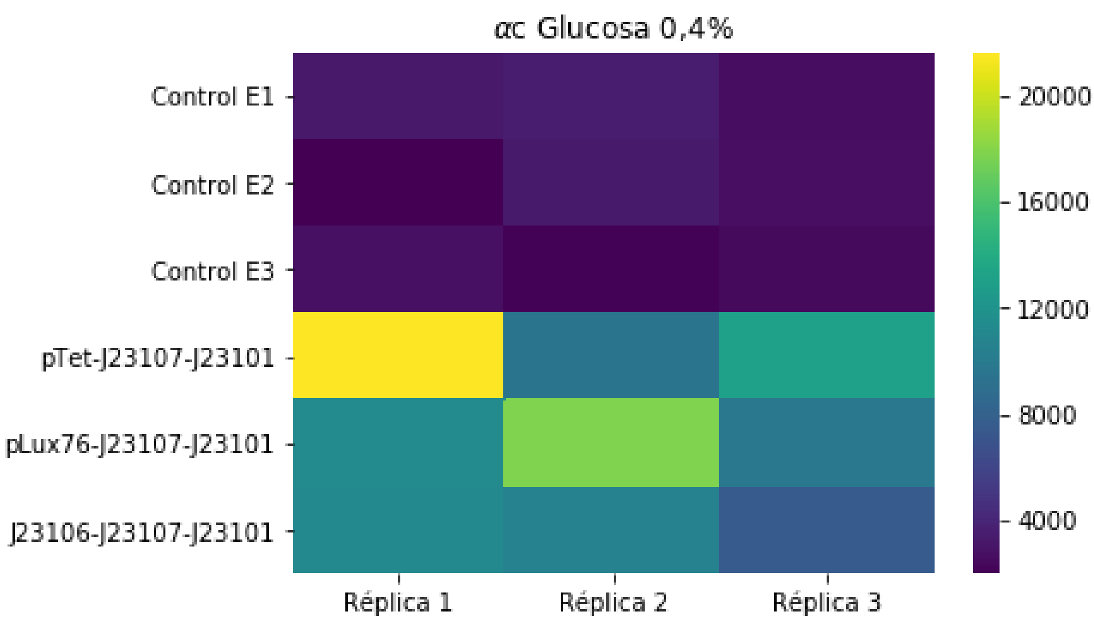
```
sns.heatmap(yglu,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)

plt.figure()
plt.title(r'$\alpha$y Glicerol 0,2%')
sns.heatmap(ygli,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)
```

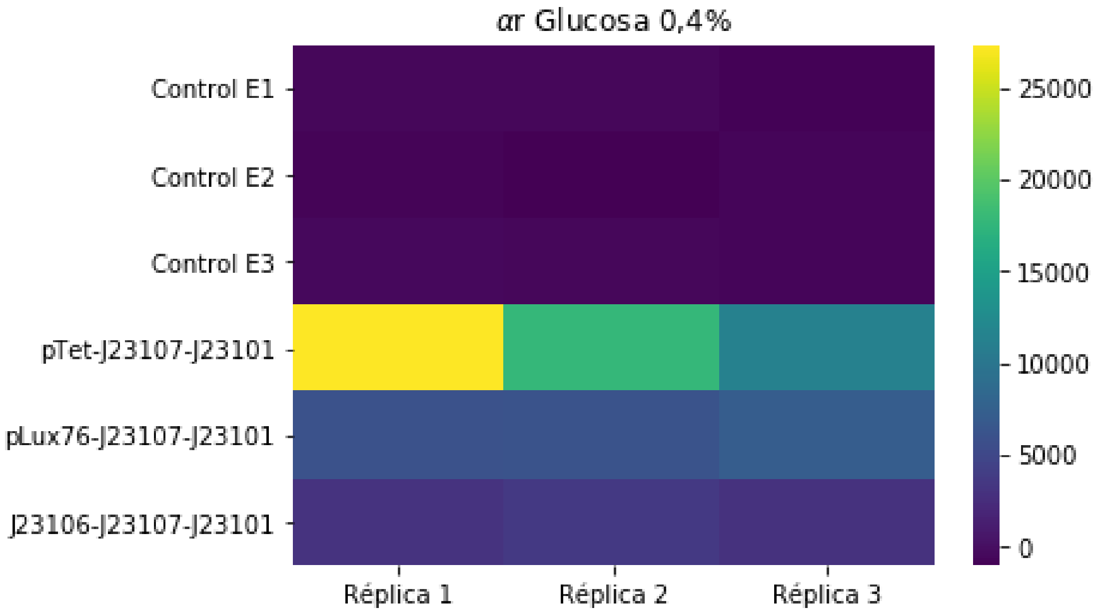
Out[74]: <matplotlib.axes._subplots.AxesSubplot at 0x2365c75bfd0>

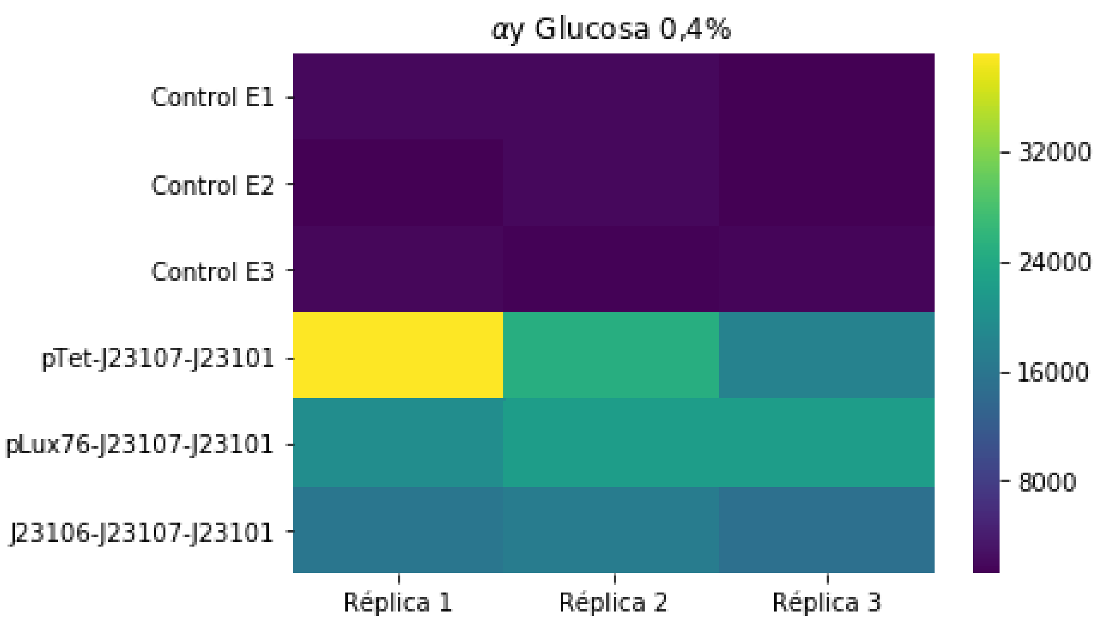




```
In [75]: xlabel=['Réplica 1','Réplica 2','Réplica 3']
         ylabel=['Control E1','Control E2','Control E3','pTet-J23107-J23101','pLux76-J23107-J231

         plt.figure()
         plt.title(r'$\alpha$c Glucosa 0,4%')
         sns.heatmap(cglu,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)
         plt.figure()
         plt.title(r'$\alpha$r Glucosa 0,4%')
         sns.heatmap(rglu,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)
         plt.figure()
         plt.title(r'$\alpha$y Glucosa 0,4%')
         sns.heatmap(yglu,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)

Out[75]: <matplotlib.axes._subplots.AxesSubplot at 0x2365f5dd278>
```



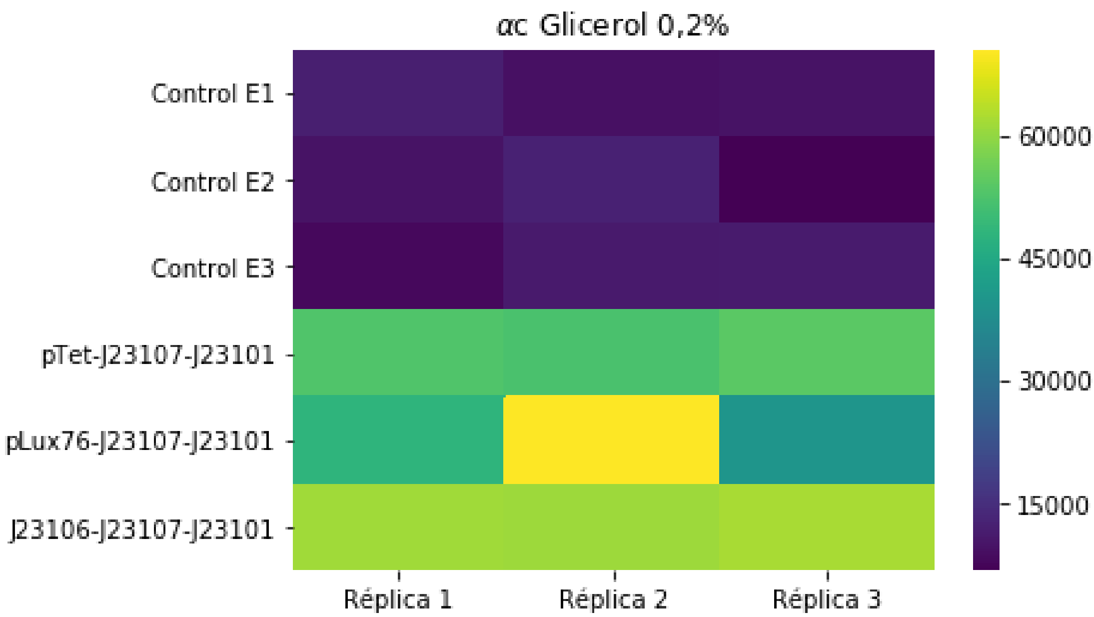


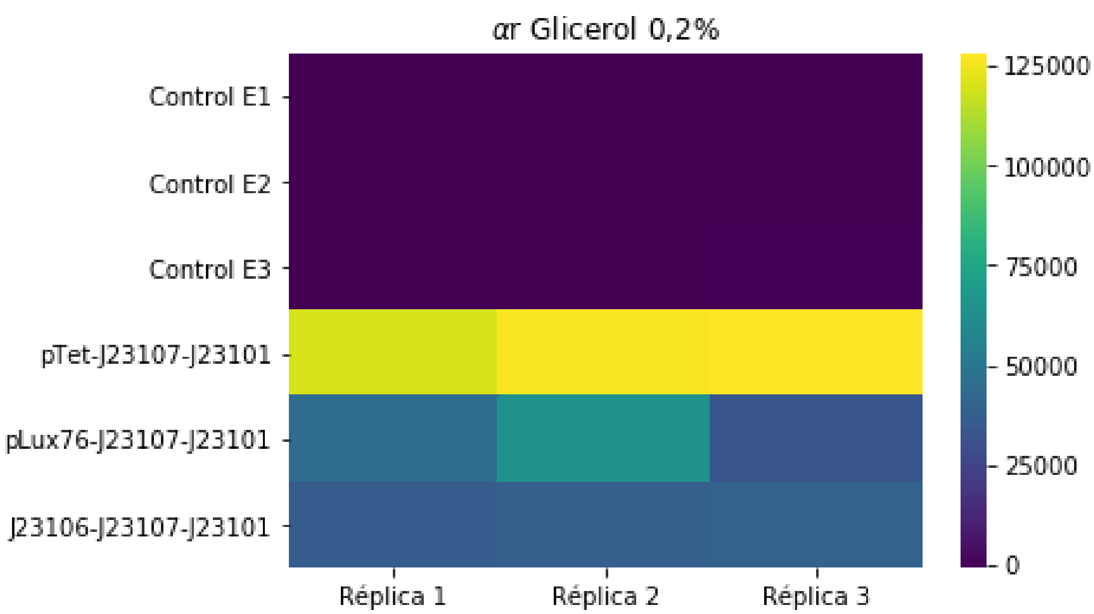


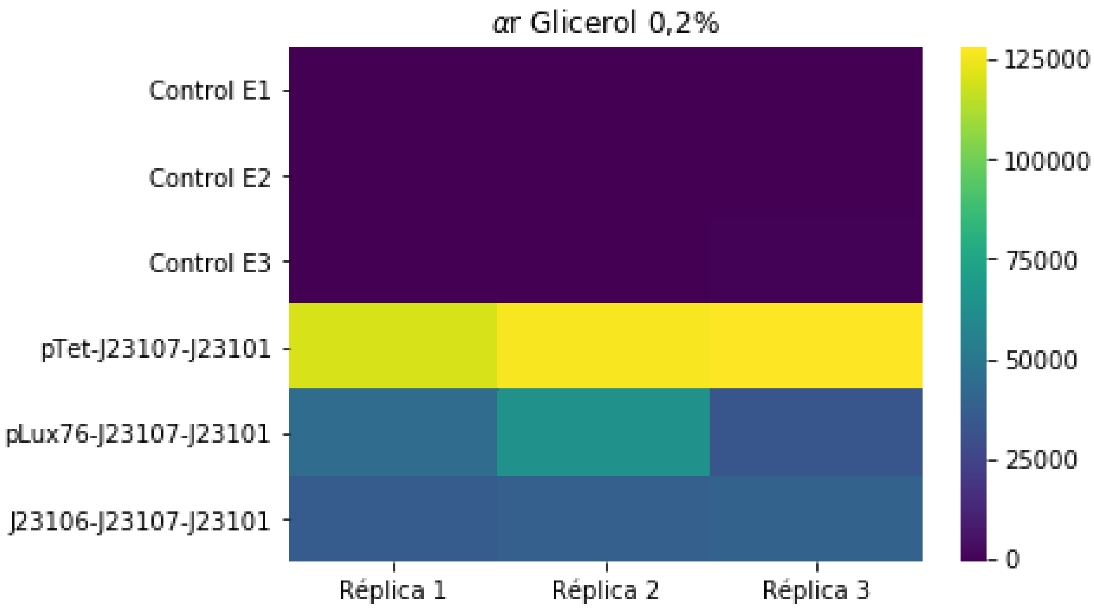

```
In [76]: xlabel=['Réplica 1','Réplica 2','Réplica 3']
         ylabel=['Control E1','Control E2','Control E3','pTet-J23107-J23101','pLux76-J23107-J231

         plt.figure()
         plt.title(r'$\alpha$c Glicerol 0,2%')
```

```
sns.heatmap(cgli,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)
plt.figure()
plt.title(r'$\alpha$r Glicerol 0,2%')
sns.heatmap(rgli,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)
plt.figure()
plt.title(r'$\alpha$r Glicerol 0,2%')
sns.heatmap(rgli,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)
```

```
Out[76]: <matplotlib.axes._subplots.AxesSubplot at 0x2365f4d75f8>
```



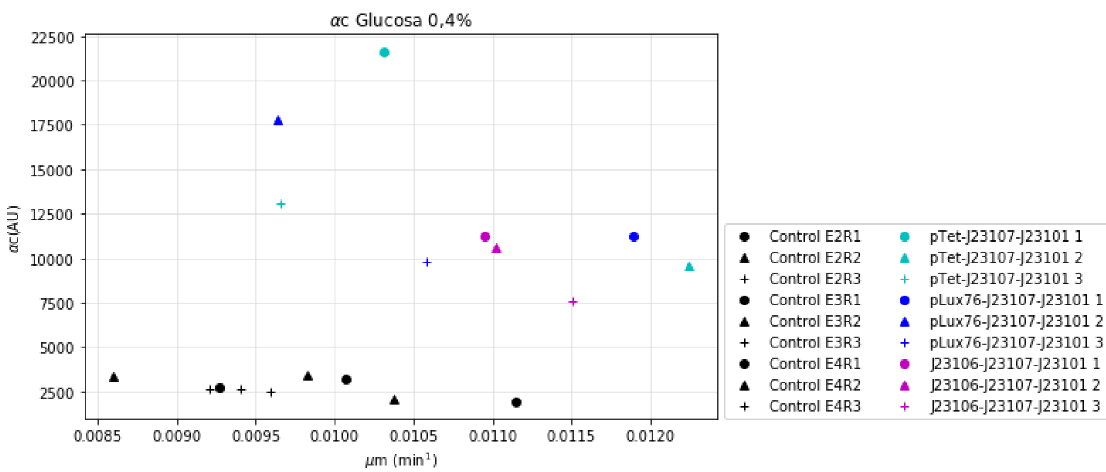


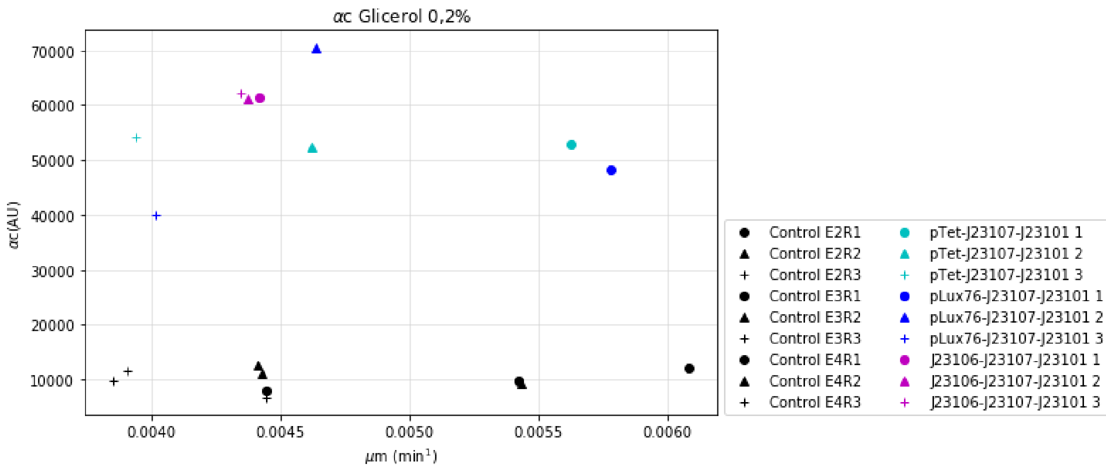


In [157]:
```
#grafico de ac versus Um
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$c Glucosa 0,4%')
plt.xlabel(r'$\mu$m (min$^1$)')
plt.ylabel(r'$\alpha$c(AU)')
plt.plot(um1,slopec1,'ko',label='Control E2R1')
plt.plot(um2,slopec2,'k^',label='Control E2R2')
plt.plot(um3,slopec3,'k+',label='Control E2R3')
plt.plot(um7,slopec7,'ko',label='Control E3R1')
plt.plot(um8,slopec8,'k^',label='Control E3R2')
plt.plot(um9,slopec9,'k+',label='Control E3R3')
plt.plot(um13,slopec13,'ko',label='Control E4R1')
plt.plot(um14,slopec14,'k^',label='Control E4R2')
plt.plot(um15,slopec15,'k+',label='Control E4R3')
plt.plot(um19,slopec19,'co',label='pTet-J23107-J23101 1')
plt.plot(um20,slopec20,'c^',label='pTet-J23107-J23101 2')
plt.plot(um21,slopec21,'c+',label='pTet-J23107-J23101 3')
plt.plot(um25,slopec25,'bo',label='pLux76-J23107-J23101 1')
plt.plot(um26,slopec26,'b^',label='pLux76-J23107-J23101 2')
plt.plot(um27,slopec27,'b+',label='pLux76-J23107-J23101 3')
plt.plot(um31,slopec31,'mo',label='J23106-J23107-J23101 1')
plt.plot(um32,slopec32,'m^',label='J23106-J23107-J23101 2')
plt.plot(um33,slopec33,'m+',label='J23106-J23107-J23101 3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
```

```python
plt.legend(loc=(1.01,0.0),ncol=2)

#grafico de ac versus Um
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$c Glicerol 0,2%')
plt.xlabel(r'$\mu$m (min$^1$)')
plt.ylabel(r'$\alpha$c(AU)')
plt.plot(um4,slopec4,'ko',label='Control E2R1')
plt.plot(um5,slopec5,'k^',label='Control E2R2')
plt.plot(um6,slopec6,'k+',label='Control E2R3')
plt.plot(um10,slopec10,'ko',label='Control E3R1')
plt.plot(um11,slopec11,'k^',label='Control E3R2')
plt.plot(um12,slopec12,'k+',label='Control E3R3')
plt.plot(um16,slopec16,'ko',label='Control E4R1')
plt.plot(um17,slopec17,'k^',label='Control E4R2')
plt.plot(um18,slopec18,'k+',label='Control E4R3')
plt.plot(um22,slopec22,'co',label='pTet-J23107-J23101 1')
plt.plot(um23,slopec23,'c^',label='pTet-J23107-J23101 2')
plt.plot(um24,slopec24,'c+',label='pTet-J23107-J23101 3')
plt.plot(um28,slopec28,'bo',label='pLux76-J23107-J23101 1')
plt.plot(um29,slopec29,'b^',label='pLux76-J23107-J23101 2')
plt.plot(um30,slopec30,'b+',label='pLux76-J23107-J23101 3')
plt.plot(um34,slopec34,'mo',label='J23106-J23107-J23101 1')
plt.plot(um35,slopec35,'m^',label='J23106-J23107-J23101 2')
plt.plot(um36,slopec36,'m+',label='J23106-J23107-J23101 3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

Out[157]: <matplotlib.legend.Legend at 0x2366c2acda0>

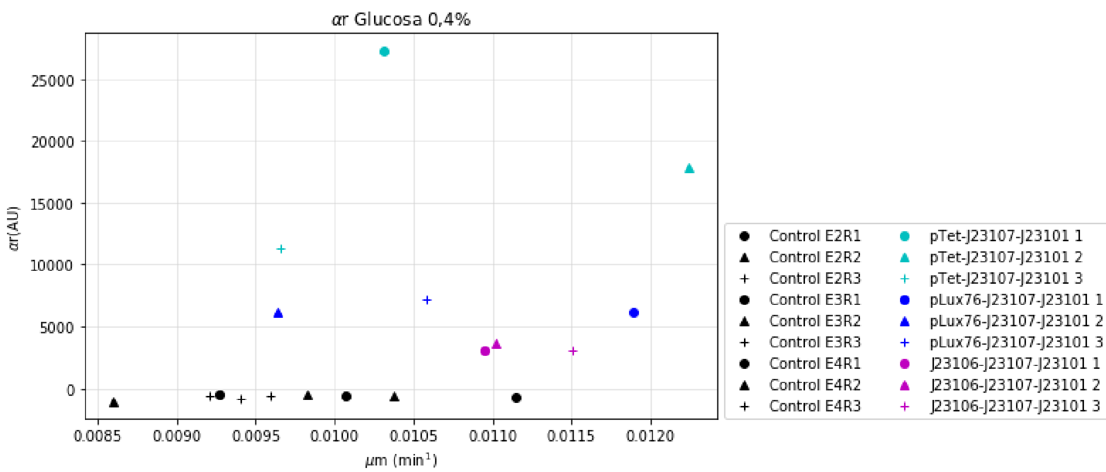


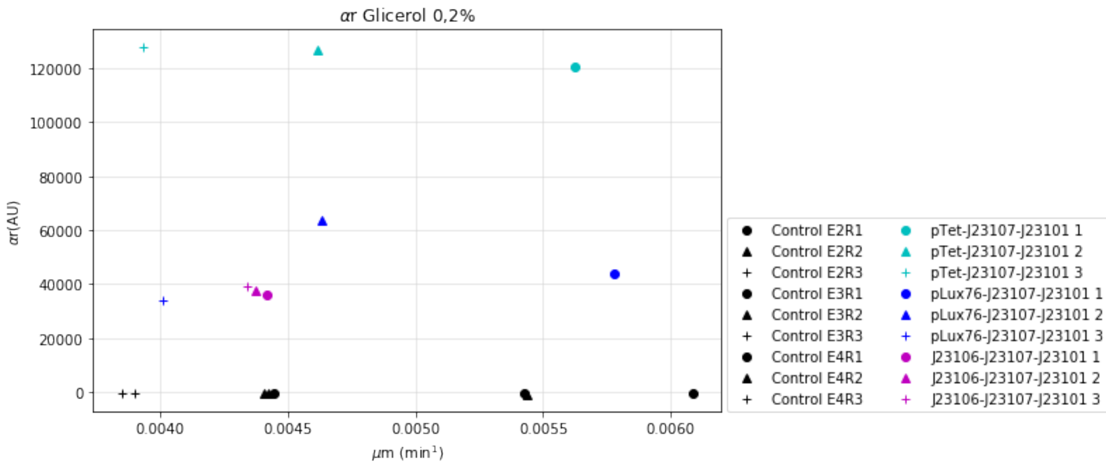


In [158]:
```
#grafico de ac versus Um
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$r Glucosa 0,4%')
plt.xlabel(r'$\mu$m (min$^1$)')
plt.ylabel(r'$\alpha$r(AU)')
plt.plot(um1,sloper1,'ko',label='Control E2R1')
plt.plot(um2,sloper2,'k^',label='Control E2R2')
plt.plot(um3,sloper3,'k+',label='Control E2R3')
plt.plot(um7,sloper7,'ko',label='Control E3R1')
plt.plot(um8,sloper8,'k^',label='Control E3R2')
plt.plot(um9,sloper9,'k+',label='Control E3R3')
plt.plot(um13,sloper13,'ko',label='Control E4R1')
plt.plot(um14,sloper14,'k^',label='Control E4R2')
plt.plot(um15,sloper15,'k+',label='Control E4R3')
plt.plot(um19,sloper19,'co',label='pTet-J23107-J23101 1')
plt.plot(um20,sloper20,'c^',label='pTet-J23107-J23101 2')
plt.plot(um21,sloper21,'c+',label='pTet-J23107-J23101 3')
plt.plot(um25,sloper25,'bo',label='pLux76-J23107-J23101 1')
plt.plot(um26,sloper26,'b^',label='pLux76-J23107-J23101 2')
plt.plot(um27,sloper27,'b+',label='pLux76-J23107-J23101 3')
plt.plot(um31,sloper31,'mo',label='J23106-J23107-J23101 1')
plt.plot(um32,sloper32,'m^',label='J23106-J23107-J23101 2')
plt.plot(um33,sloper33,'m+',label='J23106-J23107-J23101 3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)

#grafico de ac versus Um
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$r Glicerol 0,2%')
plt.xlabel(r'$\mu$m (min$^1$)')
plt.ylabel(r'$\alpha$r(AU)')
```

```
plt.plot(um4,sloper4,'ko',label='Control E2R1')
plt.plot(um5,sloper5,'k^',label='Control E2R2')
plt.plot(um6,sloper6,'k+',label='Control E2R3')
plt.plot(um10,sloper10,'ko',label='Control E3R1')
plt.plot(um11,sloper11,'k^',label='Control E3R2')
plt.plot(um12,sloper12,'k+',label='Control E3R3')
plt.plot(um16,sloper16,'ko',label='Control E4R1')
plt.plot(um17,sloper17,'k^',label='Control E4R2')
plt.plot(um18,sloper18,'k+',label='Control E4R3')
plt.plot(um22,sloper22,'co',label='pTet-J23107-J23101 1')
plt.plot(um23,sloper23,'c^',label='pTet-J23107-J23101 2')
plt.plot(um24,sloper24,'c+',label='pTet-J23107-J23101 3')
plt.plot(um28,sloper28,'bo',label='pLux76-J23107-J23101 1')
plt.plot(um29,sloper29,'b^',label='pLux76-J23107-J23101 2')
plt.plot(um30,sloper30,'b+',label='pLux76-J23107-J23101 3')
plt.plot(um34,sloper34,'mo',label='J23106-J23107-J23101 1')
plt.plot(um35,sloper35,'m^',label='J23106-J23107-J23101 2')
plt.plot(um36,sloper36,'m+',label='J23106-J23107-J23101 3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

```
Out[158]: <matplotlib.legend.Legend at 0x2366c7ccac8>
```

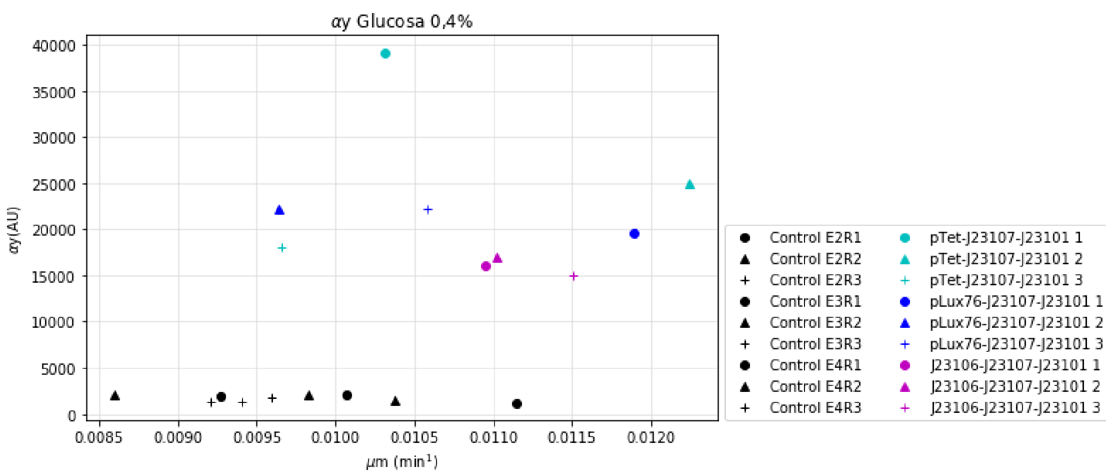


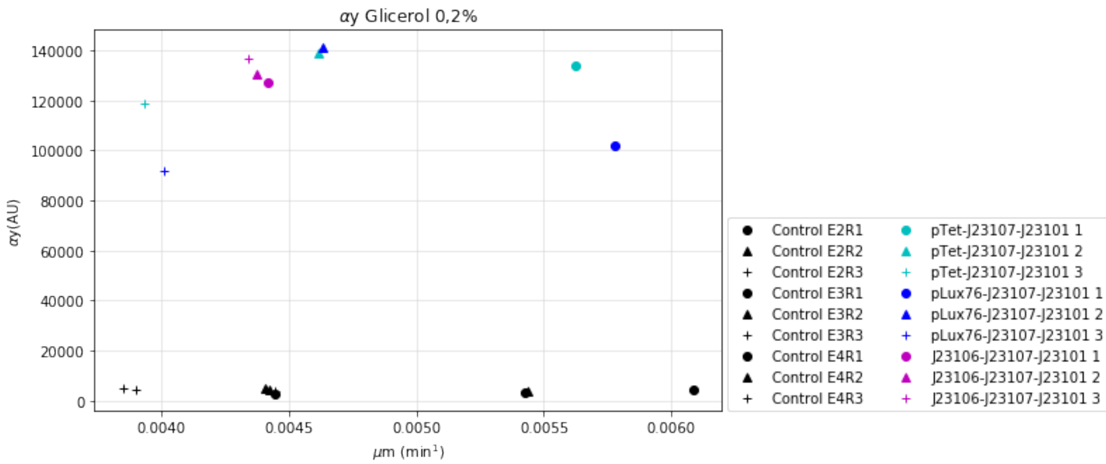


In [155]:
```
#grafico de ac versus Um
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$y Glucosa 0,4%')
plt.xlabel(r'$\mu$m (min$^1$)')
plt.ylabel(r'$\alpha$y(AU)')
plt.plot(um1,slopey1,'ko',label='Control E2R1')
plt.plot(um2,slopey2,'k^',label='Control E2R2')
plt.plot(um3,slopey3,'k+',label='Control E2R3')
plt.plot(um7,slopey7,'ko',label='Control E3R1')
plt.plot(um8,slopey8,'k^',label='Control E3R2')
plt.plot(um9,slopey9,'k+',label='Control E3R3')
plt.plot(um13,slopey13,'ko',label='Control E4R1')
plt.plot(um14,slopey14,'k^',label='Control E4R2')
plt.plot(um15,slopey15,'k+',label='Control E4R3')
plt.plot(um19,slopey19,'co',label='pTet-J23107-J23101 1')
plt.plot(um20,slopey20,'c^',label='pTet-J23107-J23101 2')
plt.plot(um21,slopey21,'c+',label='pTet-J23107-J23101 3')
plt.plot(um25,slopey25,'bo',label='pLux76-J23107-J23101 1')
plt.plot(um26,slopey26,'b^',label='pLux76-J23107-J23101 2')
plt.plot(um27,slopey27,'b+',label='pLux76-J23107-J23101 3')
plt.plot(um31,slopey31,'mo',label='J23106-J23107-J23101 1')
plt.plot(um32,slopey32,'m^',label='J23106-J23107-J23101 2')
plt.plot(um33,slopey33,'m+',label='J23106-J23107-J23101 3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)

#grafico de ac versus Um
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$y Glicerol 0,2%')
plt.xlabel(r'$\mu$m (min$^1$)')
plt.ylabel(r'$\alpha$y(AU)')
```

```
plt.plot(um4,slopey4,'ko',label='Control E2R1')
plt.plot(um5,slopey5,'k^',label='Control E2R2')
plt.plot(um6,slopey6,'k+',label='Control E2R3')
plt.plot(um10,slopey10,'ko',label='Control E3R1')
plt.plot(um11,slopey11,'k^',label='Control E3R2')
plt.plot(um12,slopey12,'k+',label='Control E3R3')
plt.plot(um16,slopey16,'ko',label='Control E4R1')
plt.plot(um17,slopey17,'k^',label='Control E4R2')
plt.plot(um18,slopey18,'k+',label='Control E4R3')
plt.plot(um22,slopey22,'co',label='pTet-J23107-J23101 1')
plt.plot(um23,slopey23,'c^',label='pTet-J23107-J23101 2')
plt.plot(um24,slopey24,'c+',label='pTet-J23107-J23101 3')
plt.plot(um28,slopey28,'bo',label='pLux76-J23107-J23101 1')
plt.plot(um29,slopey29,'b^',label='pLux76-J23107-J23101 2')
plt.plot(um30,slopey30,'b+',label='pLux76-J23107-J23101 3')
plt.plot(um34,slopey34,'mo',label='J23106-J23107-J23101 1')
plt.plot(um35,slopey35,'m^',label='J23106-J23107-J23101 2')
plt.plot(um36,slopey36,'m+',label='J23106-J23107-J23101 3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

Out[155]: <matplotlib.legend.Legend at 0x236683b29e8>

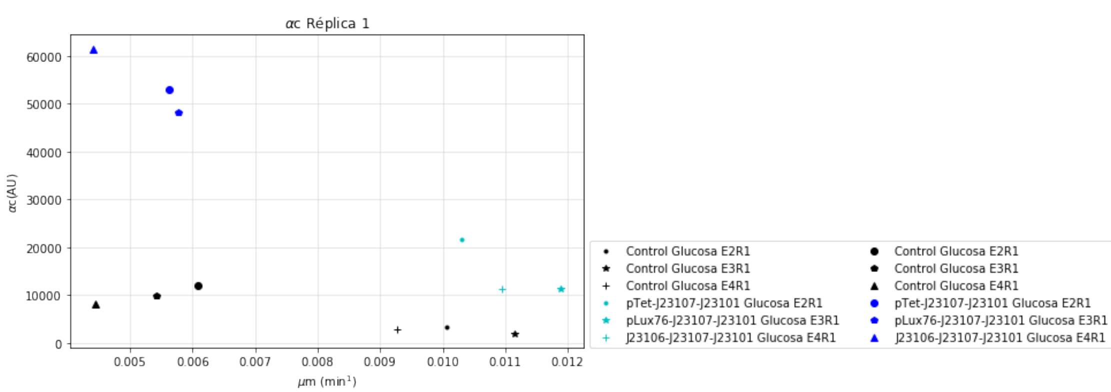


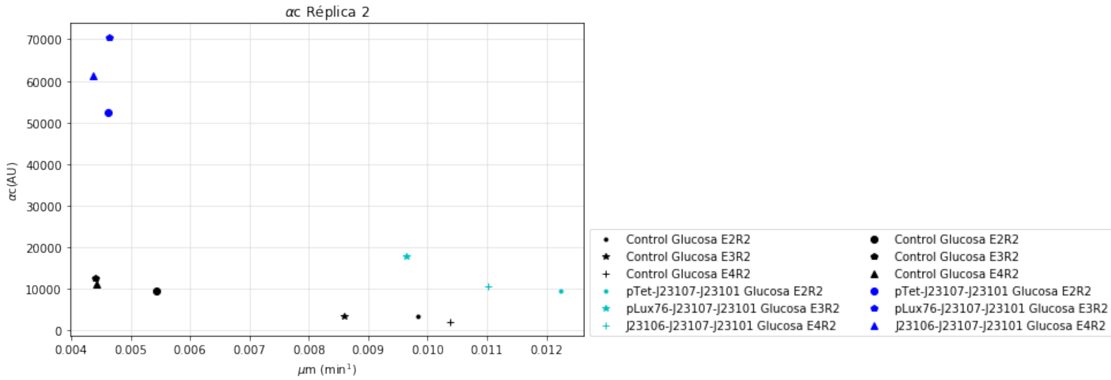


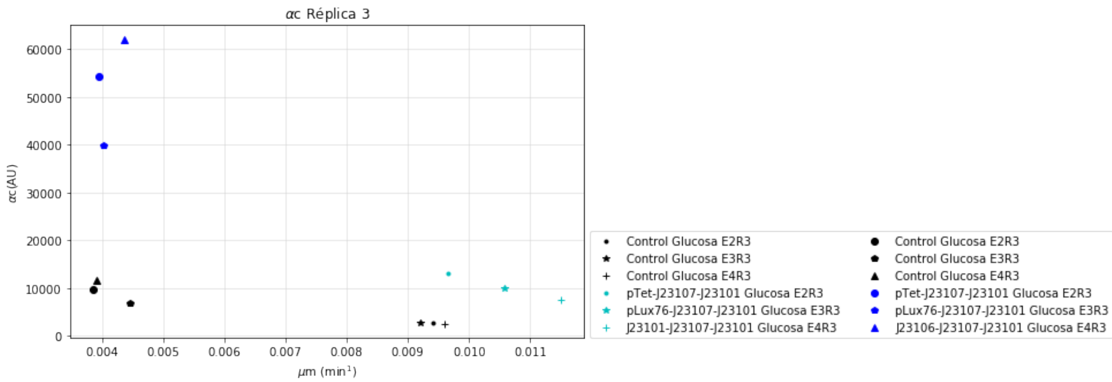

```
In [80]: #grafico de ac versus Um
         plt.figure(figsize=(8,5))
         plt.title(r'$\alpha$c Réplica 1')
         plt.xlabel(r'$\mu$m (min$^1$)')
         plt.ylabel(r'$\alpha$c(AU)')
         plt.plot(um1,slopec1,'k.',label='Control Glucosa E2R1')
         plt.plot(um7,slopec7,'k*',label='Control Glucosa E3R1')
         plt.plot(um13,slopec13,'k+',label='Control Glucosa E4R1')
         plt.plot(um19,slopec19,'c.',label='pTet-J23107-J23101 Glucosa E2R1')
         plt.plot(um25,slopec25,'c*',label='pLux76-J23107-J23101 Glucosa E3R1')
         plt.plot(um31,slopec31,'c+',label='J23106-J23107-J23101 Glucosa E4R1')
         plt.plot(um4,slopec4,'ko',label='Control Glucosa E2R1')
         plt.plot(um10,slopec10,'kp',label='Control Glucosa E3R1')
         plt.plot(um16,slopec16,'k^',label='Control Glucosa E4R1')
         plt.plot(um22,slopec22,'bo',label='pTet-J23107-J23101 Glucosa E2R1')
         plt.plot(um28,slopec28,'bp',label='pLux76-J23107-J23101 Glucosa E3R1')
         plt.plot(um34,slopec34,'b^',label='J23106-J23107-J23101 Glucosa E4R1')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
         plt.legend(loc=(1.01,0.0),ncol=2)

         #grafico de ac versus Um
         plt.figure(figsize=(8,5))
         plt.title(r'$\alpha$c Réplica 2')
         plt.xlabel(r'$\mu$m (min$^1$)')
         plt.ylabel(r'$\alpha$c(AU)')
         plt.plot(um2,slopec2,'k.',label='Control Glucosa E2R2')
         plt.plot(um8,slopec8,'k*',label='Control Glucosa E3R2')
         plt.plot(um14,slopec14,'k+',label='Control Glucosa E4R2')
         plt.plot(um20,slopec20,'c.',label='pTet-J23107-J23101 Glucosa E2R2')
         plt.plot(um26,slopec26,'c*',label='pLux76-J23107-J23101 Glucosa E3R2')
         plt.plot(um32,slopec32,'c+',label='J23106-J23107-J23101 Glucosa E4R2')
```

```python
plt.plot(um5,slopec5,'ko',label='Control Glucosa E2R2')
plt.plot(um11,slopec11,'kp',label='Control Glucosa E3R2')
plt.plot(um17,slopec17,'k^',label='Control Glucosa E4R2')
plt.plot(um23,slopec23,'bo',label='pTet-J23107-J23101 Glucosa E2R2')
plt.plot(um29,slopec29,'bp',label='pLux76-J23107-J23101 Glucosa E3R2')
plt.plot(um35,slopec35,'b^',label='J23106-J23107-J23101 Glucosa E4R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)

#grafico de ac versus Um
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$c Réplica 3')
plt.xlabel(r'$\mu$m (min$^1$)')
plt.ylabel(r'$\alpha$c(AU)')
plt.plot(um3,slopec3,'k.',label='Control Glucosa E2R3')
plt.plot(um9,slopec9,'k*',label='Control Glucosa E3R3')
plt.plot(um15,slopec15,'k+',label='Control Glucosa E4R3')
plt.plot(um21,slopec21,'c.',label='pTet-J23107-J23101 Glucosa E2R3')
plt.plot(um27,slopec27,'c*',label='pLux76-J23107-J23101 Glucosa E3R3')
plt.plot(um33,slopec33,'c+',label='J23101-J23107-J23101 Glucosa E4R3')
plt.plot(um6,slopec6,'ko',label='Control Glucosa E2R3')
plt.plot(um12,slopec12,'kp',label='Control Glucosa E3R3')
plt.plot(um18,slopec18,'k^',label='Control Glucosa E4R3')
plt.plot(um24,slopec24,'bo',label='pTet-J23107-J23101 Glucosa E2R3')
plt.plot(um30,slopec30,'bp',label='pLux76-J23107-J23101 Glucosa E3R3')
plt.plot(um36,slopec36,'b^',label='J23106-J23107-J23101 Glucosa E4R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

Out[80]: <matplotlib.legend.Legend at 0x23661253c88>



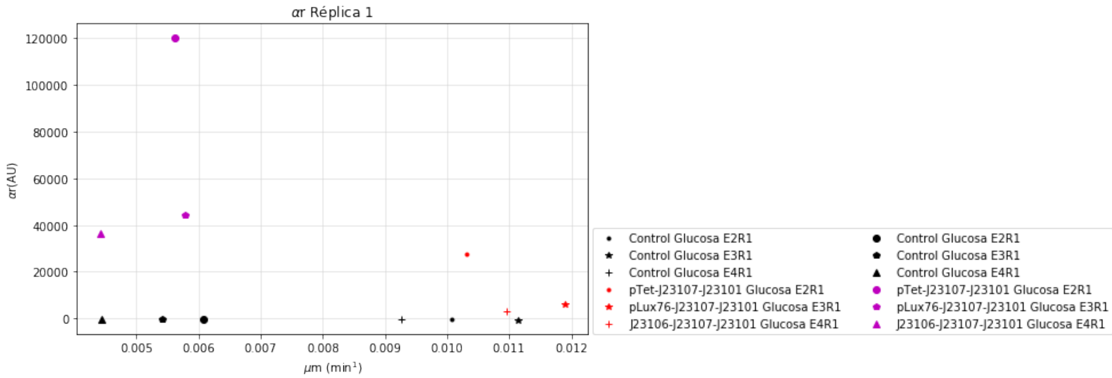


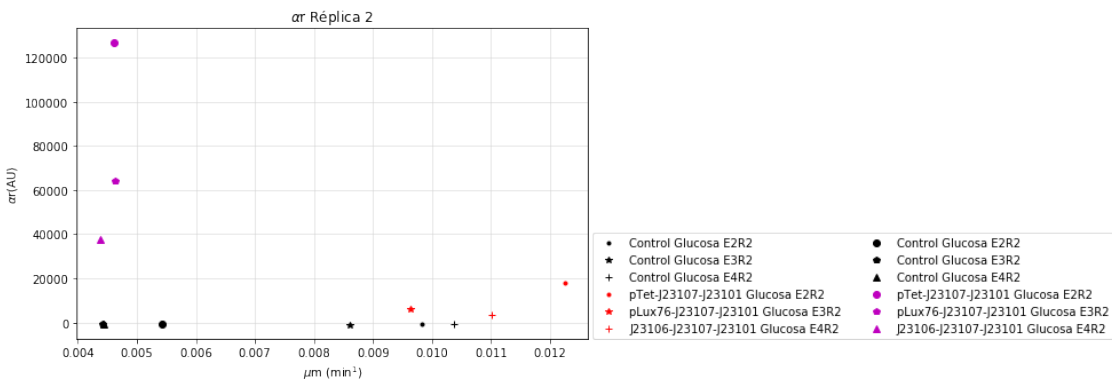


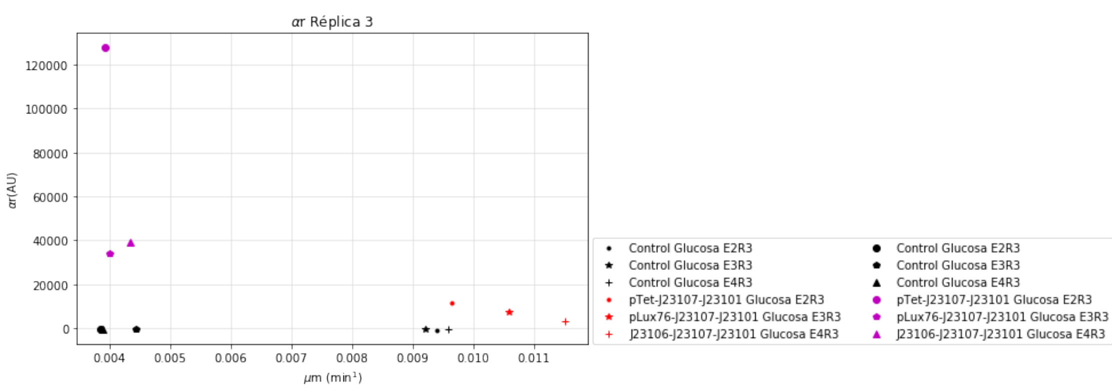

```
In [81]: #grafico de ar versus Um
         plt.figure(figsize=(8,5))
         plt.title(r'$\alpha$r Réplica 1')
         plt.xlabel(r'$\mu$m (min$^1$)')
         plt.ylabel(r'$\alpha$r(AU)')
         plt.plot(um1,sloper1,'k.',label='Control Glucosa E2R1')
         plt.plot(um7,sloper7,'k*',label='Control Glucosa E3R1')
         plt.plot(um13,sloper13,'k+',label='Control Glucosa E4R1')
         plt.plot(um19,sloper19,'r.',label='pTet-J23107-J23101 Glucosa E2R1')
         plt.plot(um25,sloper25,'r*',label='pLux76-J23107-J23101 Glucosa E3R1')
         plt.plot(um31,sloper31,'r+',label='J23106-J23107-J23101 Glucosa E4R1')
         plt.plot(um4,sloper4,'ko',label='Control Glucosa E2R1')
         plt.plot(um10,sloper10,'kp',label='Control Glucosa E3R1')
         plt.plot(um16,sloper16,'k^',label='Control Glucosa E4R1')
         plt.plot(um22,sloper22,'mo',label='pTet-J23107-J23101 Glucosa E2R1')
         plt.plot(um28,sloper28,'mp',label='pLux76-J23107-J23101 Glucosa E3R1')
         plt.plot(um34,sloper34,'m^',label='J23106-J23107-J23101 Glucosa E4R1')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
         plt.legend(loc=(1.01,0.0),ncol=2)
```

```python
#grafico de ar versus Um
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$r Réplica 2')
plt.xlabel(r'$\mu$m (min$^1$)')
plt.ylabel(r'$\alpha$r(AU)')
plt.plot(um2,sloper2,'k.',label='Control Glucosa E2R2')
plt.plot(um8,sloper8,'k*',label='Control Glucosa E3R2')
plt.plot(um14,sloper14,'k+',label='Control Glucosa E4R2')
plt.plot(um20,sloper20,'r.',label='pTet-J23107-J23101 Glucosa E2R2')
plt.plot(um26,sloper26,'r*',label='pLux76-J23107-J23101 Glucosa E3R2')
plt.plot(um32,sloper32,'r+',label='J23106-J23107-J23101 Glucosa E4R2')
plt.plot(um5,sloper5,'ko',label='Control Glucosa E2R2')
plt.plot(um11,sloper11,'kp',label='Control Glucosa E3R2')
plt.plot(um17,sloper17,'k^',label='Control Glucosa E4R2')
plt.plot(um23,sloper23,'mo',label='pTet-J23107-J23101 Glucosa E2R2')
plt.plot(um29,sloper29,'mp',label='pLux76-J23107-J23101 Glucosa E3R2')
plt.plot(um35,sloper35,'m^',label='J23106-J23107-J23101 Glucosa E4R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)

#grafico de ar versus Um
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$r Réplica 3')
plt.xlabel(r'$\mu$m (min$^1$)')
plt.ylabel(r'$\alpha$r(AU)')
plt.plot(um3,sloper3,'k.',label='Control Glucosa E2R3')
plt.plot(um9,sloper9,'k*',label='Control Glucosa E3R3')
plt.plot(um15,sloper15,'k+',label='Control Glucosa E4R3')
plt.plot(um21,sloper21,'r.',label='pTet-J23107-J23101 Glucosa E2R3')
plt.plot(um27,sloper27,'r*',label='pLux76-J23107-J23101 Glucosa E3R3')
plt.plot(um33,sloper33,'r+',label='J23106-J23107-J23101 Glucosa E4R3')
plt.plot(um6,sloper6,'ko',label='Control Glucosa E2R3')
plt.plot(um12,sloper12,'kp',label='Control Glucosa E3R3')
plt.plot(um18,sloper18,'k^',label='Control Glucosa E4R3')
plt.plot(um24,sloper24,'mo',label='pTet-J23107-J23101 Glucosa E2R3')
plt.plot(um30,sloper30,'mp',label='pLux76-J23107-J23101 Glucosa E3R3')
plt.plot(um36,sloper36,'m^',label='J23106-J23107-J23101 Glucosa E4R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

```
Out[81]: <matplotlib.legend.Legend at 0x23662254a58>
```





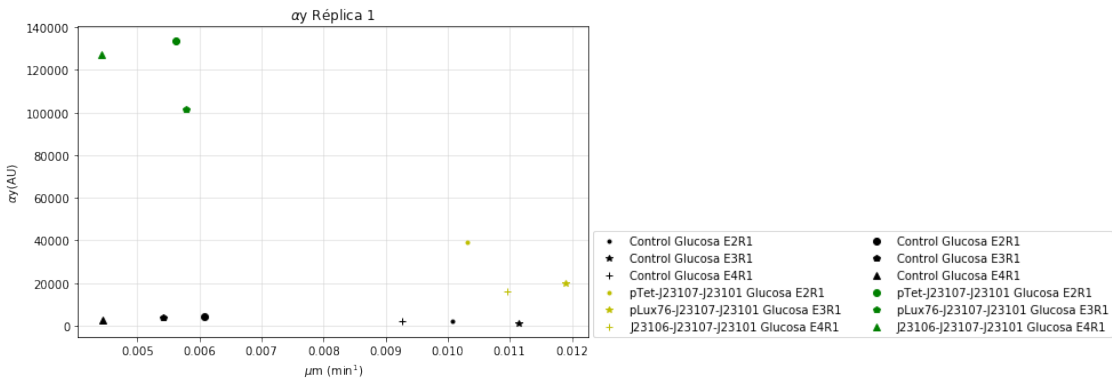


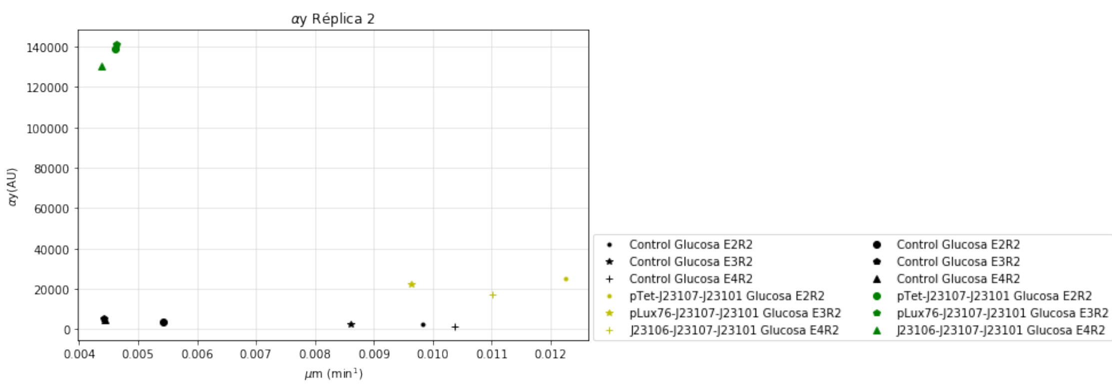

```
In [82]: #grafico de ay versus Um
         plt.figure(figsize=(8,5))
         plt.title(r'$\alpha$y Réplica 1')
         plt.xlabel(r'$\mu$m (min$^1$)')
```

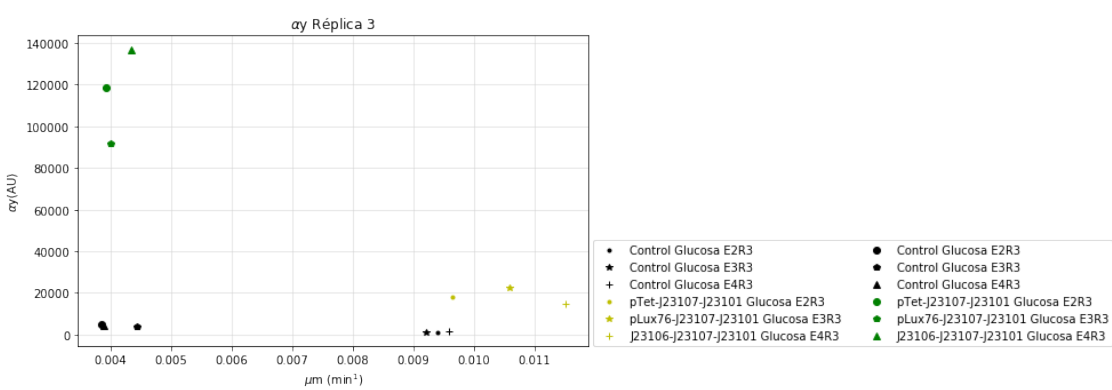
```
plt.ylabel(r'$\alpha$y(AU)')
plt.plot(um1,slopey1,'k.',label='Control Glucosa E2R1')
plt.plot(um7,slopey7,'k*',label='Control Glucosa E3R1')
plt.plot(um13,slopey13,'k+',label='Control Glucosa E4R1')
plt.plot(um19,slopey19,'y.',label='pTet-J23107-J23101 Glucosa E2R1')
plt.plot(um25,slopey25,'y*',label='pLux76-J23107-J23101 Glucosa E3R1')
plt.plot(um31,slopey31,'y+',label='J23106-J23107-J23101 Glucosa E4R1')
plt.plot(um4,slopey4,'ko',label='Control Glucosa E2R1')
plt.plot(um10,slopey10,'kp',label='Control Glucosa E3R1')
plt.plot(um16,slopey16,'k^',label='Control Glucosa E4R1')
plt.plot(um22,slopey22,'go',label='pTet-J23107-J23101 Glucosa E2R1')
plt.plot(um28,slopey28,'gp',label='pLux76-J23107-J23101 Glucosa E3R1')
plt.plot(um34,slopey34,'g^',label='J23106-J23107-J23101 Glucosa E4R1')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)

#grafico de ay versus Um
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$y Réplica 2')
plt.xlabel(r'$\mu$m (min$^1$)')
plt.ylabel(r'$\alpha$y(AU)')
plt.plot(um2,slopey2,'k.',label='Control Glucosa E2R2')
plt.plot(um8,slopey8,'k*',label='Control Glucosa E3R2')
plt.plot(um14,slopey14,'k+',label='Control Glucosa E4R2')
plt.plot(um20,slopey20,'y.',label='pTet-J23107-J23101 Glucosa E2R2')
plt.plot(um26,slopey26,'y*',label='pLux76-J23107-J23101 Glucosa E3R2')
plt.plot(um32,slopey32,'y+',label='J23106-J23107-J23101 Glucosa E4R2')
plt.plot(um5,slopey5,'ko',label='Control Glucosa E2R2')
plt.plot(um11,slopey11,'kp',label='Control Glucosa E3R2')
plt.plot(um17,slopey17,'k^',label='Control Glucosa E4R2')
plt.plot(um23,slopey23,'go',label='pTet-J23107-J23101 Glucosa E2R2')
plt.plot(um29,slopey29,'gp',label='pLux76-J23107-J23101 Glucosa E3R2')
plt.plot(um35,slopey35,'g^',label='J23106-J23107-J23101 Glucosa E4R2')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)

#grafico de ay  versus Um
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$y Réplica 3')
plt.xlabel(r'$\mu$m (min$^1$)')
plt.ylabel(r'$\alpha$y(AU)')
plt.plot(um3,slopey3,'k.',label='Control Glucosa E2R3')
plt.plot(um9,slopey9,'k*',label='Control Glucosa E3R3')
plt.plot(um15,slopey15,'k+',label='Control Glucosa E4R3')
plt.plot(um21,slopey21,'y.',label='pTet-J23107-J23101 Glucosa E2R3')
plt.plot(um27,slopey27,'y*',label='pLux76-J23107-J23101 Glucosa E3R3')
plt.plot(um33,slopey33,'y+',label='J23106-J23107-J23101 Glucosa E4R3')
plt.plot(um6,slopey6,'ko',label='Control Glucosa E2R3')
```

```
plt.plot(um12,slopey12,'kp',label='Control Glucosa E3R3')
plt.plot(um18,slopey18,'k^',label='Control Glucosa E4R3')
plt.plot(um24,slopey24,'go',label='pTet-J23107-J23101 Glucosa E2R3')
plt.plot(um30,slopey30,'gp',label='pLux76-J23107-J23101 Glucosa E3R3')
plt.plot(um36,slopey36,'g^',label='J23106-J23107-J23101 Glucosa E4R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

Out[82]: <matplotlib.legend.Legend at 0x23662a24e10>



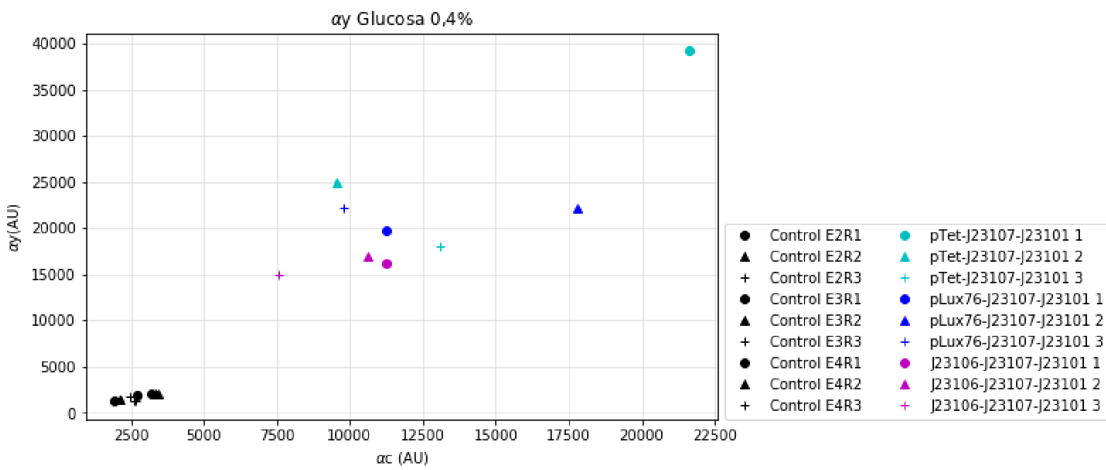


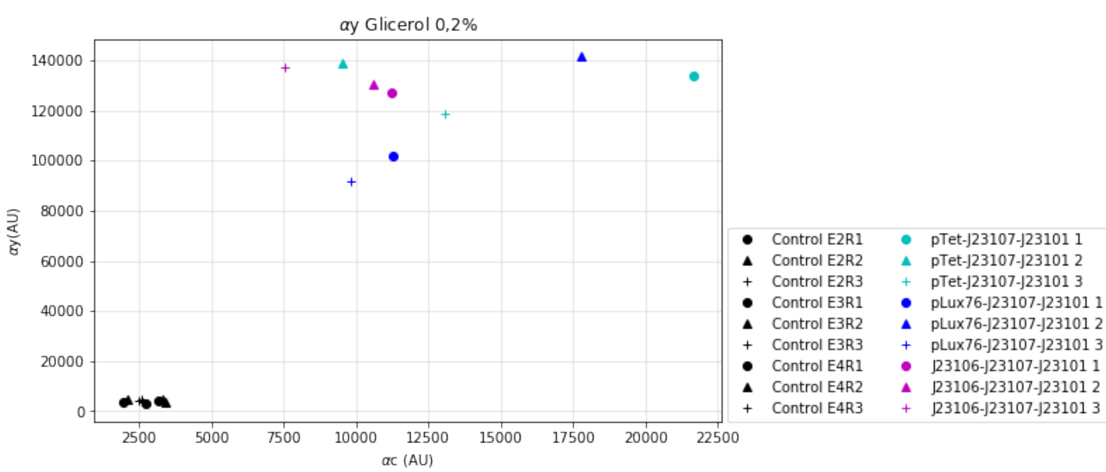


```
In [83]: #grafico de ar vs ac
         plt.figure(figsize=(8,5))
         plt.title(r'$\alpha$y Glucosa 0,4%')
         plt.xlabel(r'$\alpha$c (AU)')
         plt.ylabel(r'$\alpha$y(AU)')
         plt.plot(slopec1,slopey1,'ko',label='Control E2R1')
         plt.plot(slopec2,slopey2,'k^',label='Control E2R2')
         plt.plot(slopec3,slopey3,'k+',label='Control E2R3')
         plt.plot(slopec7,slopey7,'ko',label='Control E3R1')
         plt.plot(slopec8,slopey8,'k^',label='Control E3R2')
         plt.plot(slopec9,slopey9,'k+',label='Control E3R3')
         plt.plot(slopec13,slopey13,'ko',label='Control E4R1')
         plt.plot(slopec14,slopey14,'k^',label='Control E4R2')
         plt.plot(slopec15,slopey15,'k+',label='Control E4R3')
         plt.plot(slopec19,slopey19,'co',label='pTet-J23107-J23101 1')
         plt.plot(slopec20,slopey20,'c^',label='pTet-J23107-J23101 2')
         plt.plot(slopec21,slopey21,'c+',label='pTet-J23107-J23101 3')
         plt.plot(slopec25,slopey25,'bo',label='pLux76-J23107-J23101 1')
         plt.plot(slopec26,slopey26,'b^',label='pLux76-J23107-J23101 2')
         plt.plot(slopec27,slopey27,'b+',label='pLux76-J23107-J23101 3')
         plt.plot(slopec31,slopey31,'mo',label='J23106-J23107-J23101 1')
         plt.plot(slopec32,slopey32,'m^',label='J23106-J23107-J23101 2')
         plt.plot(slopec33,slopey33,'m+',label='J23106-J23107-J23101 3')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
         plt.legend(loc=(1.01,0.0),ncol=2)

         #grafico de ay vs ac
         plt.figure(figsize=(8,5))
         plt.title(r'$\alpha$y Glicerol 0,2%')
         plt.xlabel(r'$\alpha$c (AU)')
         plt.ylabel(r'$\alpha$y(AU)')
         plt.plot(slopec1,slopey4,'ko',label='Control E2R1')
         plt.plot(slopec2,slopey5,'k^',label='Control E2R2')
         plt.plot(slopec3,slopey6,'k+',label='Control E2R3')
         plt.plot(slopec7,slopey10,'ko',label='Control E3R1')
         plt.plot(slopec8,slopey11,'k^',label='Control E3R2')
         plt.plot(slopec9,slopey12,'k+',label='Control E3R3')
         plt.plot(slopec13,slopey16,'ko',label='Control E4R1')
         plt.plot(slopec14,slopey17,'k^',label='Control E4R2')
         plt.plot(slopec15,slopey18,'k+',label='Control E4R3')
         plt.plot(slopec19,slopey22,'co',label='pTet-J23107-J23101 1')
         plt.plot(slopec20,slopey23,'c^',label='pTet-J23107-J23101 2')
         plt.plot(slopec21,slopey24,'c+',label='pTet-J23107-J23101 3')
         plt.plot(slopec25,slopey28,'bo',label='pLux76-J23107-J23101 1')
         plt.plot(slopec26,slopey29,'b^',label='pLux76-J23107-J23101 2')
```

```
plt.plot(slopec27,slopey30,'b+',label='pLux76-J23107-J23101 3')
plt.plot(slopec31,slopey34,'mo',label='J23106-J23107-J23101 1')
plt.plot(slopec32,slopey35,'m^',label='J23106-J23107-J23101 2')
plt.plot(slopec33,slopey36,'m+',label='J23106-J23107-J23101 3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

Out[83]: <matplotlib.legend.Legend at 0x23662ab63c8>

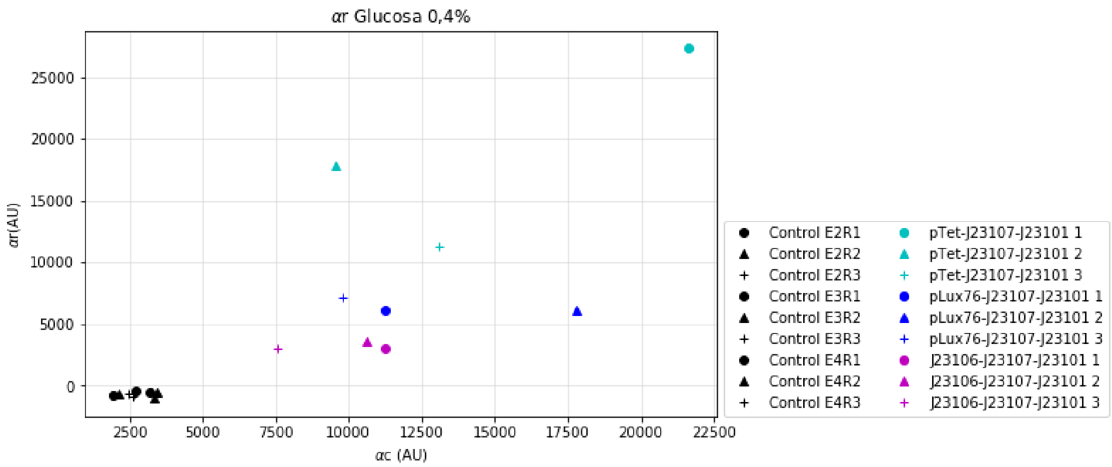


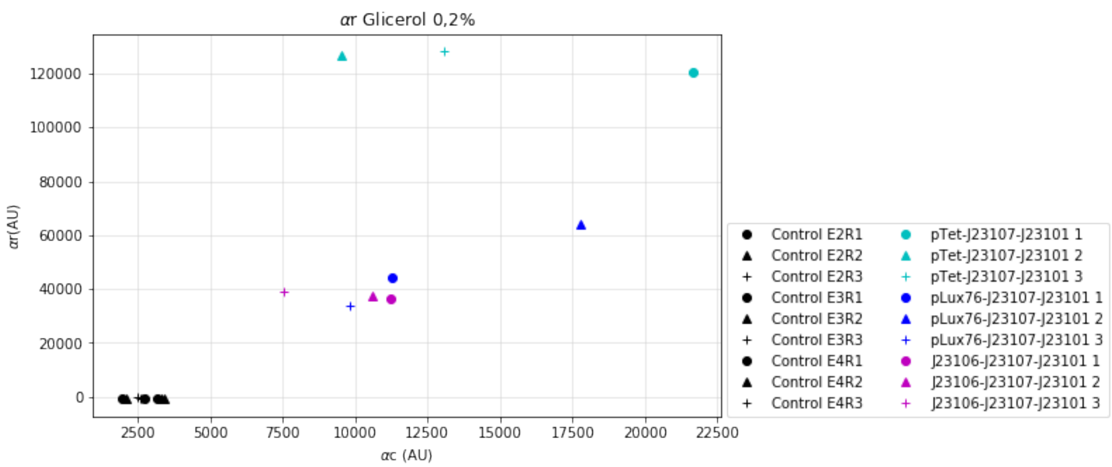


In [84]:
```
#grafico de ar vs ac
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$r Glucosa 0,4%')
plt.xlabel(r'$\alpha$c (AU)')
plt.ylabel(r'$\alpha$r(AU)')
```

```
plt.plot(slopec1,sloper1,'ko',label='Control E2R1')
plt.plot(slopec2,sloper2,'k^',label='Control E2R2')
plt.plot(slopec3,sloper3,'k+',label='Control E2R3')
plt.plot(slopec7,sloper7,'ko',label='Control E3R1')
plt.plot(slopec8,sloper8,'k^',label='Control E3R2')
plt.plot(slopec9,sloper9,'k+',label='Control E3R3')
plt.plot(slopec13,sloper13,'ko',label='Control E4R1')
plt.plot(slopec14,sloper14,'k^',label='Control E4R2')
plt.plot(slopec15,sloper15,'k+',label='Control E4R3')
plt.plot(slopec19,sloper19,'co',label='pTet-J23107-J23101 1')
plt.plot(slopec20,sloper20,'c^',label='pTet-J23107-J23101 2')
plt.plot(slopec21,sloper21,'c+',label='pTet-J23107-J23101 3')
plt.plot(slopec25,sloper25,'bo',label='pLux76-J23107-J23101 1')
plt.plot(slopec26,sloper26,'b^',label='pLux76-J23107-J23101 2')
plt.plot(slopec27,sloper27,'b+',label='pLux76-J23107-J23101 3')
plt.plot(slopec31,sloper31,'mo',label='J23106-J23107-J23101 1')
plt.plot(slopec32,sloper32,'m^',label='J23106-J23107-J23101 2')
plt.plot(slopec33,sloper33,'m+',label='J23106-J23107-J23101 3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)

#grafico de ar vs ac
plt.figure(figsize=(8,5))
plt.title(r'$\alpha$r Glicerol 0,2%')
plt.xlabel(r'$\alpha$c (AU)')
plt.ylabel(r'$\alpha$r(AU)')
plt.plot(slopec1,sloper4,'ko',label='Control E2R1')
plt.plot(slopec2,sloper5,'k^',label='Control E2R2')
plt.plot(slopec3,sloper6,'k+',label='Control E2R3')
plt.plot(slopec7,sloper10,'ko',label='Control E3R1')
plt.plot(slopec8,sloper11,'k^',label='Control E3R2')
plt.plot(slopec9,sloper12,'k+',label='Control E3R3')
plt.plot(slopec13,sloper16,'ko',label='Control E4R1')
plt.plot(slopec14,sloper17,'k^',label='Control E4R2')
plt.plot(slopec15,sloper18,'k+',label='Control E4R3')
plt.plot(slopec19,sloper22,'co',label='pTet-J23107-J23101 1')
plt.plot(slopec20,sloper23,'c^',label='pTet-J23107-J23101 2')
plt.plot(slopec21,sloper24,'c+',label='pTet-J23107-J23101 3')
plt.plot(slopec25,sloper28,'bo',label='pLux76-J23107-J23101 1')
plt.plot(slopec26,sloper29,'b^',label='pLux76-J23107-J23101 2')
plt.plot(slopec27,sloper30,'b+',label='pLux76-J23107-J23101 3')
plt.plot(slopec31,sloper34,'mo',label='J23106-J23107-J23101 1')
plt.plot(slopec32,sloper35,'m^',label='J23106-J23107-J23101 2')
plt.plot(slopec33,sloper36,'m+',label='J23106-J23107-J23101 3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

```
Out[84]: <matplotlib.legend.Legend at 0x2365feee7b8>
```

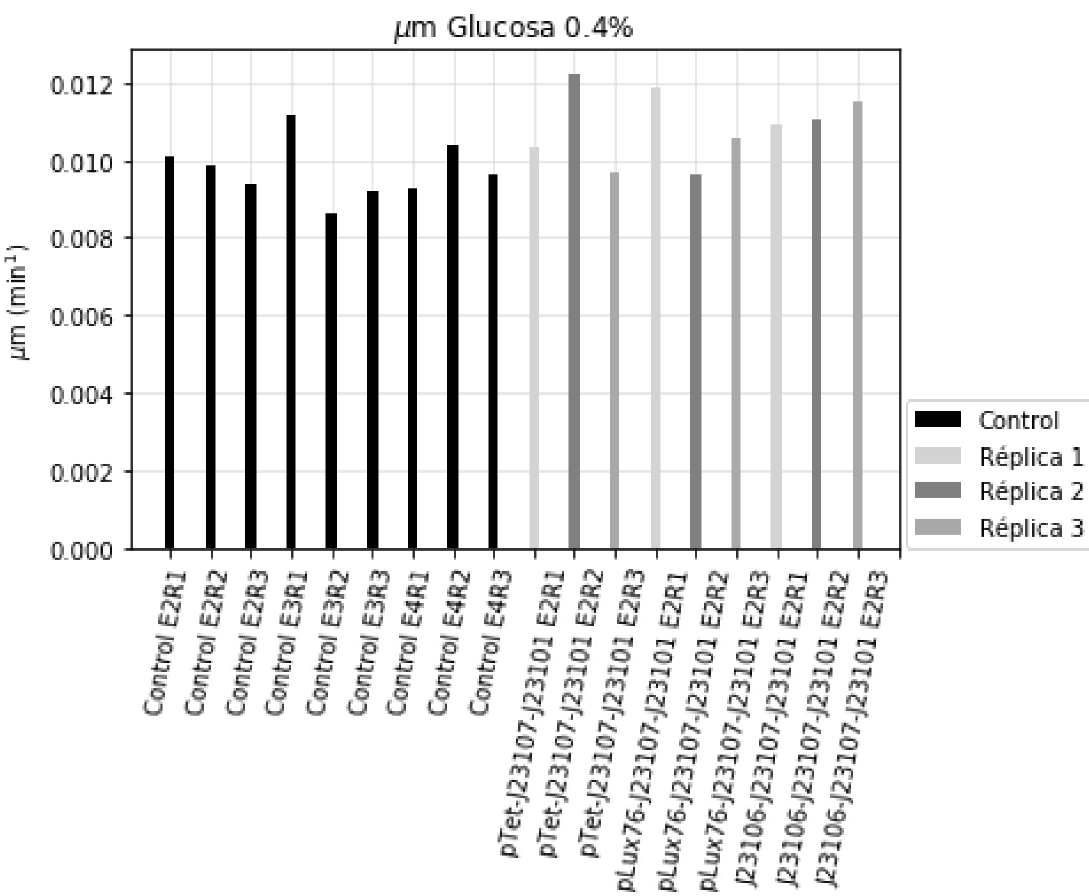




In [85]:
```
#Grafico de barras um de FPs
uglu=[um1,um2,um3,um7,um8,um9,um13,um14,um15,um19,um20,um21,um25,um26,um27,um31,um32,um
ugli=[um4,um5,um6,um10,um11,um12,um16,um17,um18,um22,um23,um24,um28,um29,um30,um34,um35

X = np.arange(19)
plt.figure()
plt.title(r'$\mu$m Glucosa 0.4%')
plt.ylabel(r'$\mu$m (min$^1$)')
plt.bar(X[0]+0.00,uglu[0],color='k',width=0.25,label='Control',zorder=3)
plt.bar(X[1]+0.00,uglu[1],color='k',width=0.25,zorder=3)
plt.bar(X[2]+0.00,uglu[2],color='k',width=0.25,zorder=3)
plt.bar(X[3]+0.00,uglu[3],color='k',width=0.25,zorder=3)
plt.bar(X[4]+0.00,uglu[4],color='k',width=0.25,zorder=3)
plt.bar(X[5]+0.00,uglu[5],color='k',width=0.25,zorder=3)
```

```
plt.bar(X[6]+0.00,uglu[6],color='k',width=0.25,zorder=3)
plt.bar(X[7]+0.00,uglu[7],color='k',width=0.25,zorder=3)
plt.bar(X[8]+0.00,uglu[8],color='k',width=0.25,zorder=3)
plt.bar(X[9]+0.00,uglu[9],color='lightgrey',width=0.25,label='Réplica 1',zorder=3)
plt.bar(X[10]+0.00,uglu[10],color='grey',width=0.25,label='Réplica 2',zorder=3)
plt.bar(X[11]+0.00,uglu[11],color='darkgrey',width=0.25,label='Réplica 3',zorder=3)
plt.bar(X[12]+0.00,uglu[12],color='lightgrey',width=0.25,zorder=3)
plt.bar(X[13]+0.00,uglu[13],color='grey',width=0.25,zorder=3)
plt.bar(X[14]+0.00,uglu[14],color='darkgrey',width=0.25,zorder=3)
plt.bar(X[15]+0.00,uglu[15],color='lightgrey',width=0.25,zorder=3)
plt.bar(X[16]+0.00,uglu[16],color='grey',width=0.25,zorder=3)
plt.bar(X[17]+0.00,uglu[17],color='darkgrey',width=0.25,zorder=3)
plt.xticks(X,['Control E2R1','Control E2R2','Control E2R3','Control E3R1','Control E3R2
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0))
```

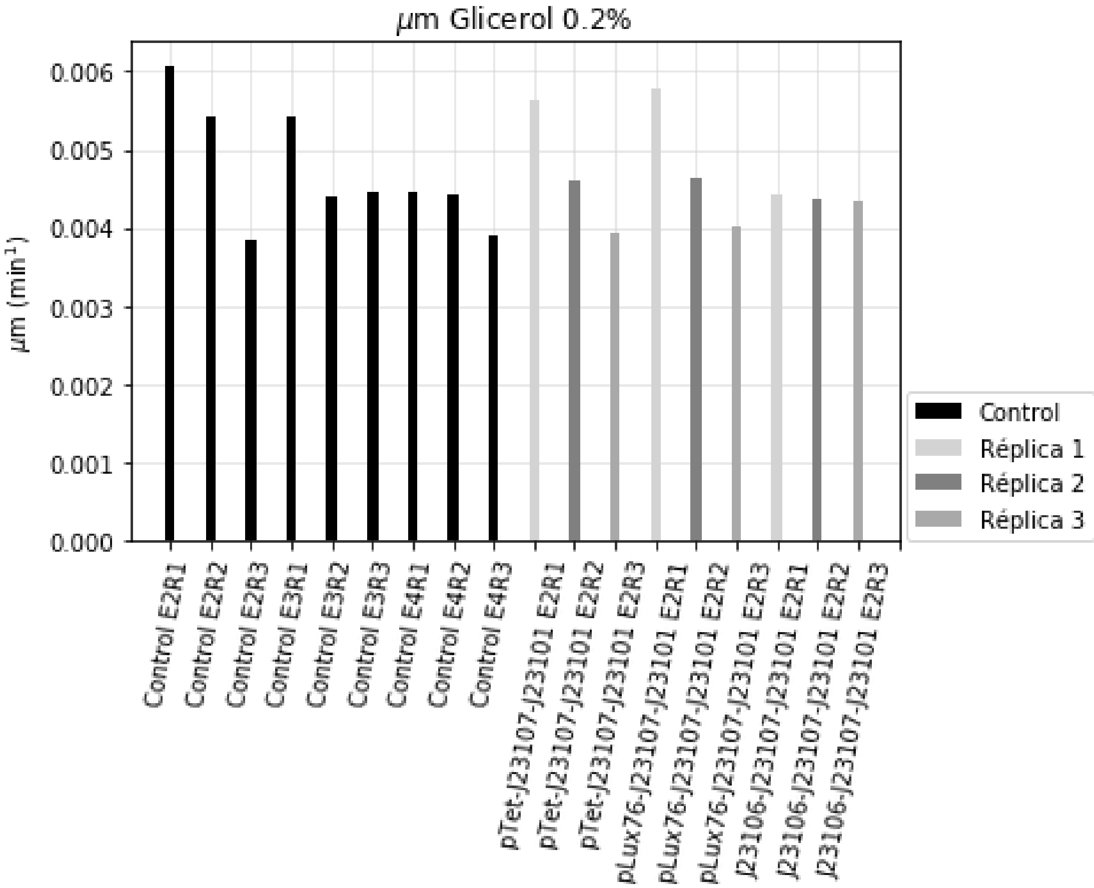
Out[85]: <matplotlib.legend.Legend at 0x2365f7c83c8>




```
In [86]: X = np.arange(19)
         plt.figure()
```

```
plt.title(r'$\mu$m Glicerol 0.2%')
plt.ylabel(r'$\mu$m (min$^1$)')
plt.bar(X[0]+0.00,ugli[0],color='k',width=0.25,label='Control',zorder=3)
plt.bar(X[1]+0.00,ugli[1],color='k',width=0.25,zorder=3)
plt.bar(X[2]+0.00,ugli[2],color='k',width=0.25,zorder=3)
plt.bar(X[3]+0.00,ugli[3],color='k',width=0.25,zorder=3)
plt.bar(X[4]+0.00,ugli[4],color='k',width=0.25,zorder=3)
plt.bar(X[5]+0.00,ugli[5],color='k',width=0.25,zorder=3)
plt.bar(X[6]+0.00,ugli[6],color='k',width=0.25,zorder=3)
plt.bar(X[7]+0.00,ugli[7],color='k',width=0.25,zorder=3)
plt.bar(X[8]+0.00,ugli[8],color='k',width=0.25,zorder=3)
plt.bar(X[9]+0.00,ugli[9],color='lightgrey',width=0.25,label='Réplica 1',zorder=3)
plt.bar(X[10]+0.00,ugli[10],color='grey',width=0.25,label='Réplica 2',zorder=3)
plt.bar(X[11]+0.00,ugli[11],color='darkgrey',width=0.25,label='Réplica 3',zorder=3)
plt.bar(X[12]+0.00,ugli[12],color='lightgrey',width=0.25,zorder=3)
plt.bar(X[13]+0.00,ugli[13],color='grey',width=0.25,zorder=3)
plt.bar(X[14]+0.00,ugli[14],color='darkgrey',width=0.25,zorder=3)
plt.bar(X[15]+0.00,ugli[15],color='lightgrey',width=0.25,zorder=3)
plt.bar(X[16]+0.00,ugli[16],color='grey',width=0.25,zorder=3)
plt.bar(X[17]+0.00,ugli[17],color='darkgrey',width=0.25,zorder=3)
plt.xticks(X,['Control E2R1','Control E2R2','Control E2R3','Control E3R1','Control E3R2
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0))
```

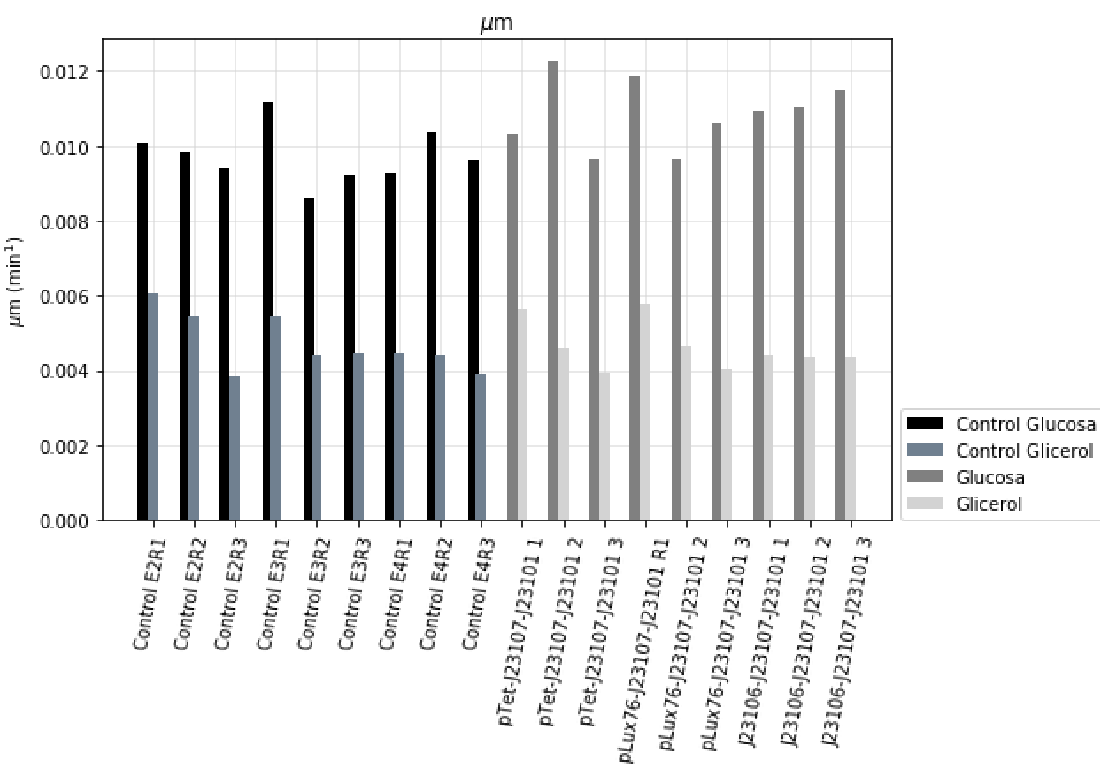
Out[86]: <matplotlib.legend.Legend at 0x23661934710>




```
In [87]: X = np.arange(18)
         plt.figure(figsize=(8,5))
         plt.title(r'$\mu$m')
         plt.ylabel(r'$\mu$m (min$^1$)')
         plt.bar(X[0]-0.25,uglu[0],color='k',width=0.25,label='Control Glucosa',zorder=3)
         plt.bar(X[0]+0.00,ugli[0],color='slategrey',width=0.25,label='Control Glicerol',zorder=
         plt.bar(X[1]-0.20,uglu[1],color='k',width=0.25,zorder=3)
         plt.bar(X[1]+0.00,ugli[1],color='slategrey',width=0.25,zorder=3)
         plt.bar(X[2]-0.25,uglu[2],color='k',width=0.25,zorder=3)
         plt.bar(X[2]+0.00,ugli[2],color='slategrey',width=0.25,zorder=3)
         plt.bar(X[3]-0.20,uglu[3],color='k',width=0.25,zorder=3)
         plt.bar(X[3]+0.00,ugli[3],color='slategrey',width=0.25,zorder=3)
         plt.bar(X[4]-0.20,uglu[4],color='k',width=0.25,zorder=3)
         plt.bar(X[4]+0.00,ugli[4],color='slategrey',width=0.25,zorder=3)
         plt.bar(X[5]-0.20,uglu[5],color='k',width=0.25,zorder=3)
         plt.bar(X[5]+0.00,ugli[5],color='slategrey',width=0.25,zorder=3)
         plt.bar(X[6]-0.20,uglu[6],color='k',width=0.25,zorder=3)
         plt.bar(X[6]+0.00,ugli[6],color='slategrey',width=0.25,zorder=3)
         plt.bar(X[7]-0.20,uglu[7],color='k',width=0.25,zorder=3)
```

```
plt.bar(X[7]+0.00,ugli[7],color='slategrey',width=0.25,zorder=3)
plt.bar(X[8]-0.20,uglu[8],color='k',width=0.25,zorder=3)
plt.bar(X[8]+0.00,ugli[8],color='slategrey',width=0.25,zorder=3)
plt.bar(X[9]-0.25,uglu[9],color='grey',width=0.25,label='Glucosa',zorder=3)
plt.bar(X[9]+0.00,ugli[9],color='lightgrey',width=0.25,label='Glicerol',zorder=3)
plt.bar(X[10]-0.25,uglu[10],color='grey',width=0.25,zorder=3)
plt.bar(X[10]+0.00,ugli[10],color='lightgrey',width=0.25,zorder=3)
plt.bar(X[11]-0.25,uglu[11],color='grey',width=0.25,zorder=3)
plt.bar(X[11]+0.00,ugli[11],color='lightgrey',width=0.25,zorder=3)
plt.bar(X[12]-0.25,uglu[12],color='grey',width=0.25,zorder=3)
plt.bar(X[12]+0.00,ugli[12],color='lightgrey',width=0.25,zorder=3)
plt.bar(X[13]-0.25,uglu[13],color='grey',width=0.25,zorder=3)
plt.bar(X[13]+0.00,ugli[13],color='lightgrey',width=0.25,zorder=3)
plt.bar(X[14]-0.25,uglu[14],color='grey',width=0.25,zorder=3)
plt.bar(X[14]+0.00,ugli[14],color='lightgrey',width=0.25,zorder=3)
plt.bar(X[15]-0.25,uglu[15],color='grey',width=0.25,zorder=3)
plt.bar(X[15]+0.00,ugli[15],color='lightgrey',width=0.25,zorder=3)
plt.bar(X[16]-0.25,uglu[16],color='grey',width=0.25,zorder=3)
plt.bar(X[16]+0.00,ugli[16],color='lightgrey',width=0.25,zorder=3)
plt.bar(X[17]-0.25,uglu[17],color='grey',width=0.25,zorder=3)
plt.bar(X[17]+0.00,ugli[17],color='lightgrey',width=0.25,zorder=3)
plt.xticks(X, ['Control E2R1','Control E2R2','Control E2R3','Control E3R1','Control E3R
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0))
```

```
Out[87]: <matplotlib.legend.Legend at 0x23662811588>
```



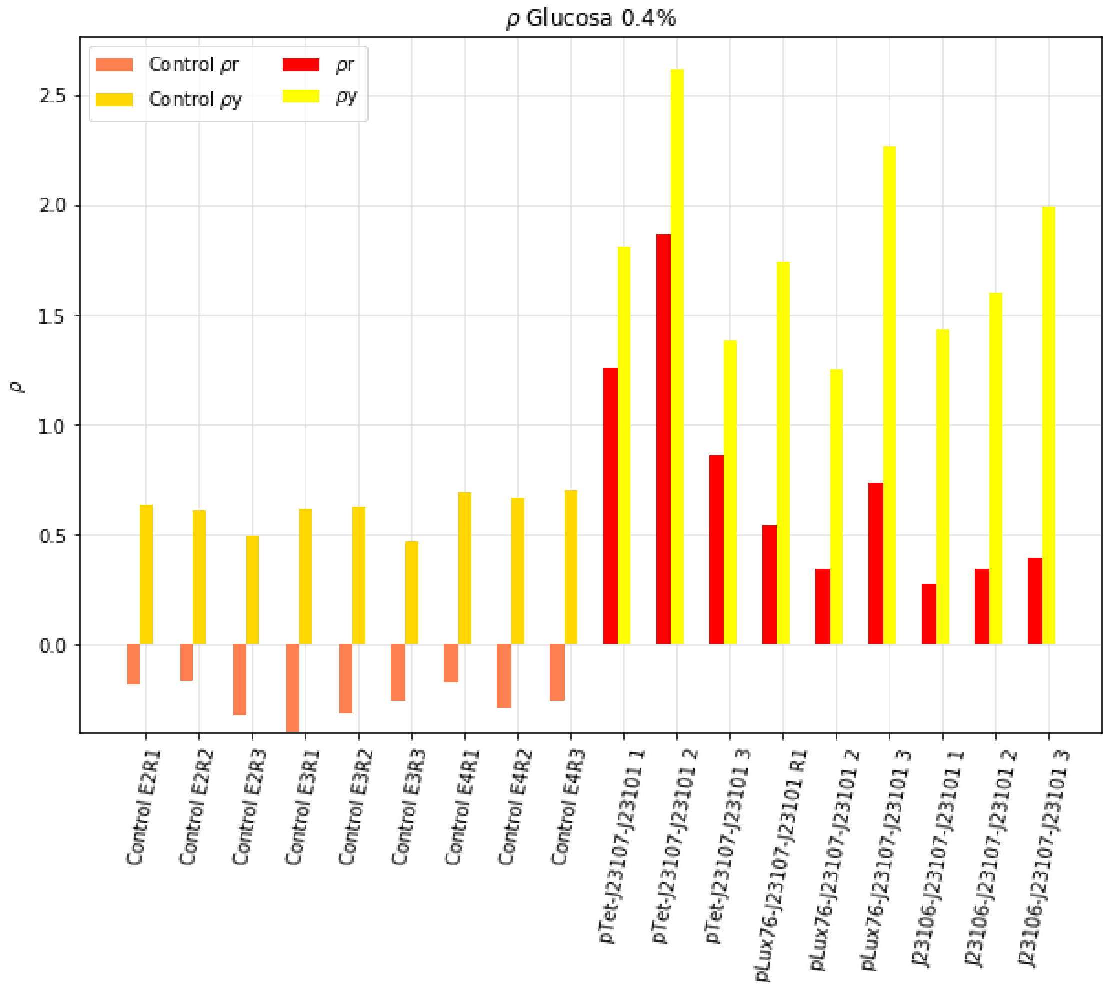
```
In [88]: #Ro RFP
         pr1=sloper1/slopec1
         pr2=sloper2/slopec2
         pr3=sloper3/slopec3
         pr4=sloper4/slopec4
         pr5=sloper5/slopec5
         pr6=sloper6/slopec6
         pr7=sloper7/slopec7
         pr8=sloper8/slopec8
         pr9=sloper9/slopec9
         pr10=sloper10/slopec10
         pr11=sloper11/slopec11
         pr12=sloper12/slopec12
         pr13=sloper13/slopec13
         pr14=sloper14/slopec14
         pr15=sloper15/slopec15
         pr16=sloper16/slopec16
         pr17=sloper17/slopec17
         pr18=sloper18/slopec18
         pr19=sloper19/slopec19
         pr20=sloper20/slopec20
         pr21=sloper21/slopec21
         pr22=sloper22/slopec22
         pr23=sloper23/slopec23
         pr24=sloper24/slopec24
         pr25=sloper25/slopec25
         pr26=sloper26/slopec26
         pr27=sloper27/slopec27
         pr28=sloper28/slopec28
         pr29=sloper29/slopec29
         pr30=sloper30/slopec30
         pr31=sloper31/slopec31
         pr32=sloper32/slopec32
         pr33=sloper33/slopec33
         pr34=sloper34/slopec34
         pr35=sloper35/slopec35
         pr36=sloper36/slopec36


         ro_rfp=[pr1,pr2,pr3,pr4,pr5,pr6,pr7,pr8,pr9,pr10,pr11,pr12,pr13,pr14,pr15,pr16,pr17,pr1
         ro_rfpglu=[[pr1,pr2,pr3],[pr7,pr8,pr9],[pr13,pr14,pr15],[pr19,pr20,pr21],[pr25,pr26,pr2
         ro_rfpgli=[[pr4,pr5,pr6],[pr10,pr11,pr12],[pr16,pr17,pr18],[pr22,pr23,pr24],[pr28,pr29,

In [89]: #Ro YFP
         py1=slopey1/slopec1
```

```
py2=slopey2/slopec2
py3=slopey3/slopec3
py4=slopey4/slopec4
py5=slopey5/slopec5
py6=slopey6/slopec6
py7=slopey7/slopec7
py8=slopey8/slopec8
py9=slopey9/slopec9
py10=slopey10/slopec10
py11=slopey11/slopec11
py12=slopey12/slopec12
py13=slopey13/slopec13
py14=slopey14/slopec14
py15=slopey15/slopec15
py16=slopey16/slopec16
py17=slopey17/slopec17
py18=slopey18/slopec18
py19=slopey19/slopec19
py20=slopey20/slopec20
py21=slopey21/slopec21
py22=slopey22/slopec22
py23=slopey23/slopec23
py24=slopey24/slopec24
py25=slopey25/slopec25
py26=slopey26/slopec26
py27=slopey27/slopec27
py28=slopey28/slopec28
py29=slopey29/slopec29
py30=slopey30/slopec30
py31=slopey31/slopec31
py32=slopey32/slopec32
py33=slopey33/slopec33
py34=slopey34/slopec34
py35=slopey35/slopec35
py36=slopey36/slopec36


ro_yfp=[py1,py2,py3,py4,py5,py6,py7,py8,py9,py10,py11,py12,py13,py14,py15,py16,py17,py1
ro_yfpglu=[[py1,py2,py3],[py7,py8,py9],[py13,py14,py15],[py19,py20,py21],[py25,py26,py2
ro_yfpgli=[[py4,py5,py6],[py10,py11,py12],[py16,py17,py18],[py22,py23,py24],[py28,py29,
```

In [90]:
```
X = np.arange(18)
plt.figure(figsize=(10,7))
plt.title(r'$\rho$ Glucosa 0.4%')
plt.ylabel(r'$\rho$')
plt.bar(X[0]-0.25,ro_rfp[0],color='coral',width=0.25,label= 'Control'+' '+r'$\rho$r',zo
plt.bar(X[0]+0.00,ro_yfp[0],color='gold',width=0.25,label= 'Control'+' '+r'$\rho$y',zor
plt.bar(X[1]-0.25,ro_rfp[1],color='coral',width=0.25,zorder=3)
```

```python
plt.bar(X[1]+0.00,ro_yfp[1],color='gold',width=0.25,zorder=3)
plt.bar(X[2]-0.25,ro_rfp[2],color='coral',width=0.25,zorder=3)
plt.bar(X[2]+0.00,ro_yfp[2],color='gold',width=0.25,zorder=3)
plt.bar(X[3]-0.25,ro_rfp[6],color='coral',width=0.25,zorder=3)
plt.bar(X[3]+0.00,ro_yfp[6],color='gold',width=0.25,zorder=3)
plt.bar(X[4]-0.25,ro_rfp[7],color='coral',width=0.25,zorder=3)
plt.bar(X[4]+0.00,ro_yfp[7],color='gold',width=0.25,zorder=3)
plt.bar(X[5]-0.25,ro_rfp[8],color='coral',width=0.25,zorder=3)
plt.bar(X[5]+0.00,ro_yfp[8],color='gold',width=0.25,zorder=3)
plt.bar(X[6]-0.25,ro_rfp[12],color='coral',width=0.25,zorder=3)
plt.bar(X[6]+0.00,ro_yfp[12],color='gold',width=0.25,zorder=3)
plt.bar(X[7]-0.25,ro_rfp[13],color='coral',width=0.25,zorder=3)
plt.bar(X[7]+0.00,ro_yfp[13],color='gold',width=0.25,zorder=3)
plt.bar(X[8]-0.25,ro_rfp[14],color='coral',width=0.25,zorder=3)
plt.bar(X[8]+0.00,ro_yfp[14],color='gold',width=0.25,zorder=3)
plt.bar(X[9]-0.25,ro_rfp[18],color='r',width=0.25,label=r'$\rho$r',zorder=3)
plt.bar(X[9]+0.00,ro_yfp[18],color='yellow',width=0.25,label=r'$\rho$y',zorder=3)
plt.bar(X[10]-0.25,ro_rfp[19],color='r',width=0.25,zorder=3)
plt.bar(X[10]+0.00,ro_yfp[19],color='yellow',width=0.25,zorder=3)
plt.bar(X[11]-0.25,ro_rfp[20],color='r',width=0.25,zorder=3)
plt.bar(X[11]+0.00,ro_yfp[20],color='yellow',width=0.25,zorder=3)
plt.bar(X[12]-0.25,ro_rfp[24],color='r',width=0.25,zorder=3)
plt.bar(X[12]+0.00,ro_yfp[24],color='yellow',width=0.25,zorder=3)
plt.bar(X[13]-0.25,ro_rfp[25],color='r',width=0.25,zorder=3)
plt.bar(X[13]+0.00,ro_yfp[25],color='yellow',width=0.25,zorder=3)
plt.bar(X[14]-0.25,ro_rfp[26],color='r',width=0.25,zorder=3)
plt.bar(X[14]+0.00,ro_yfp[26],color='yellow',width=0.25,zorder=3)
plt.bar(X[15]-0.25,ro_rfp[30],color='r',width=0.25,zorder=3)
plt.bar(X[15]+0.00,ro_yfp[30],color='yellow',width=0.25,zorder=3)
plt.bar(X[16]-0.25,ro_rfp[31],color='r',width=0.25,zorder=3)
plt.bar(X[16]+0.00,ro_yfp[31],color='yellow',width=0.25,zorder=3)
plt.bar(X[17]-0.25,ro_rfp[32],color='r',width=0.25,zorder=3)
plt.bar(X[17]+0.00,ro_yfp[32],color='yellow',width=0.25,zorder=3)

plt.xticks(X, ['Control E2R1','Control E2R2','Control E2R3','Control E3R1','Control E3R
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc='upper left',ncol=2)
```

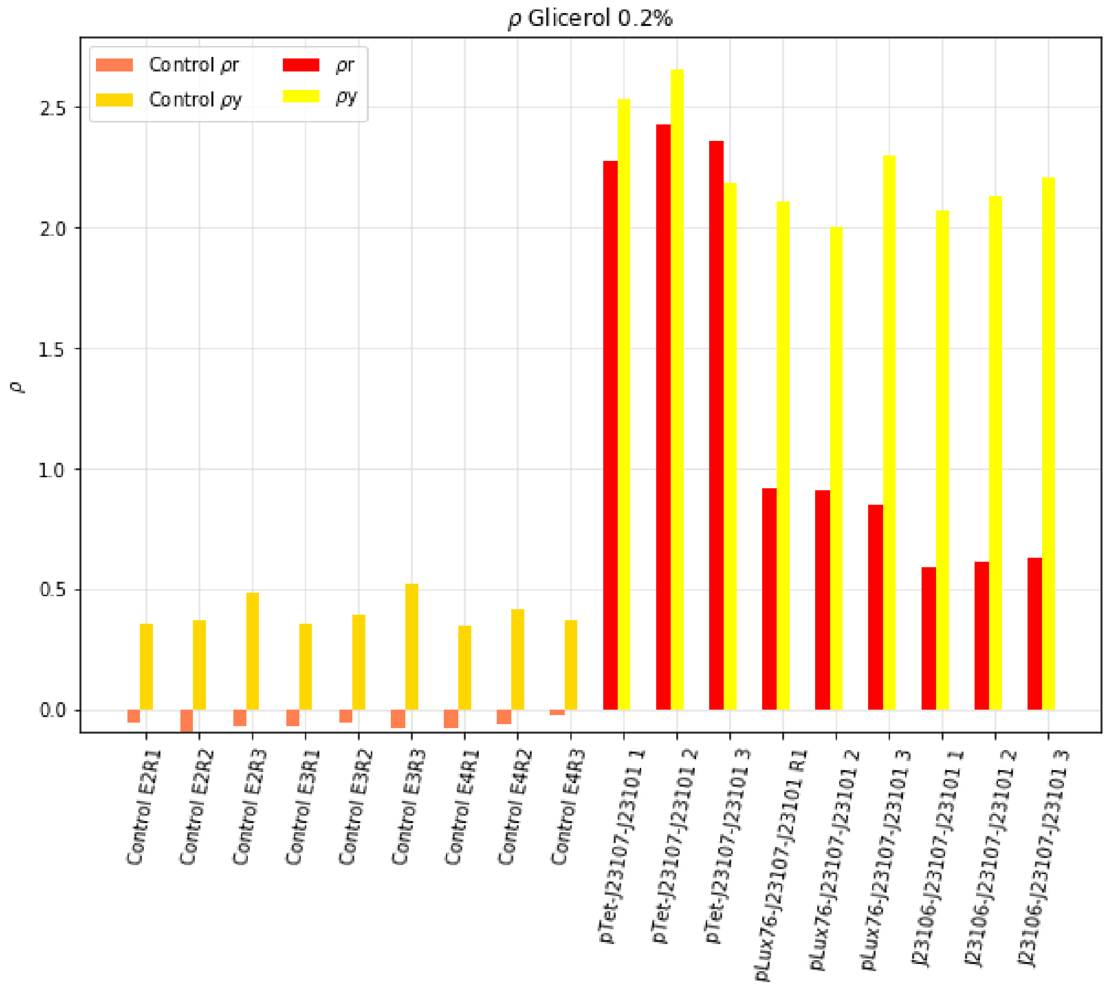
Out[90]: <matplotlib.legend.Legend at 0x2366288f9b0>




```
In [91]: X = np.arange(18)
         plt.figure(figsize=(10,7))
         plt.title(r'$\rho$ Glicerol 0.2%')
         plt.ylabel(r'$\rho$')
         plt.bar(X[0]-0.25,ro_rfp[3],color='coral',width=0.25,label= 'Control'+' '+r'$\rho$r',zo
         plt.bar(X[0]+0.00,ro_yfp[3],color='gold',width=0.25,label= 'Control'+' '+r'$\rho$y',zor
         plt.bar(X[1]-0.25,ro_rfp[4],color='coral',width=0.25,zorder=3)
         plt.bar(X[1]+0.00,ro_yfp[4],color='gold',width=0.25,zorder=3)
         plt.bar(X[2]-0.25,ro_rfp[5],color='coral',width=0.25,zorder=3)
         plt.bar(X[2]+0.00,ro_yfp[5],color='gold',width=0.25,zorder=3)
         plt.bar(X[3]-0.25,ro_rfp[9],color='coral',width=0.25,zorder=3)
         plt.bar(X[3]+0.00,ro_yfp[9],color='gold',width=0.25,zorder=3)
         plt.bar(X[4]-0.25,ro_rfp[10],color='coral',width=0.25,zorder=3)
         plt.bar(X[4]+0.00,ro_yfp[10],color='gold',width=0.25,zorder=3)
         plt.bar(X[5]-0.25,ro_rfp[11],color='coral',width=0.25,zorder=3)
         plt.bar(X[5]+0.00,ro_yfp[11],color='gold',width=0.25,zorder=3)
```

```
plt.bar(X[6]-0.25,ro_rfp[15],color='coral',width=0.25,zorder=3)
plt.bar(X[6]+0.00,ro_yfp[15],color='gold',width=0.25,zorder=3)
plt.bar(X[7]-0.25,ro_rfp[16],color='coral',width=0.25,zorder=3)
plt.bar(X[7]+0.00,ro_yfp[16],color='gold',width=0.25,zorder=3)
plt.bar(X[8]-0.25,ro_rfp[17],color='coral',width=0.25,zorder=3)
plt.bar(X[8]+0.00,ro_yfp[17],color='gold',width=0.25,zorder=3)
plt.bar(X[9]-0.25,ro_rfp[21],color='r',width=0.25,label=r'$\rho$r',zorder=3)
plt.bar(X[9]+0.00,ro_yfp[21],color='yellow',width=0.25,label=r'$\rho$y',zorder=3)
plt.bar(X[10]-0.25,ro_rfp[22],color='r',width=0.25,zorder=3)
plt.bar(X[10]+0.00,ro_yfp[22],color='yellow',width=0.25,zorder=3)
plt.bar(X[11]-0.25,ro_rfp[23],color='r',width=0.25,zorder=3)
plt.bar(X[11]+0.00,ro_yfp[23],color='yellow',width=0.25,zorder=3)
plt.bar(X[12]-0.25,ro_rfp[27],color='r',width=0.25,zorder=3)
plt.bar(X[12]+0.00,ro_yfp[27],color='yellow',width=0.25,zorder=3)
plt.bar(X[13]-0.25,ro_rfp[28],color='r',width=0.25,zorder=3)
plt.bar(X[13]+0.00,ro_yfp[28],color='yellow',width=0.25,zorder=3)
plt.bar(X[14]-0.25,ro_rfp[29],color='r',width=0.25,zorder=3)
plt.bar(X[14]+0.00,ro_yfp[29],color='yellow',width=0.25,zorder=3)
plt.bar(X[15]-0.25,ro_rfp[33],color='r',width=0.25,zorder=3)
plt.bar(X[15]+0.00,ro_yfp[33],color='yellow',width=0.25,zorder=3)
plt.bar(X[16]-0.25,ro_rfp[34],color='r',width=0.25,zorder=3)
plt.bar(X[16]+0.00,ro_yfp[34],color='yellow',width=0.25,zorder=3)
plt.bar(X[17]-0.25,ro_rfp[35],color='r',width=0.25,zorder=3)
plt.bar(X[17]+0.00,ro_yfp[35],color='yellow',width=0.25,zorder=3)

plt.xticks(X, ['Control E2R1','Control E2R2','Control E2R3','Control E3R1','Control E3R
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc='upper left',ncol=2)
```

Out[91]: <matplotlib.legend.Legend at 0x23662bcc9b0>

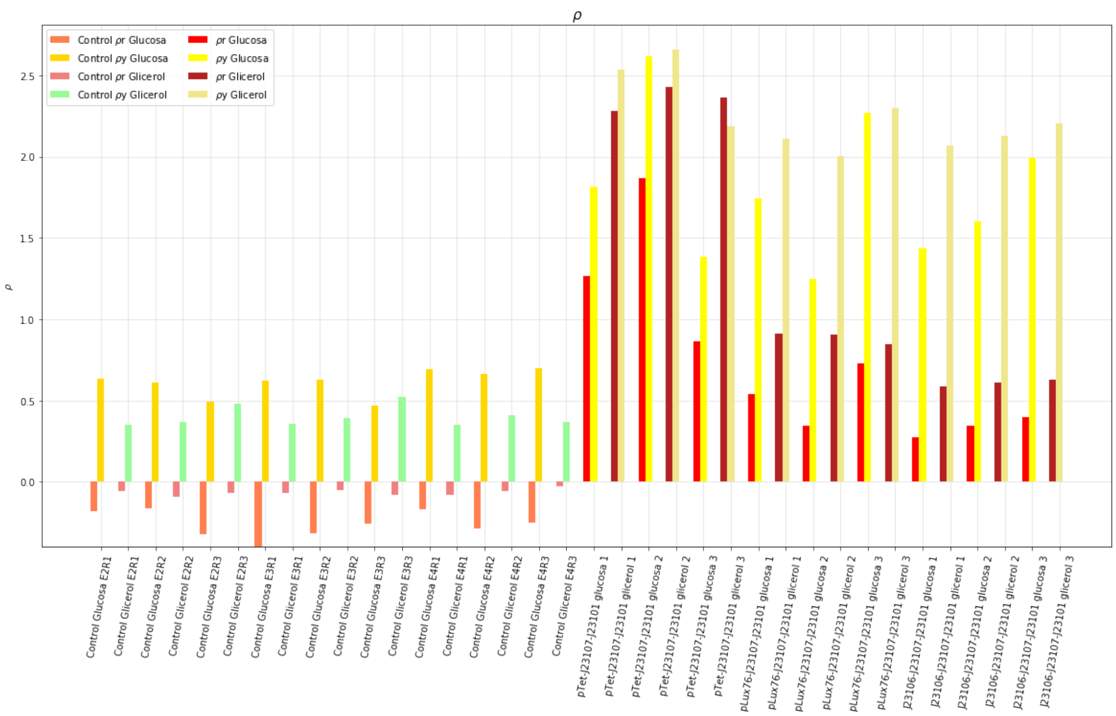



```
In [92]: X = np.arange(36)
         plt.figure(figsize=(20,10))
         plt.title(r'$\rho$',fontsize=15.0)
         plt.ylabel(r'$\rho$')
         plt.bar(X[0]-0.25,ro_rfp[0],color='coral',width=0.25,label= 'Control'+' '+r'$\rho$r Glu
         plt.bar(X[0]+0.00,ro_yfp[0],color='gold',width=0.25,label= 'Control'+' '+r'$\rho$y Gluc
         plt.bar(X[1]-0.25,ro_rfp[3],color='lightcoral',width=0.25,label= 'Control'+' '+r'$\rho$
         plt.bar(X[1]+0.00,ro_yfp[3],color='palegreen',width=0.25,label= 'Control'+' '+r'$\rho$y
         plt.bar(X[2]-0.25,ro_rfp[1],color='coral',width=0.25,zorder=3)
         plt.bar(X[2]+0.00,ro_yfp[1],color='gold',width=0.25,zorder=3)
         plt.bar(X[3]-0.25,ro_rfp[4],color='lightcoral',width=0.25,zorder=3)
         plt.bar(X[3]+0.00,ro_yfp[4],color='palegreen',width=0.25,zorder=3)
         plt.bar(X[4]-0.25,ro_rfp[2],color='coral',width=0.25,zorder=3)
         plt.bar(X[4]+0.00,ro_yfp[2],color='gold',width=0.25,zorder=3)
         plt.bar(X[5]-0.25,ro_rfp[5],color='lightcoral',width=0.25,zorder=3)
         plt.bar(X[5]+0.00,ro_yfp[5],color='palegreen',width=0.25,zorder=3)
```

```
plt.bar(X[6]-0.25,ro_rfp[6],color='coral',width=0.25,zorder=3)
plt.bar(X[6]+0.00,ro_yfp[6],color='gold',width=0.25,zorder=3)
plt.bar(X[7]-0.25,ro_rfp[9],color='lightcoral',width=0.25,zorder=3)
plt.bar(X[7]+0.00,ro_yfp[9],color='palegreen',width=0.25,zorder=3)
plt.bar(X[8]-0.25,ro_rfp[7],color='coral',width=0.25,zorder=3)
plt.bar(X[8]+0.00,ro_yfp[7],color='gold',width=0.25,zorder=3)
plt.bar(X[9]-0.25,ro_rfp[10],color='lightcoral',width=0.25,zorder=3)
plt.bar(X[9]+0.00,ro_yfp[10],color='palegreen',width=0.25,zorder=3)
plt.bar(X[10]-0.25,ro_rfp[8],color='coral',width=0.25,zorder=3)
plt.bar(X[10]+0.00,ro_yfp[8],color='gold',width=0.25,zorder=3)
plt.bar(X[11]-0.25,ro_rfp[11],color='lightcoral',width=0.25,zorder=3)
plt.bar(X[11]+0.00,ro_yfp[11],color='palegreen',width=0.25,zorder=3)
plt.bar(X[12]-0.25,ro_rfp[12],color='coral',width=0.25,zorder=3)
plt.bar(X[12]+0.00,ro_yfp[12],color='gold',width=0.25,zorder=3)
plt.bar(X[13]-0.25,ro_rfp[15],color='lightcoral',width=0.25,zorder=3)
plt.bar(X[13]+0.00,ro_yfp[15],color='palegreen',width=0.25,zorder=3)
plt.bar(X[14]-0.25,ro_rfp[13],color='coral',width=0.25,zorder=3)
plt.bar(X[14]+0.00,ro_yfp[13],color='gold',width=0.25,zorder=3)
plt.bar(X[15]-0.25,ro_rfp[16],color='lightcoral',width=0.25,zorder=3)
plt.bar(X[15]+0.00,ro_yfp[16],color='palegreen',width=0.25,zorder=3)
plt.bar(X[16]-0.25,ro_rfp[14],color='coral',width=0.25,zorder=3)
plt.bar(X[16]+0.00,ro_yfp[14],color='gold',width=0.25,zorder=3)
plt.bar(X[17]-0.25,ro_rfp[17],color='lightcoral',width=0.25,zorder=3)
plt.bar(X[17]+0.00,ro_yfp[17],color='palegreen',width=0.25,zorder=3)


plt.bar(X[18]-0.25,ro_rfp[18],color='r',width=0.25,label=r'$\rho$r Glucosa',zorder=3)
plt.bar(X[18]+0.00,ro_yfp[18],color='yellow',width=0.25,label=r'$\rho$y Glucosa',zorder
plt.bar(X[19]-0.25,ro_rfp[21],color='firebrick',width=0.25,label=r'$\rho$r Glicerol',zo
plt.bar(X[19]+0.00,ro_yfp[21],color='khaki',width=0.25,label=r'$\rho$y Glicerol',zorder
plt.bar(X[20]-0.25,ro_rfp[19],color='r',width=0.25,zorder=3)
plt.bar(X[20]+0.00,ro_yfp[19],color='yellow',width=0.25,zorder=3)
plt.bar(X[21]-0.25,ro_rfp[22],color='firebrick',width=0.25,zorder=3)
plt.bar(X[21]+0.00,ro_yfp[22],color='khaki',width=0.25,zorder=3)
plt.bar(X[22]-0.25,ro_rfp[20],color='r',width=0.25,zorder=3)
plt.bar(X[22]+0.00,ro_yfp[20],color='yellow',width=0.25,zorder=3)
plt.bar(X[23]-0.25,ro_rfp[23],color='firebrick',width=0.25,zorder=3)
plt.bar(X[23]+0.00,ro_yfp[23],color='khaki',width=0.25,zorder=3)
plt.bar(X[24]-0.25,ro_rfp[24],color='r',width=0.25,zorder=3)
plt.bar(X[24]+0.00,ro_yfp[24],color='yellow',width=0.25,zorder=3)
plt.bar(X[25]-0.25,ro_rfp[27],color='firebrick',width=0.25,zorder=3)
plt.bar(X[25]+0.00,ro_yfp[27],color='khaki',width=0.25,zorder=3)
plt.bar(X[26]-0.25,ro_rfp[25],color='r',width=0.25,zorder=3)
plt.bar(X[26]+0.00,ro_yfp[25],color='yellow',width=0.25,zorder=3)
plt.bar(X[27]-0.25,ro_rfp[28],color='firebrick',width=0.25,zorder=3)
plt.bar(X[27]+0.00,ro_yfp[28],color='khaki',width=0.25,zorder=3)
plt.bar(X[28]-0.25,ro_rfp[26],color='r',width=0.25,zorder=3)
plt.bar(X[28]+0.00,ro_yfp[26],color='yellow',width=0.25,zorder=3)
```

```
plt.bar(X[29]-0.25,ro_rfp[29],color='firebrick',width=0.25,zorder=3)
plt.bar(X[29]+0.00,ro_yfp[29],color='khaki',width=0.25,zorder=3)
plt.bar(X[30]-0.25,ro_rfp[30],color='r',width=0.25,zorder=3)
plt.bar(X[30]+0.00,ro_yfp[30],color='yellow',width=0.25,zorder=3)
plt.bar(X[31]-0.25,ro_rfp[33],color='firebrick',width=0.25,zorder=3)
plt.bar(X[31]+0.00,ro_yfp[33],color='khaki',width=0.25,zorder=3)
plt.bar(X[32]-0.25,ro_rfp[31],color='r',width=0.25,zorder=3)
plt.bar(X[32]+0.00,ro_yfp[31],color='yellow',width=0.25,zorder=3)
plt.bar(X[33]-0.25,ro_rfp[34],color='firebrick',width=0.25,zorder=3)
plt.bar(X[33]+0.00,ro_yfp[34],color='khaki',width=0.25,zorder=3)
plt.bar(X[34]-0.25,ro_rfp[32],color='r',width=0.25,zorder=3)
plt.bar(X[34]+0.00,ro_yfp[32],color='yellow',width=0.25,zorder=3)
plt.bar(X[35]-0.25,ro_rfp[35],color='firebrick',width=0.25,zorder=3)
plt.bar(X[35]+0.00,ro_yfp[35],color='khaki',width=0.25,zorder=3)
plt.xticks(X, ['Control Glucosa E2R1','Control Glicerol E2R1','Control Glucosa E2R2','C
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc='upper left',ncol=2)
```

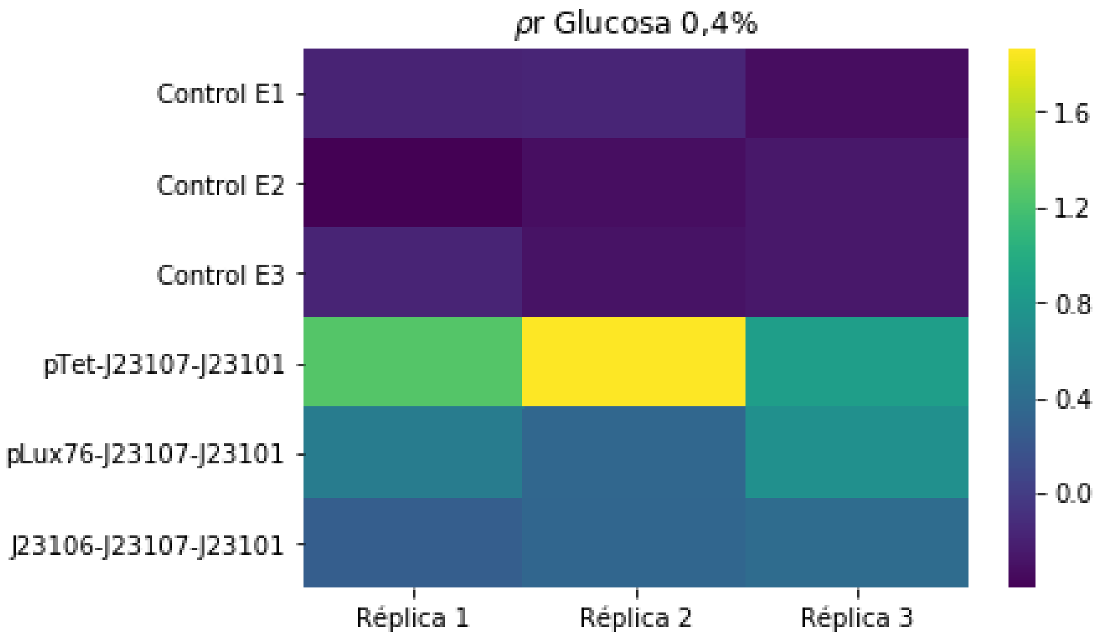
Out[92]: <matplotlib.legend.Legend at 0x236635f2588>

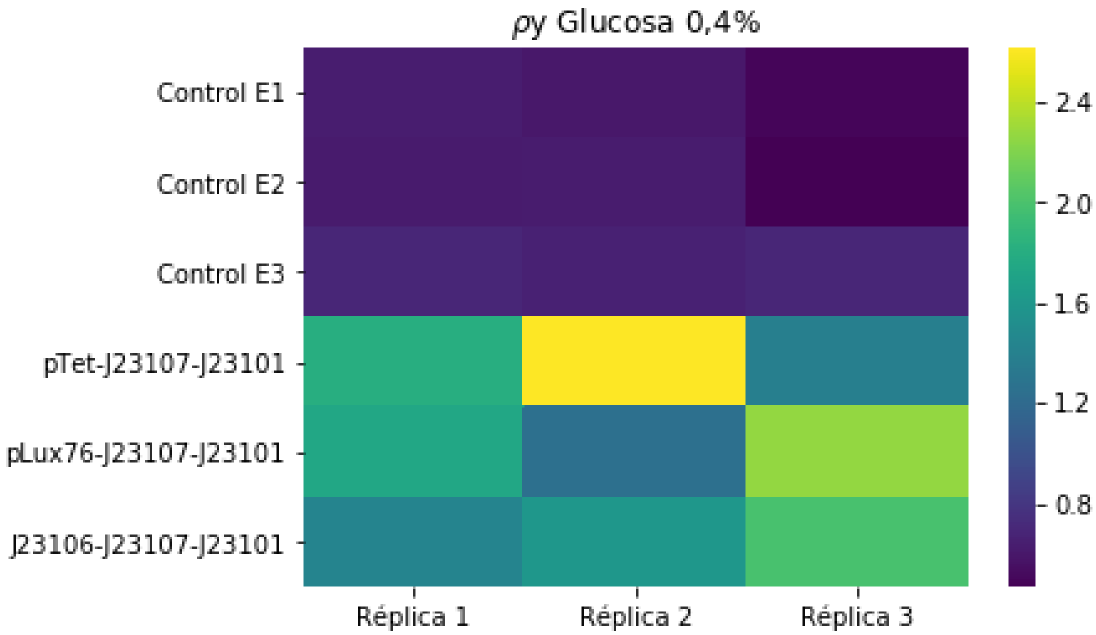



```
In [93]: ro_rfpglu=[[pr1,pr2,pr3],[pr7,pr8,pr9],[pr13,pr14,pr15],[pr19,pr20,pr21],[pr25,pr26,pr2

         ro_yfpglu=[[py1,py2,py3],[py7,py8,py9],[py13,py14,py15],[py19,py20,py21],[py25,py26,py2

         xlabel=['Réplica 1','Réplica 2','Réplica 3']
```

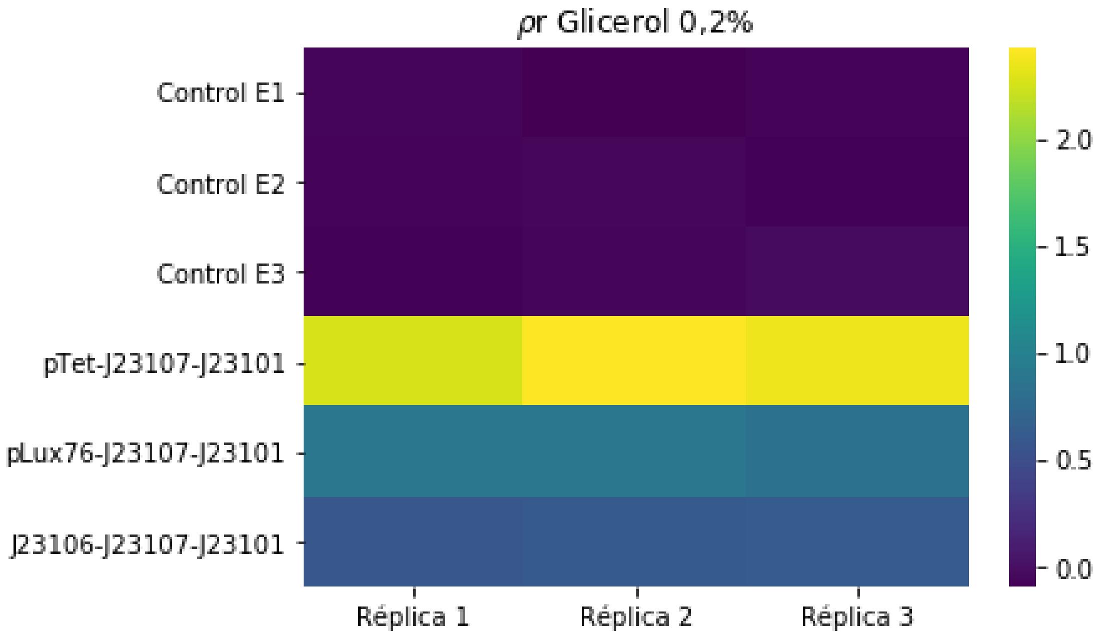
```
ylabel=['Control E1','Control E2','Control E3','pTet-J23107-J23101','pLux76-J23107-J231

plt.figure()
plt.title(r'$\rho$r Glucosa 0,4%')
sns.heatmap(ro_rfpglu,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)

plt.figure()
plt.title(r'$\rho$y Glucosa 0,4%')
sns.heatmap(ro_yfpglu,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)
```

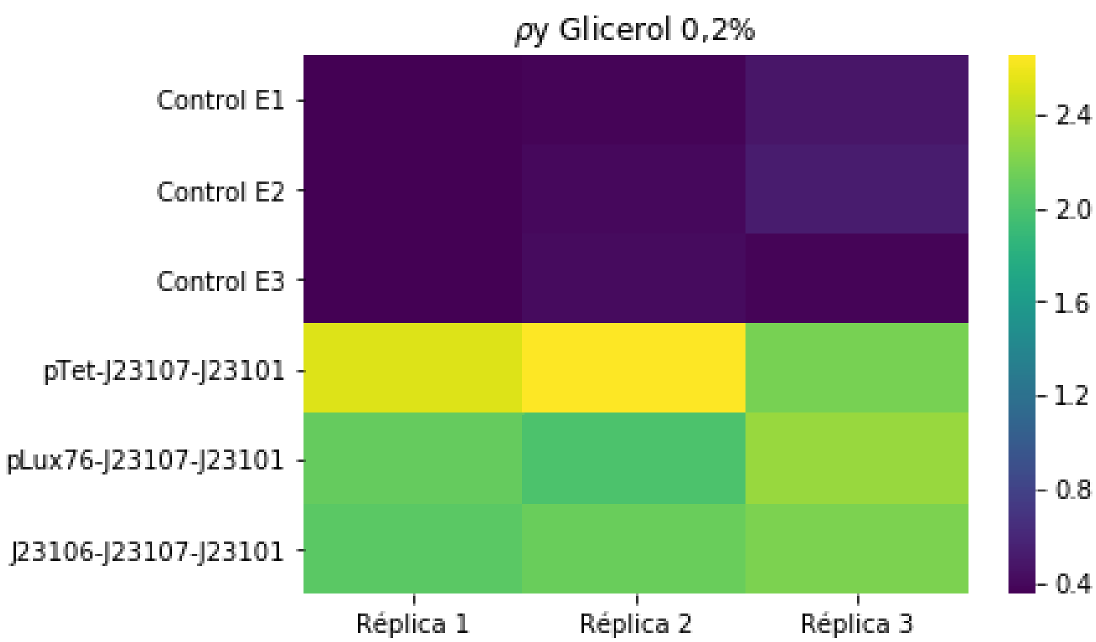
Out[93]: <matplotlib.axes._subplots.AxesSubplot at 0x23663414630>






```
In [94]: ro_rfpgli=[[pr4,pr5,pr6],[pr10,pr11,pr12],[pr16,pr17,pr18],[pr22,pr23,pr24],[pr28,pr29,
         ro_yfpgli=[[py4,py5,py6],[py10,py11,py12],[py16,py17,py18],[py22,py23,py24],[py28,py29,

         xlabel=['Réplica 1','Réplica 2','Réplica 3']
         ylabel=['Control E1','Control E2','Control E3','pTet-J23107-J23101','pLux76-J23107-J231

         plt.figure()
         plt.title(r'$\rho$r Glicerol 0,2%')
         sns.heatmap(ro_rfpgli,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)

         plt.figure()
         plt.title(r'$\rho$y Glicerol 0,2%')
         sns.heatmap(ro_yfpgli,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)

Out[94]: <matplotlib.axes._subplots.AxesSubplot at 0x23662328908>
```

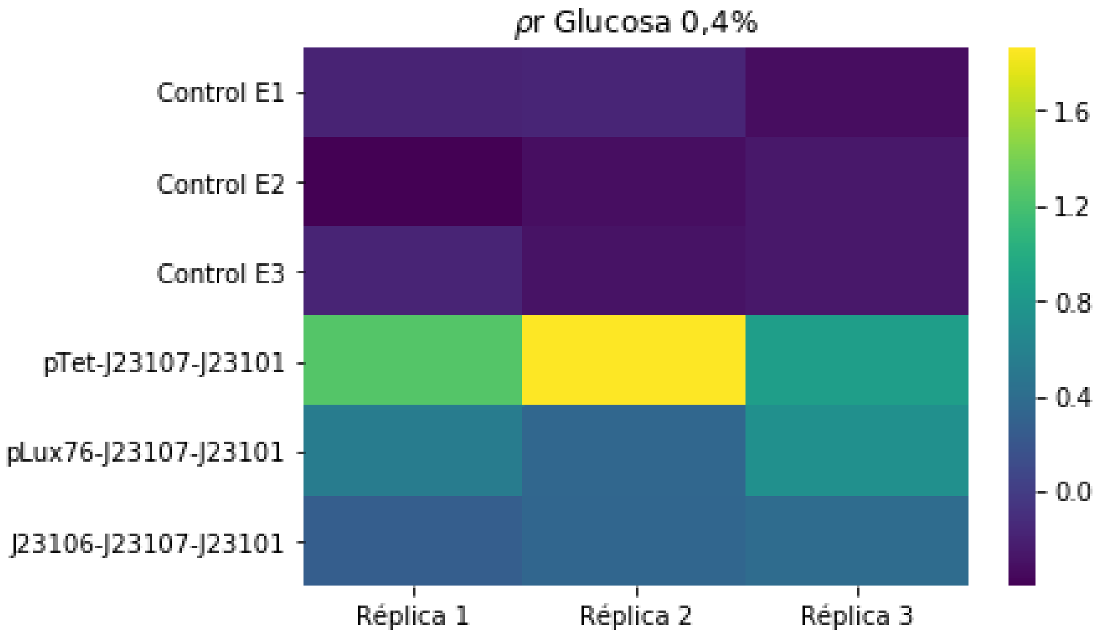


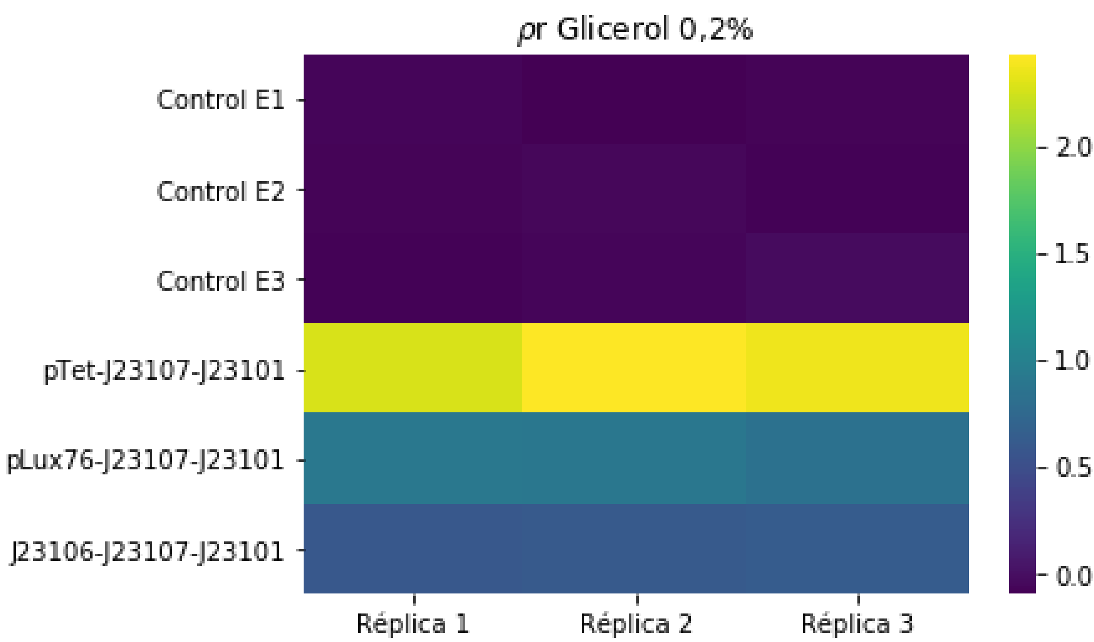



```
In [95]: xlabel=['Réplica 1','Réplica 2','Réplica 3']
         ylabel=['Control E1','Control E2','Control E3','pTet-J23107-J23101','pLux76-J23107-J231

         plt.figure()
```

```
plt.title(r'$\rho$r Glucosa 0,4%')
sns.heatmap(ro_rfpglu,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)

plt.figure()
plt.title(r'$\rho$r Glicerol 0,2%')
sns.heatmap(ro_rfpgli,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)
```

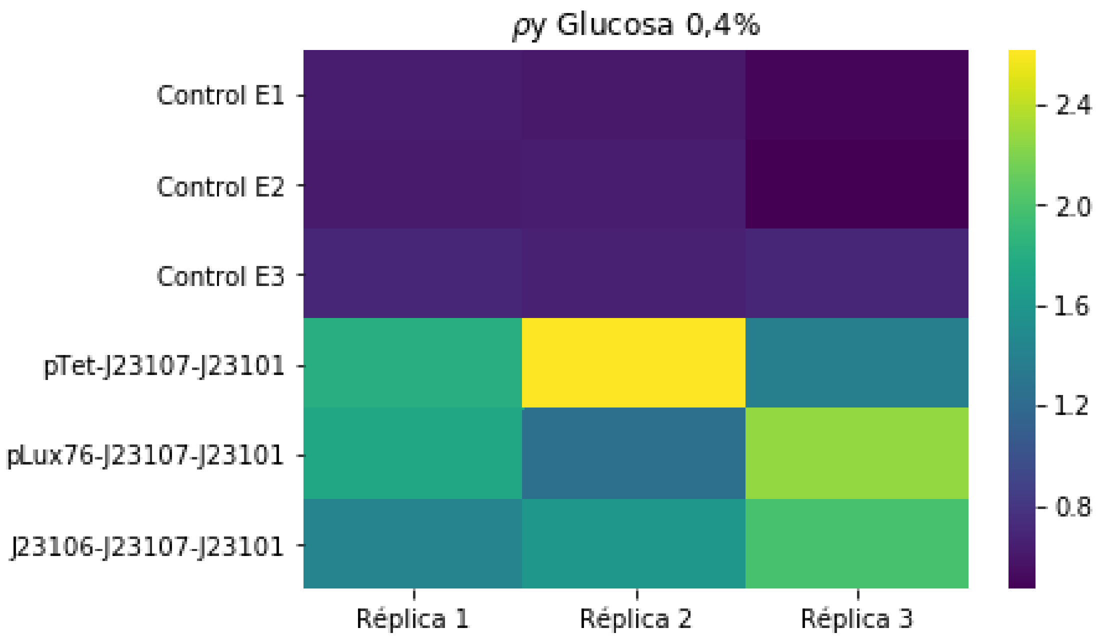
Out[95]: <matplotlib.axes._subplots.AxesSubplot at 0x23663674780>

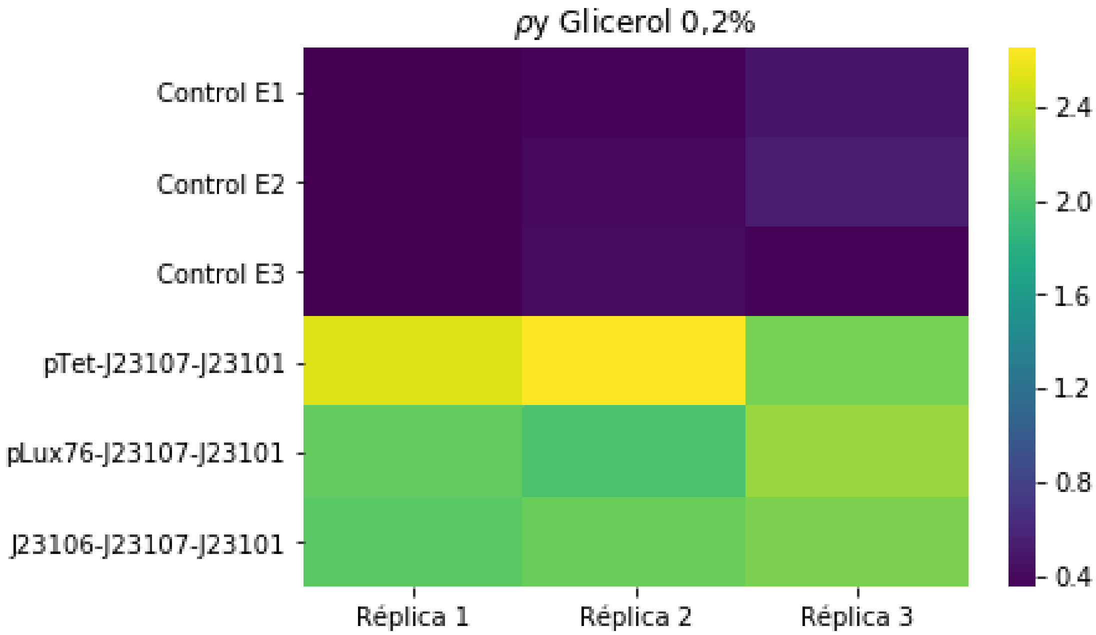




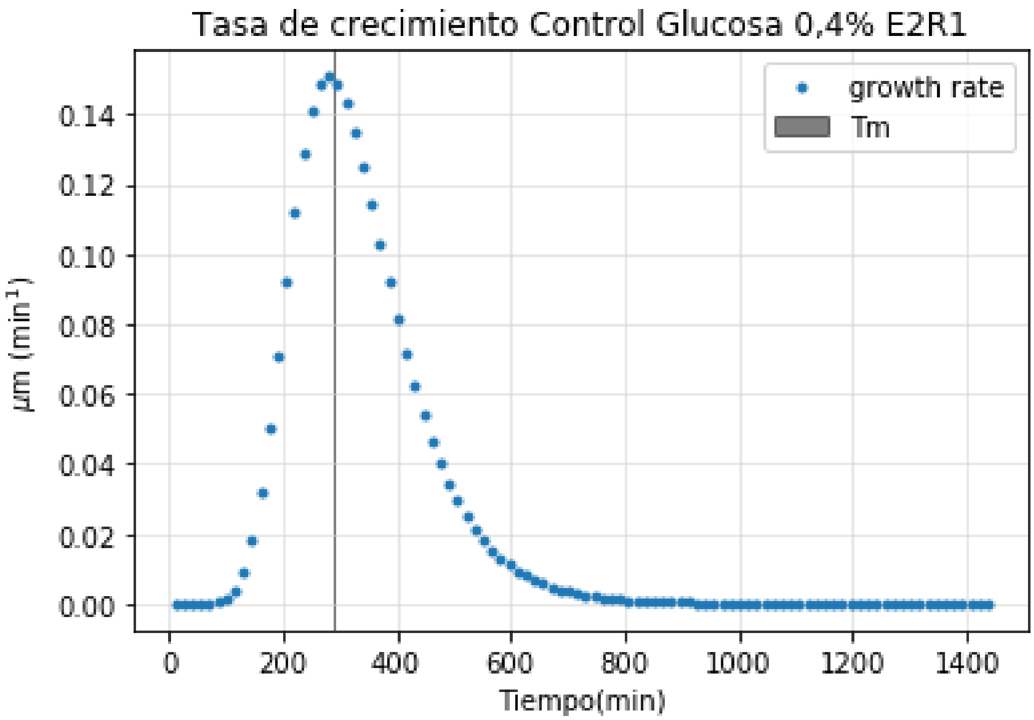
```
In [96]: xlabel=['Réplica 1','Réplica 2','Réplica 3']
         ylabel=['Control E1','Control E2','Control E3','pTet-J23107-J23101','pLux76-J23107-J231

         plt.figure()
         plt.title(r'$\rho$y Glucosa 0,4%')
         sns.heatmap(ro_yfpglu,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)

         plt.figure()
         plt.title(r'$\rho$y Glicerol 0,2%')
         sns.heatmap(ro_yfpgli,cmap='viridis',xticklabels=xlabel,yticklabels=ylabel)
```

```
Out[96]: <matplotlib.axes._subplots.AxesSubplot at 0x23663048588>
```

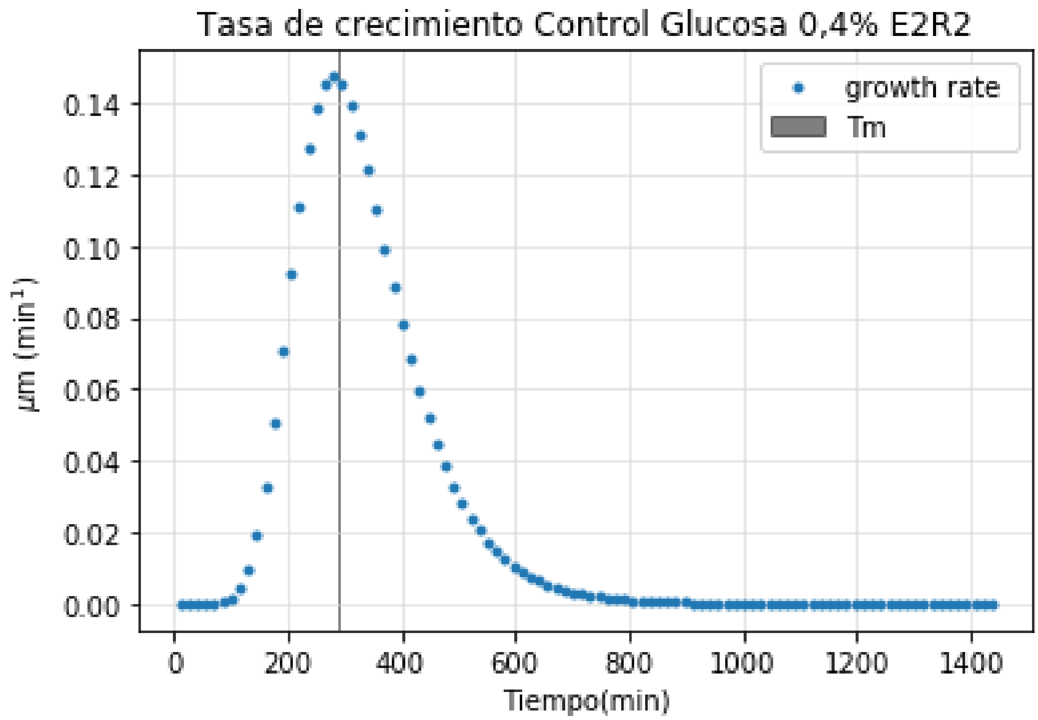





```
In [97]: #tasa de crecimiento
         ye1=((A1*np.exp(-np.exp((((um1*np.exp(1))/A1)*(l1-tt))+1))))
         #Con diff
         dy1=(np.diff(ye1))
         plt.figure()
         plt.title('Tasa de crecimiento Control Glucosa 0,4% E2R1')
         plt.xlabel('Tiempo(min)')
         plt.ylabel(r'$\mu$m (min$^1$)')
         plt.axvspan(tm1,tm1, color='k', alpha=0.5, label="Tm")
         plt.plot(tt[:-1],dy1,'.',label='growth rate')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
         plt.legend(loc='upper right')

Out[97]: <matplotlib.legend.Legend at 0x236632d0ba8>
```

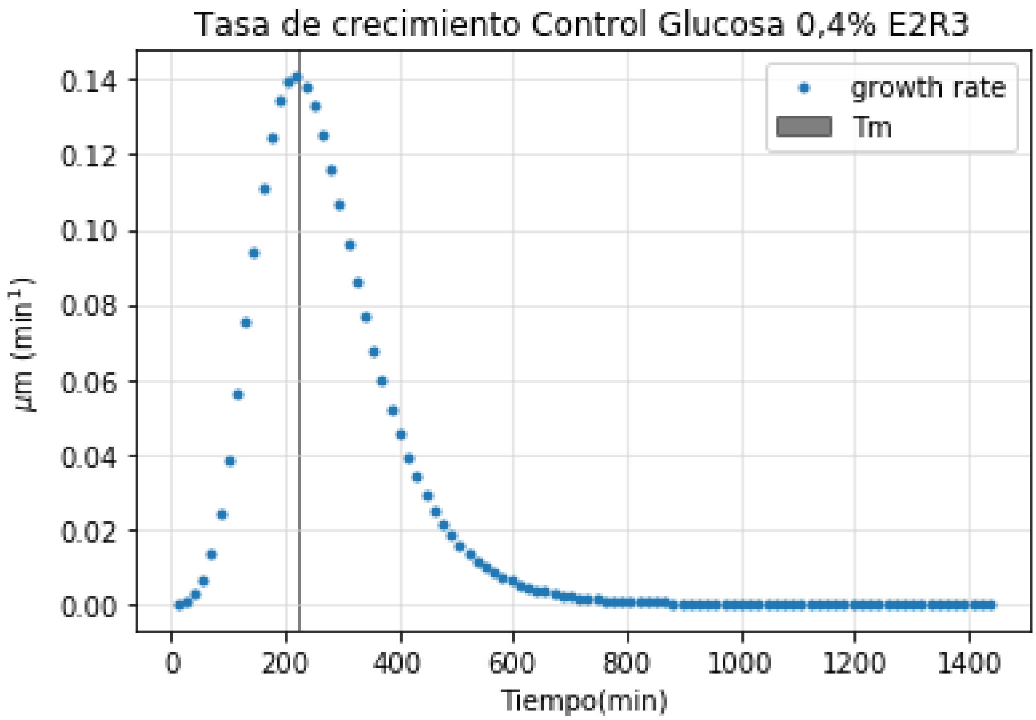



```
In [98]: #tasa de crecimiento

         ye2=((A2*np.exp(-np.exp((((um2*np.exp(1))/A2)*(l2-tt))+1))))
         #Con diff
         dy2=(np.diff(ye2))
         plt.figure()
         plt.title('Tasa de crecimiento Control Glucosa 0,4% E2R2')
         plt.xlabel('Tiempo(min)')
         plt.ylabel(r'$\mu$m (min$^1$)')
         plt.axvspan(tm2,tm2, color='k', alpha=0.5, label="Tm")
         plt.plot(tt[:-1],dy2,'.',label='growth rate ')
         plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
         plt.legend(loc='upper right')

Out[98]: <matplotlib.legend.Legend at 0x23663e03940>
```

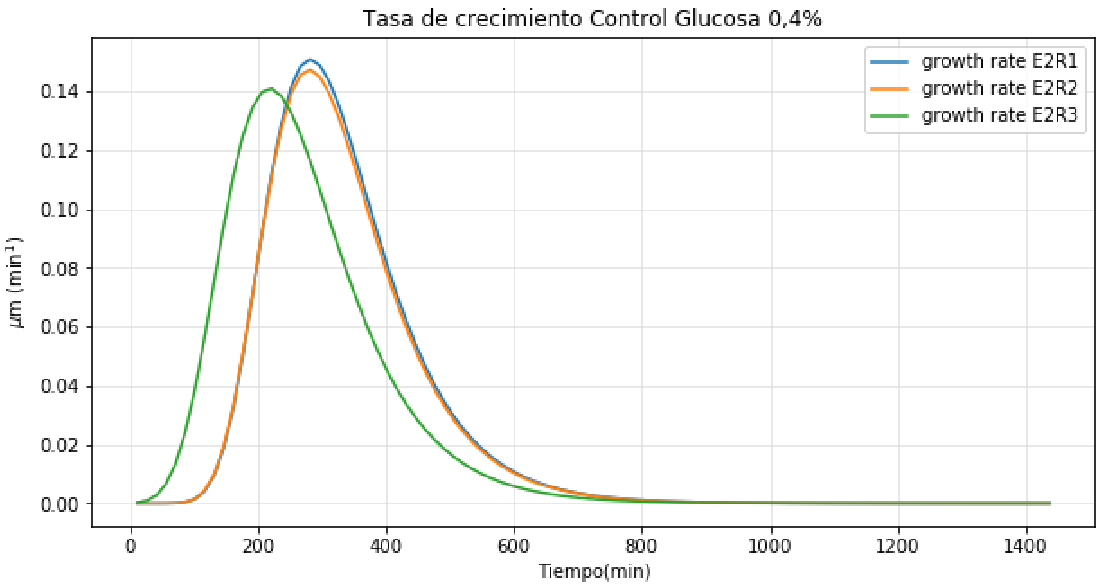


In [99]:
```
#tasa de crecimiento
ye3=((A3*np.exp(-np.exp((((um3*np.exp(1))/A3)*(l3-tt))+1))))
#Con diff
dy3=(np.diff(ye3))
plt.figure()
plt.title('Tasa de crecimiento Control Glucosa 0,4% E2R3')
plt.xlabel('Tiempo(min)')
plt.ylabel(r'$\mu$m (min$^1$)')
plt.axvspan(tm3,tm3, color='k', alpha=0.5, label="Tm")
plt.plot(tt[:-1],dy3,'.',label='growth rate')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc='upper right')
```

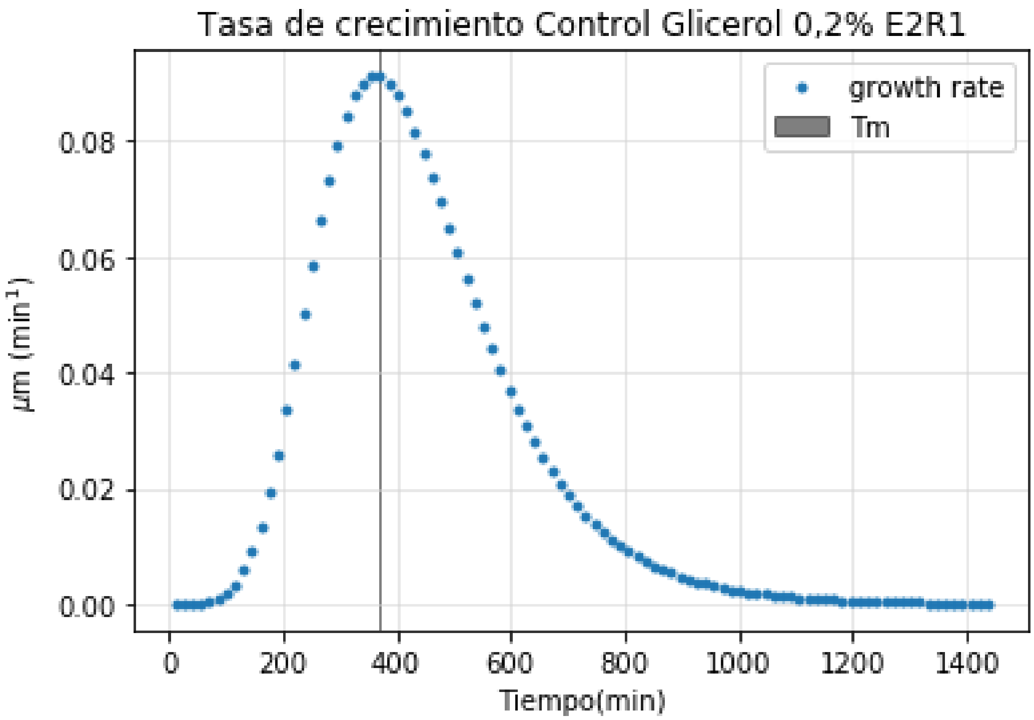
Out[99]:
```
<matplotlib.legend.Legend at 0x23663eccc88>
```



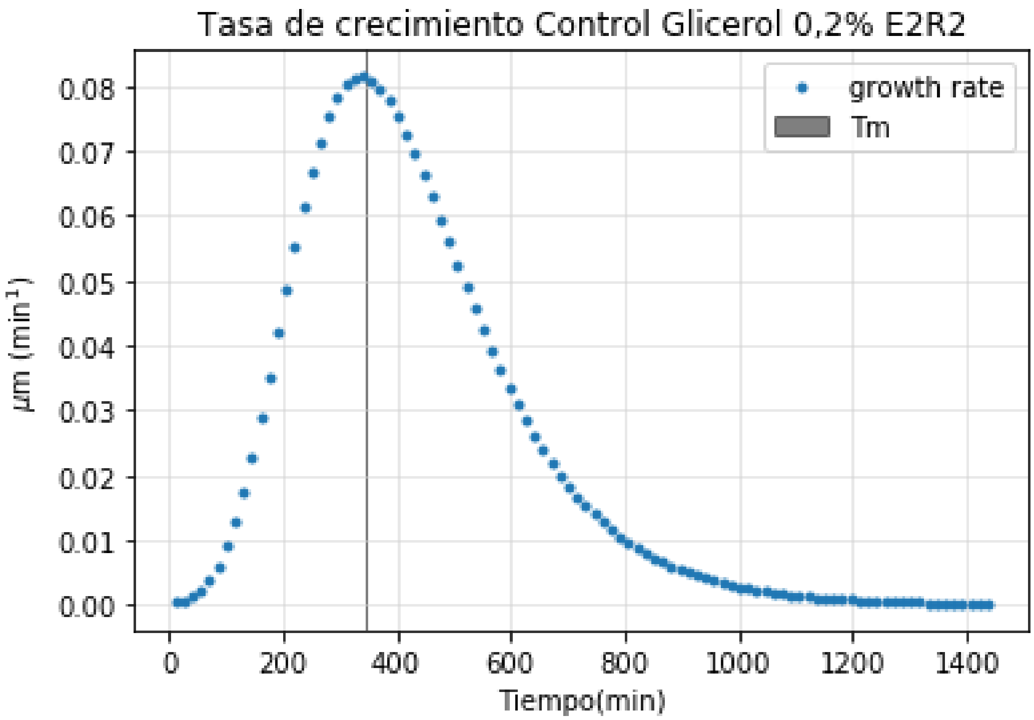

```
In [100]: #Tasas control réplicas glucosa
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento Control Glucosa 0,4%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy1,label='growth rate E2R1')
          plt.plot(tt[:-1],dy2,label='growth rate E2R2')
          plt.plot(tt[:-1],dy3,label='growth rate E2R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[100]: <matplotlib.legend.Legend at 0x23664f75a58>
```



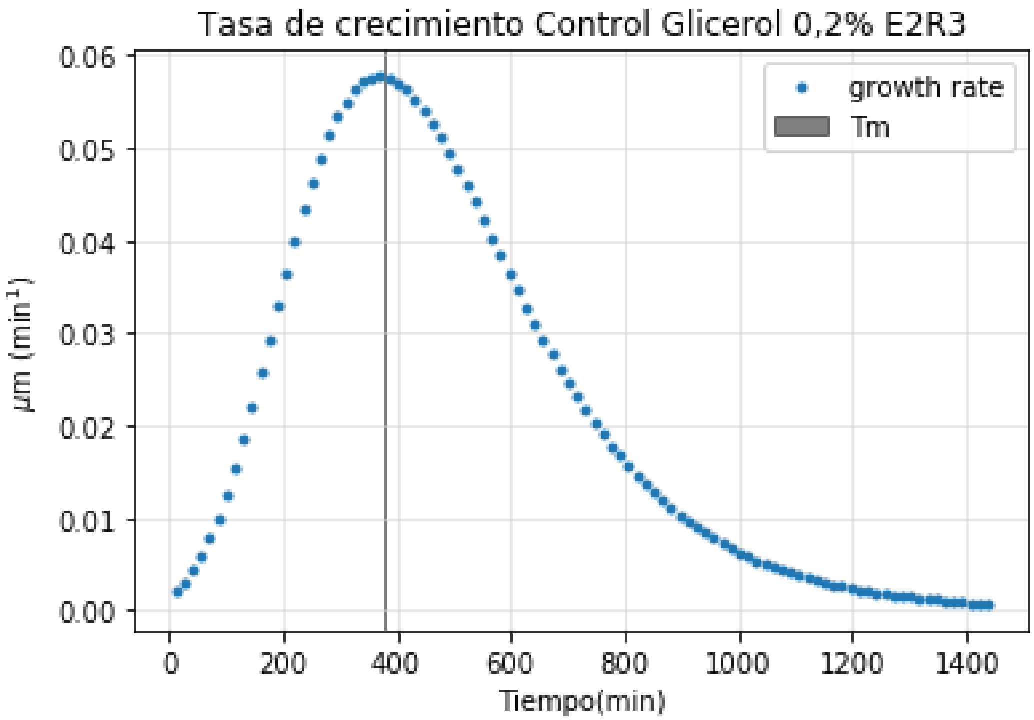

```
In [101]: #tasa de crecimiento
          ye4=((A4*np.exp(-np.exp((((um4*np.exp(1))/A4)*(l4-tt))+1))))
          #Con diff
          dy4=(np.diff(ye4))
          plt.figure()
          plt.title('Tasa de crecimiento Control Glicerol 0,2% E2R1')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm4,tm4, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy4,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[101]: <matplotlib.legend.Legend at 0x2366505dcf8>
```



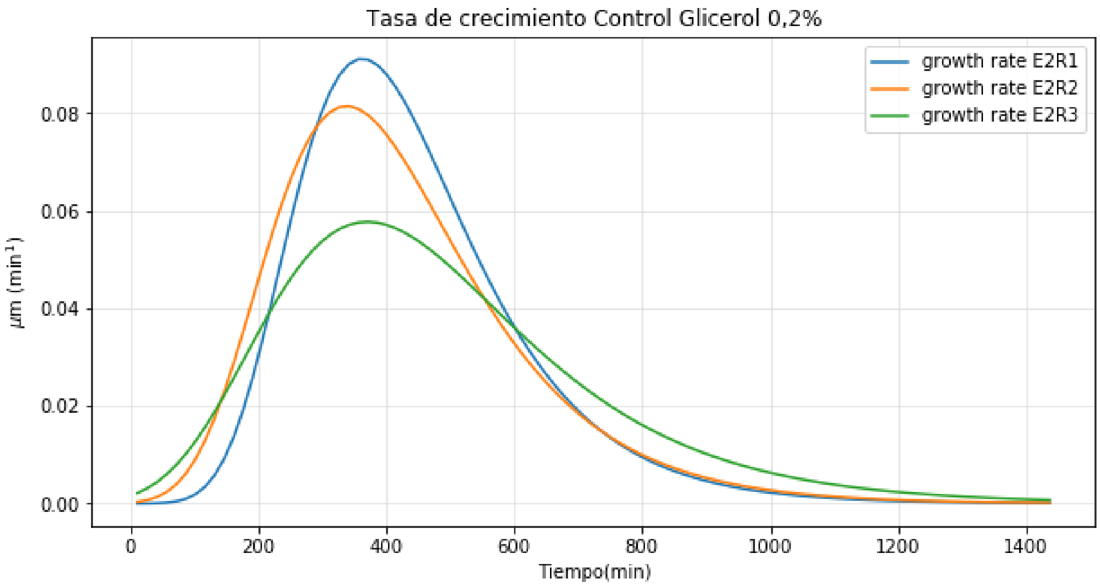

```
In [102]: #tasa de crecimiento
          ye5=((A5*np.exp(-np.exp((((um5*np.exp(1))/A5)*(l5-tt))+1))))
          #Con diff
          dy5=(np.diff(ye5))
          plt.figure()
          plt.title('Tasa de crecimiento Control Glicerol 0,2% E2R2')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm5,tm5, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy5,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[102]: <matplotlib.legend.Legend at 0x23665129ac8>
```



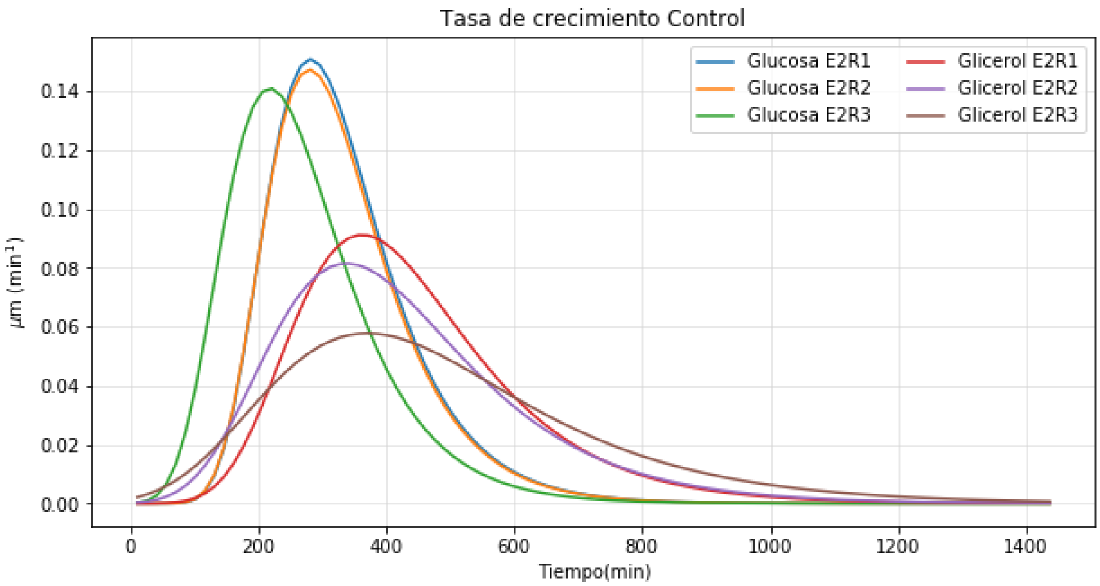

```
In [103]: #tasa de crecimiento
          ye6=((A6*np.exp(-np.exp((((um6*np.exp(1))/A6)*(l6-tt))+1))))
          #Con diff
          dy6=(np.diff(ye6))
          plt.figure()
          plt.title('Tasa de crecimiento Control Glicerol 0,2% E2R3')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm6,tm6, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy6,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[103]: <matplotlib.legend.Legend at 0x236651feba8>
```



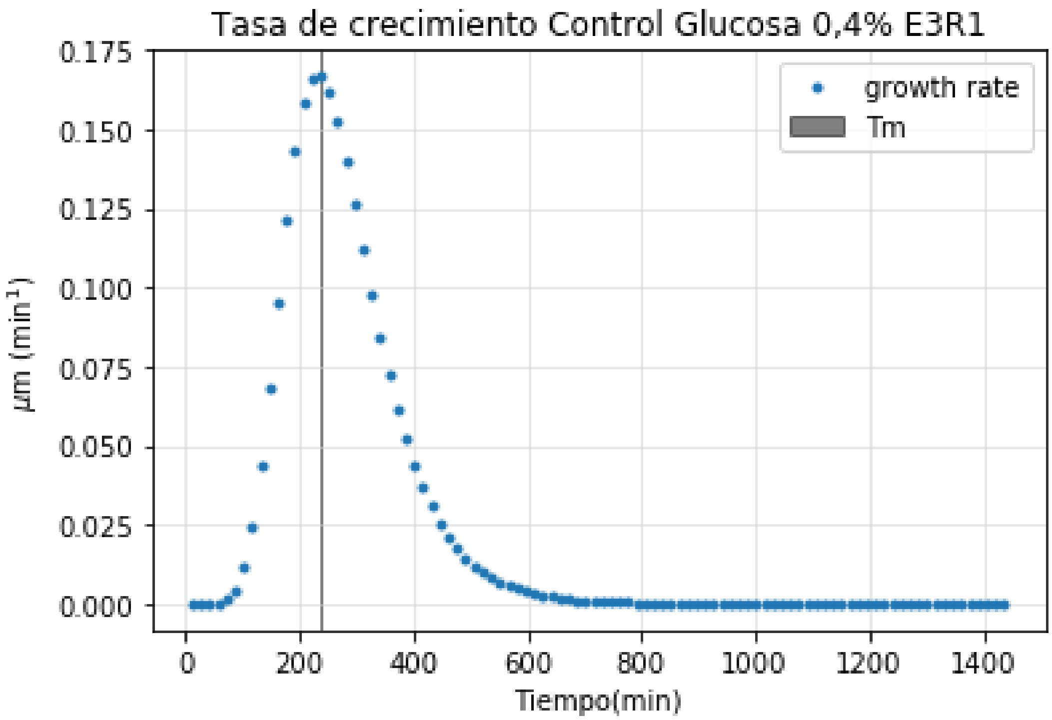

```
In [104]: #Tasas control réplicas glicerol
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento Control Glicerol 0,2%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy4,label='growth rate E2R1')
          plt.plot(tt[:-1],dy5,label='growth rate E2R2')
          plt.plot(tt[:-1],dy6,label='growth rate E2R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[104]: <matplotlib.legend.Legend at 0x236652d79e8>
```



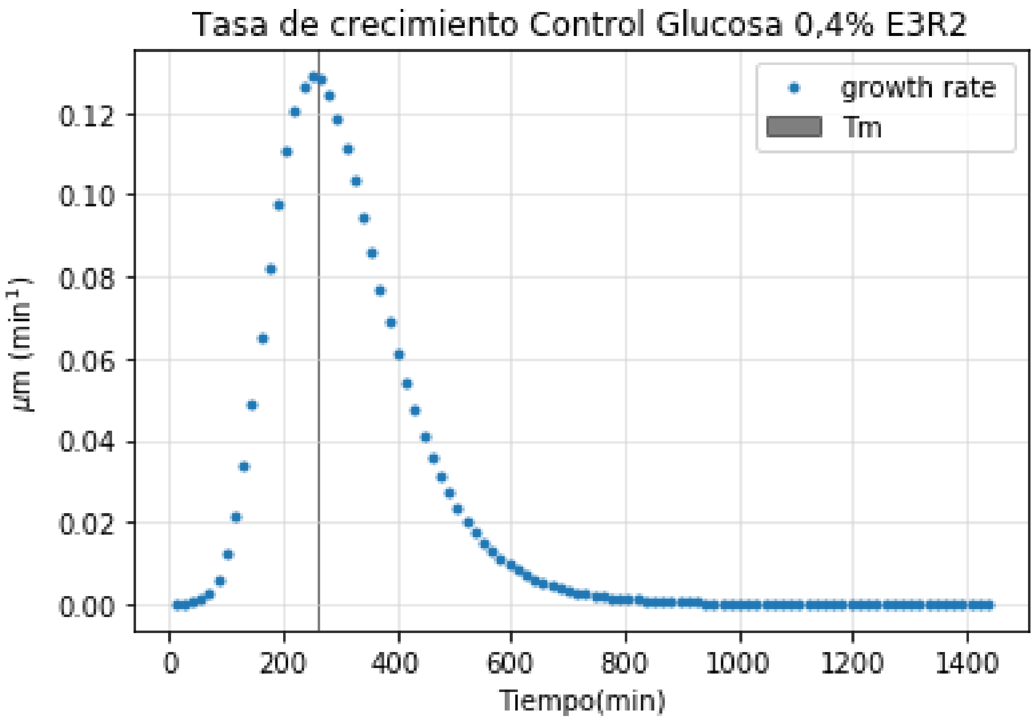

```
In [105]: #Tasas control réplicas controles
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento Control')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy1,label='Glucosa E2R1')
          plt.plot(tt[:-1],dy2,label='Glucosa E2R2')
          plt.plot(tt[:-1],dy3,label='Glucosa E2R3')
          plt.plot(tt[:-1],dy4,label='Glicerol E2R1')
          plt.plot(tt[:-1],dy5,label='Glicerol E2R2')
          plt.plot(tt[:-1],dy6,label='Glicerol E2R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right',ncol=2)

Out[105]: <matplotlib.legend.Legend at 0x236653c16a0>
```



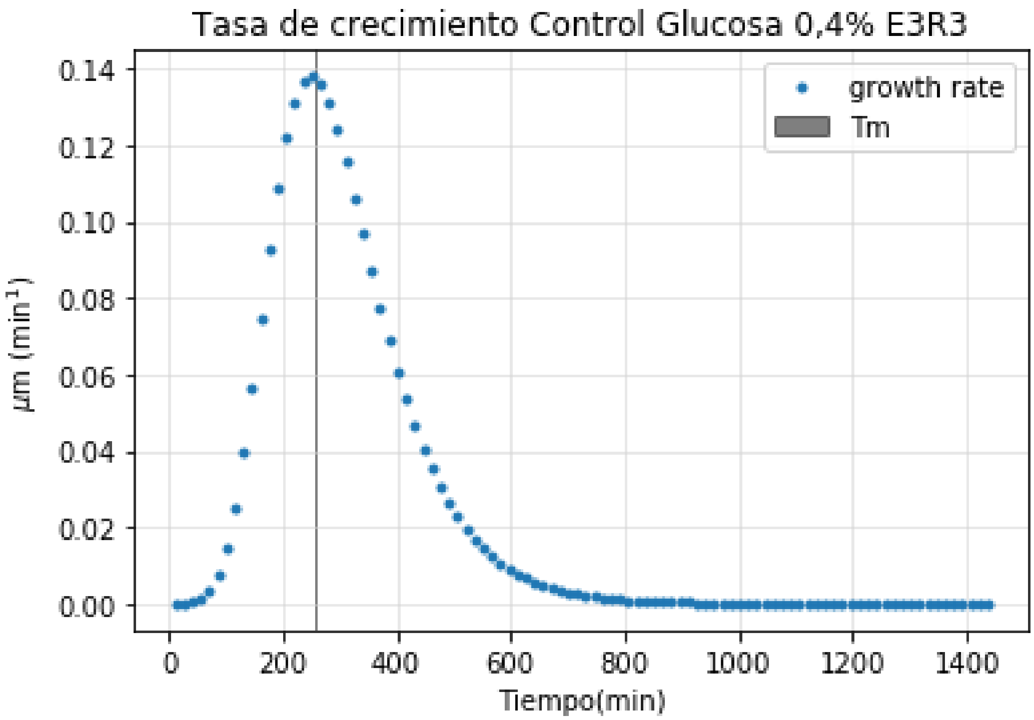

```
In [106]: #tasa de crecimiento
          ye7=((A7*np.exp(-np.exp((((um7*np.exp(1))/A7)*(l7-tt))+1))))
          #Con diff
          dy7=(np.diff(ye7))
          plt.figure()
          plt.title('Tasa de crecimiento Control Glucosa 0,4% E3R1')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm7,tm7, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy7,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[106]: <matplotlib.legend.Legend at 0x2366549d898>
```



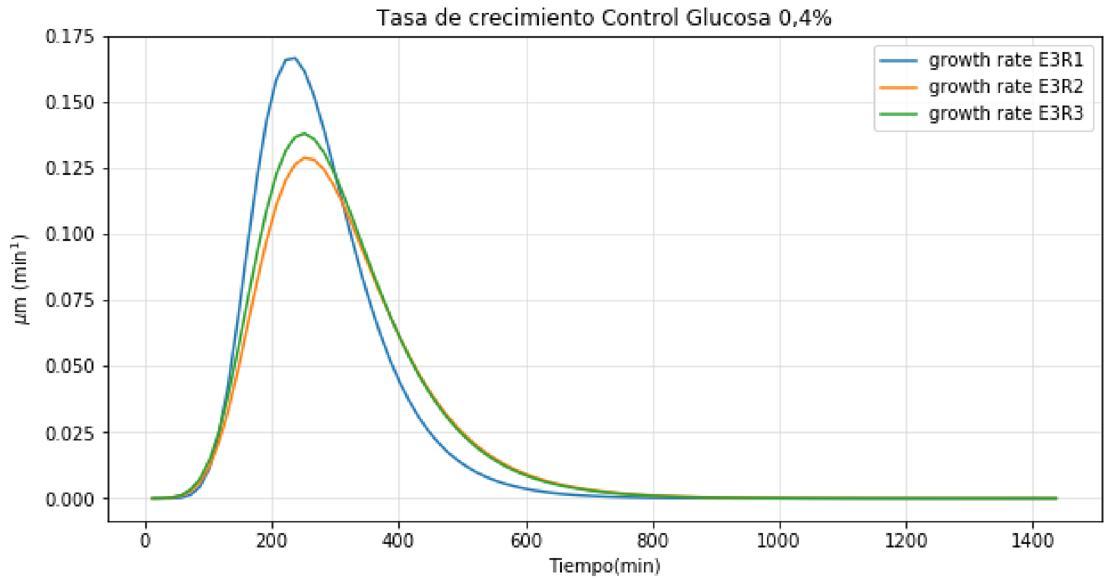

```
In [107]: #tasa de crecimiento

          ye8=((A8*np.exp(-np.exp((((um8*np.exp(1))/A8)*(l8-tt))+1))))
          #Con diff
          dy8=(np.diff(ye8))
          plt.figure()
          plt.title('Tasa de crecimiento Control Glucosa 0,4% E3R2')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm8,tm8, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy8,'.',label='growth rate ')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[107]: <matplotlib.legend.Legend at 0x23665575fd0>
```



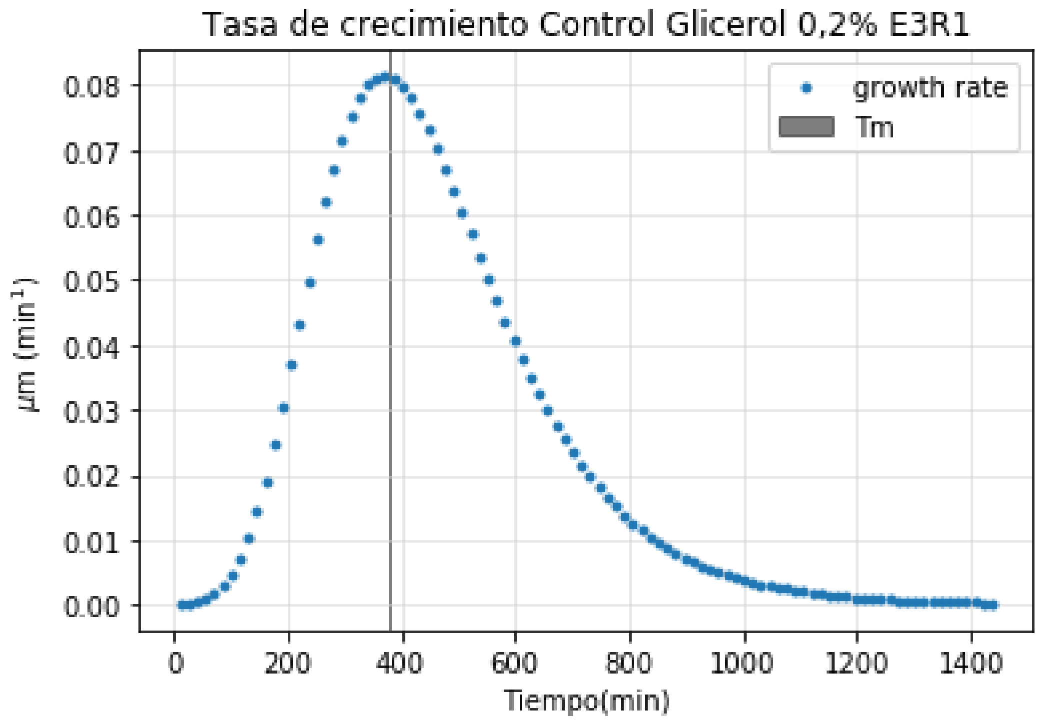

```
In [108]: #tasa de crecimiento
          ye9=((A9*np.exp(-np.exp((((um9*np.exp(1))/A9)*(l9-tt))+1))))
          #Con diff
          dy9=(np.diff(ye9))
          plt.figure()
          plt.title('Tasa de crecimiento Control Glucosa 0,4% E3R3')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm9,tm9, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy9,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[108]: <matplotlib.legend.Legend at 0x23663ee3940>
```



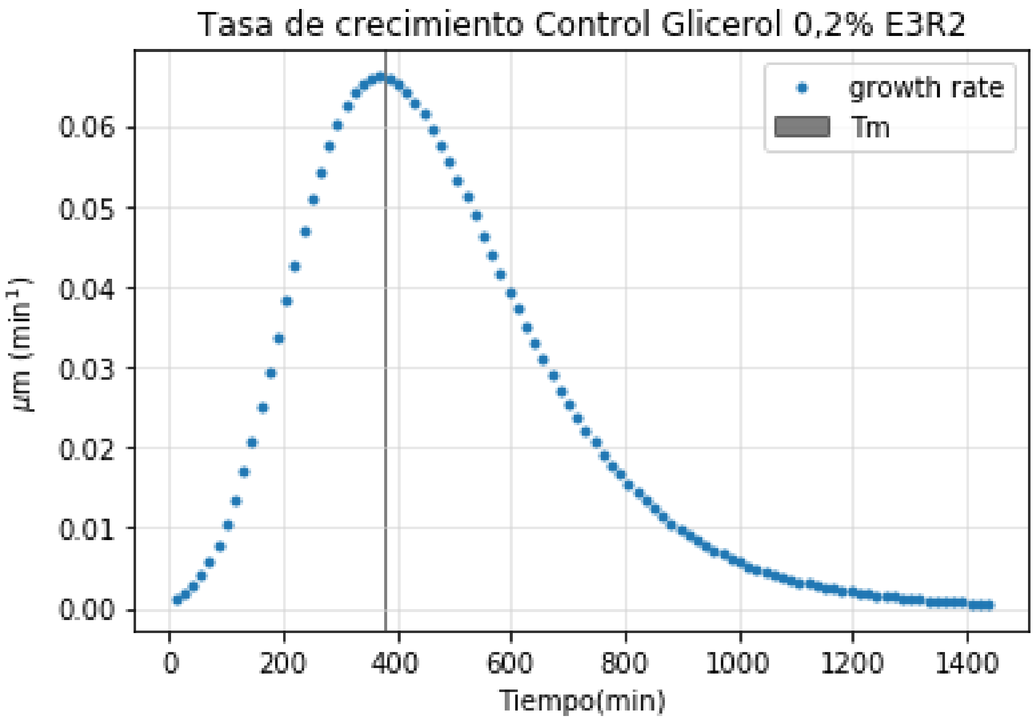

```
In [109]: #Tasas control réplicas glucosa
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento Control Glucosa 0,4%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy7,label='growth rate E3R1')
          plt.plot(tt[:-1],dy8,label='growth rate E3R2')
          plt.plot(tt[:-1],dy9,label='growth rate E3R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[109]: <matplotlib.legend.Legend at 0x23661bf3b00>
```



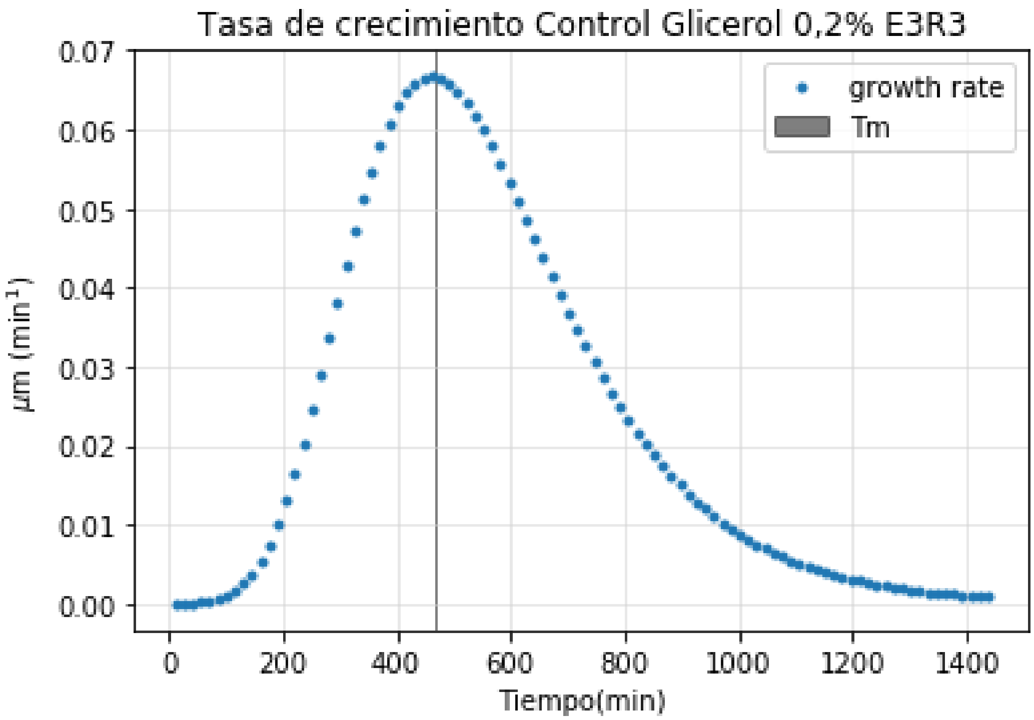

```
In [110]: #tasa de crecimiento
          ye10=((A10*np.exp(-np.exp((((um10*np.exp(1))/A10)*(l10-tt))+1))))
          #Con diff
          dy10=(np.diff(ye10))
          plt.figure()
          plt.title('Tasa de crecimiento Control Glicerol 0,2% E3R1')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm10,tm10, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy10,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[110]: <matplotlib.legend.Legend at 0x2366269fd30>
```



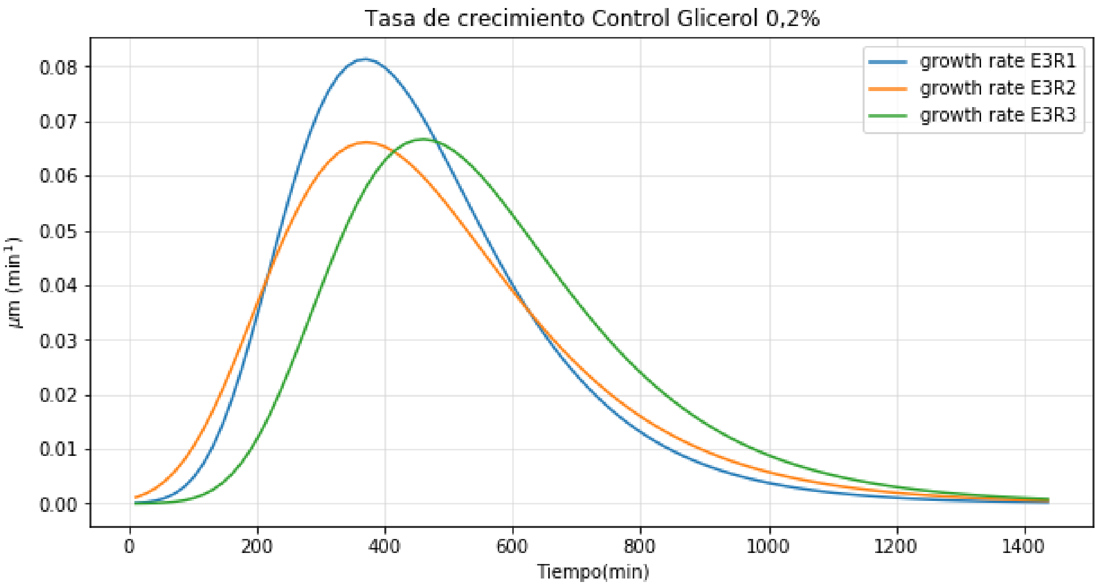

```
In [111]: #tasa de crecimiento
          ye11=((A11*np.exp(-np.exp((((um11*np.exp(1))/A11)*(l11-tt))+1))))
          #Con diff
          dy11=(np.diff(ye11))
          plt.figure()
          plt.title('Tasa de crecimiento Control Glicerol 0,2% E3R2')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm11,tm11, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy11,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[111]: <matplotlib.legend.Legend at 0x2365d6699e8>
```



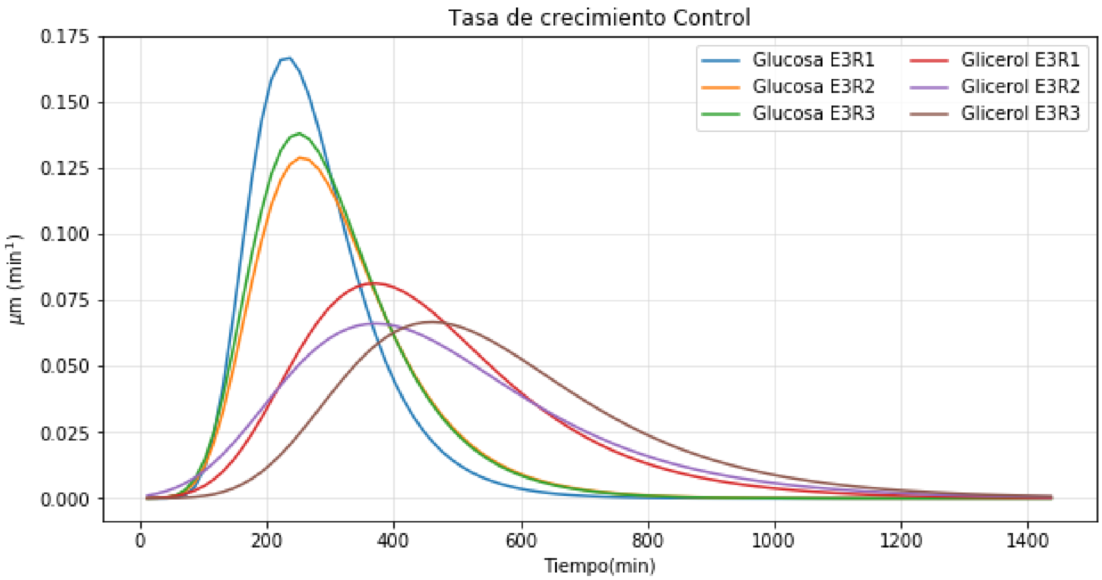

```
In [112]: #tasa de crecimiento
          ye12=((A12*np.exp(-np.exp((((um12*np.exp(1))/A12)*(l12-tt))+1))))
          #Con diff
          dy12=(np.diff(ye12))
          plt.figure()
          plt.title('Tasa de crecimiento Control Glicerol 0,2% E3R3')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm12,tm12, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy12,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[112]: <matplotlib.legend.Legend at 0x2365f57e7f0>
```



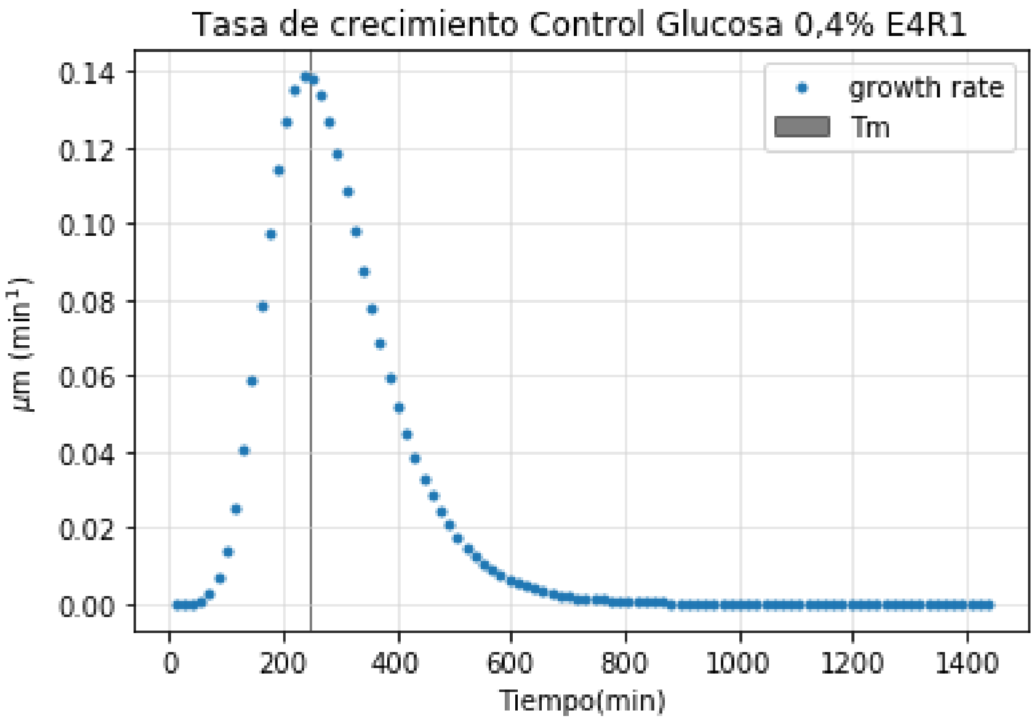

```
In [113]: #Tasas control réplicas glicerol
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento Control Glicerol 0,2%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy10,label='growth rate E3R1')
          plt.plot(tt[:-1],dy11,label='growth rate E3R2')
          plt.plot(tt[:-1],dy12,label='growth rate E3R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[113]: <matplotlib.legend.Legend at 0x23665230dd8>
```




```
In [114]: #Tasas control réplicas controles
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento Control')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy7,label='Glucosa E3R1')
          plt.plot(tt[:-1],dy8,label='Glucosa E3R2')
          plt.plot(tt[:-1],dy9,label='Glucosa E3R3')
          plt.plot(tt[:-1],dy10,label='Glicerol E3R1')
          plt.plot(tt[:-1],dy11,label='Glicerol E3R2')
          plt.plot(tt[:-1],dy12,label='Glicerol E3R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right',ncol=2)

Out[114]: <matplotlib.legend.Legend at 0x23661a25ac8>
```

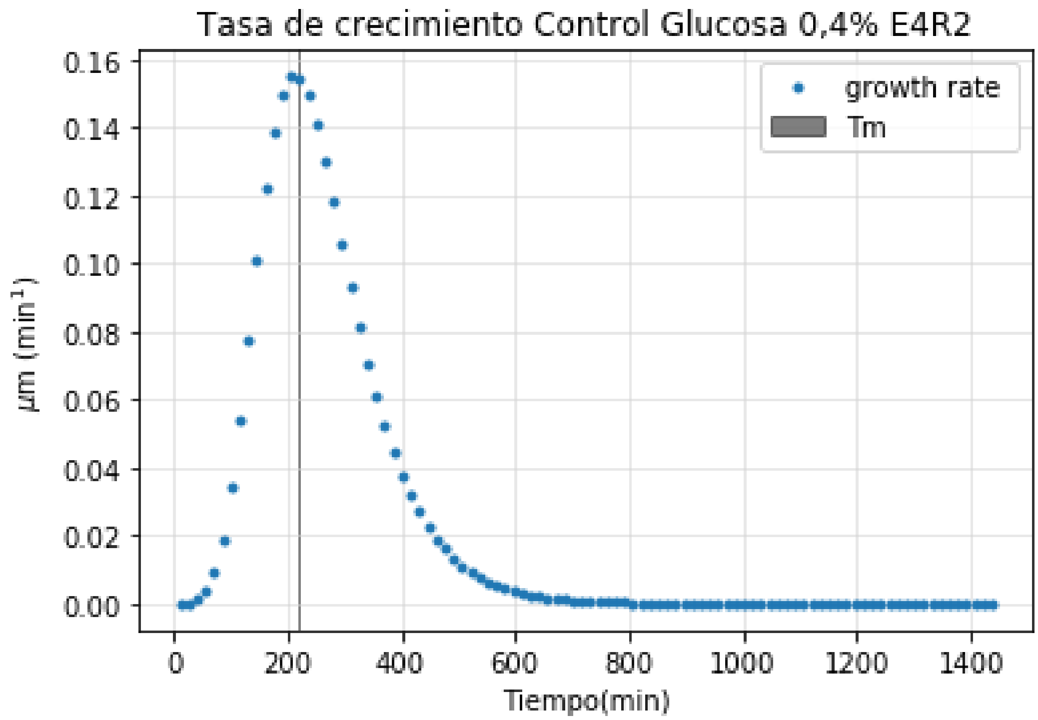



```
In [115]: #tasa de crecimiento
          ye13=((A13*np.exp(-np.exp((((um13*np.exp(1))/A13)*(l13-tt))+1))))
          #Con diff
          dy13=(np.diff(ye13))
          plt.figure()
          plt.title('Tasa de crecimiento Control Glucosa 0,4% E4R1')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm13,tm13, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy13,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[115]: <matplotlib.legend.Legend at 0x236636bfef0>
```



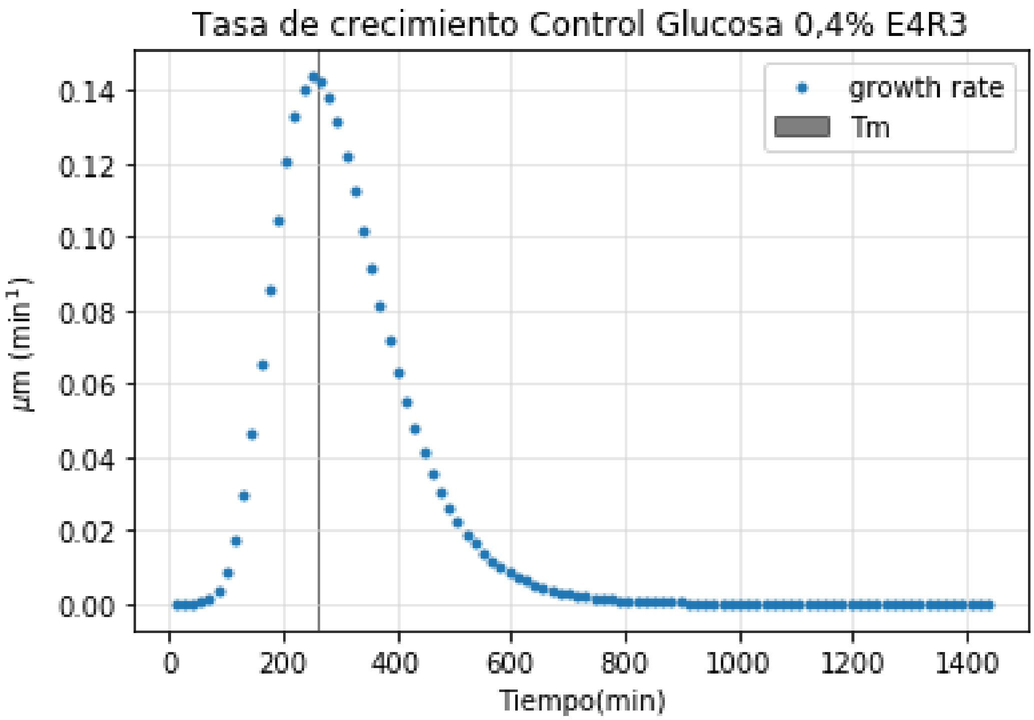
In [116]:
```
#tasa de crecimiento

ye14=((A14*np.exp(-np.exp((((um14*np.exp(1))/A14)*(l14-tt))+1))))
#Con diff
dy14=(np.diff(ye14))
plt.figure()
plt.title('Tasa de crecimiento Control Glucosa 0,4% E4R2')
plt.xlabel('Tiempo(min)')
plt.ylabel(r'$\mu$m (min$^1$)')
plt.axvspan(tm14,tm14, color='k', alpha=0.5, label="Tm")
plt.plot(tt[:-1],dy14,'.',label='growth rate ')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc='upper right')
```

Out[116]:
```
<matplotlib.legend.Legend at 0x23663792a90>
```

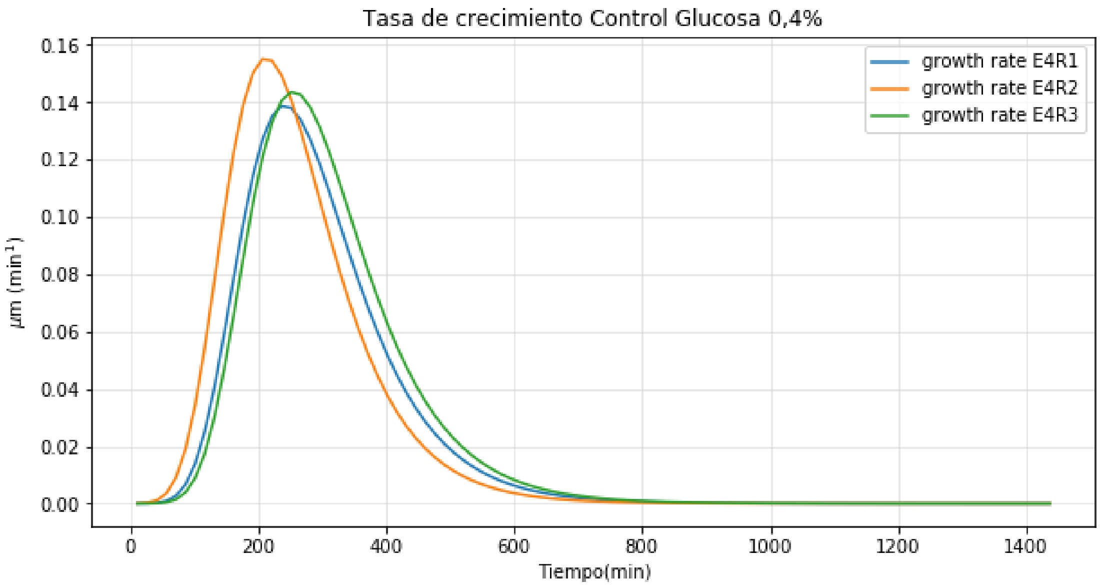


In [117]:
```
#tasa de crecimiento
ye15=((A15*np.exp(-np.exp((((um15*np.exp(1))/A15)*(l15-tt))+1))))
#Con diff
dy15=(np.diff(ye15))
plt.figure()
plt.title('Tasa de crecimiento Control Glucosa 0,4% E4R3')
plt.xlabel('Tiempo(min)')
plt.ylabel(r'$\mu$m (min$^1$)')
plt.axvspan(tm15,tm15, color='k', alpha=0.5, label="Tm")
plt.plot(tt[:-1],dy15,'.',label='growth rate')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc='upper right')
```

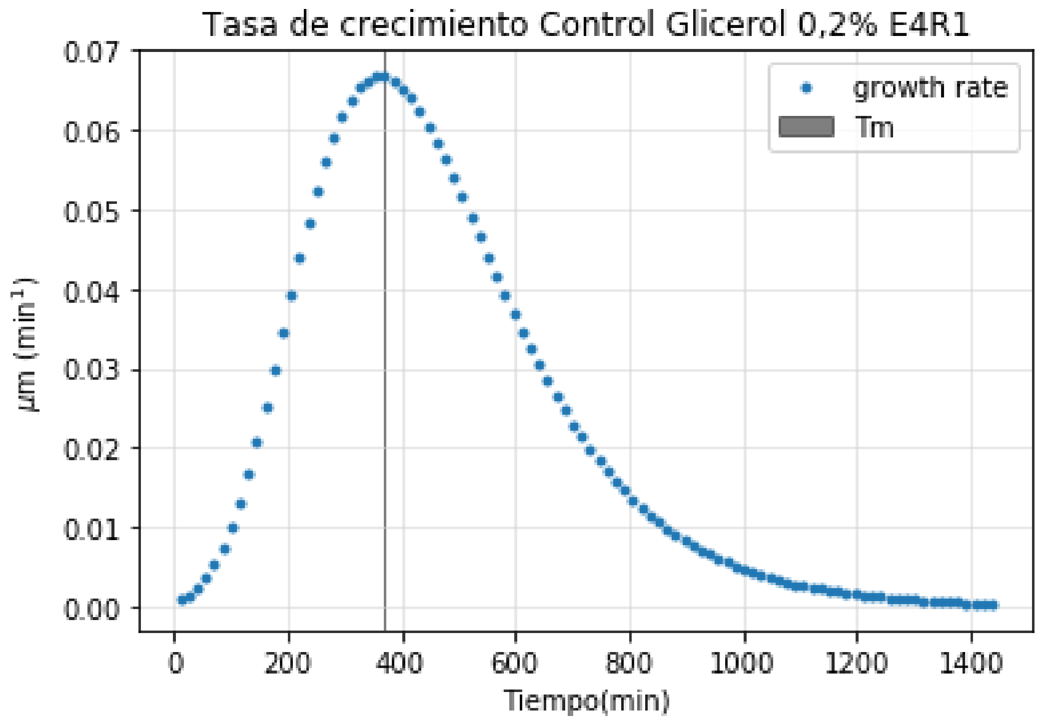
Out[117]:
```
<matplotlib.legend.Legend at 0x2366384fef0>
```




```
In [118]: #Tasas control réplicas glucosa
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento Control Glucosa 0,4%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy13,label='growth rate E4R1')
          plt.plot(tt[:-1],dy14,label='growth rate E4R2')
          plt.plot(tt[:-1],dy15,label='growth rate E4R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[118]: <matplotlib.legend.Legend at 0x236639269b0>
```

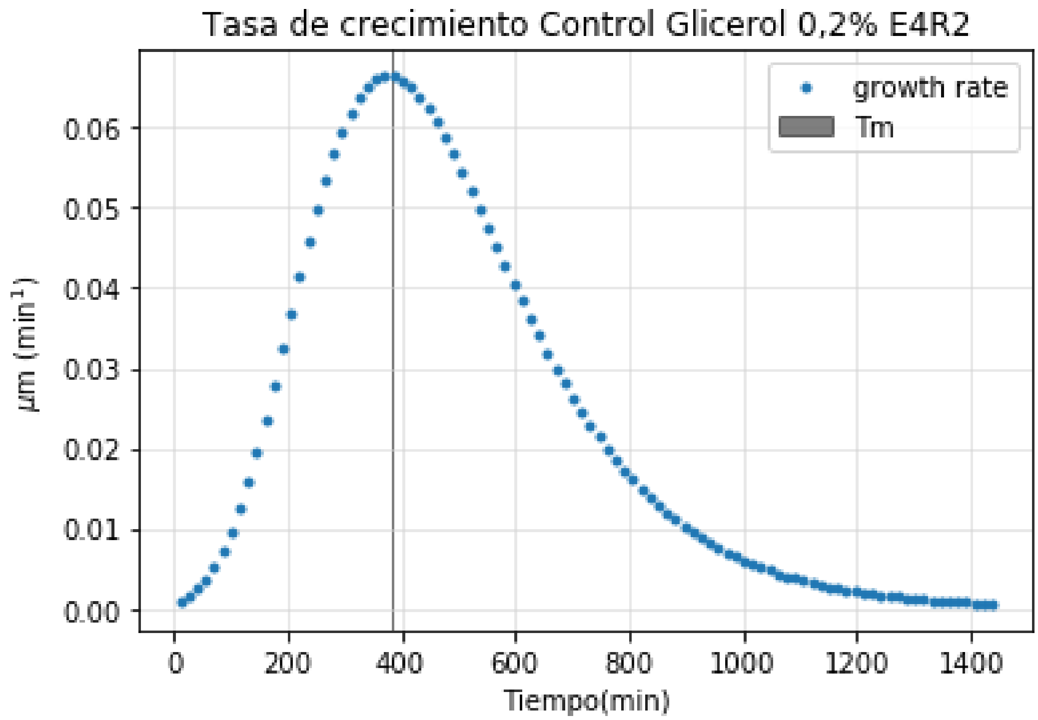



```
In [119]: #tasa de crecimiento
          ye16=((A16*np.exp(-np.exp((((um16*np.exp(1))/A16)*(l16-tt))+1))))
          #Con diff
          dy16=(np.diff(ye16))
          plt.figure()
          plt.title('Tasa de crecimiento Control Glicerol 0,2% E4R1')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm16,tm16, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy16,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[119]: <matplotlib.legend.Legend at 0x236639f17f0>
```

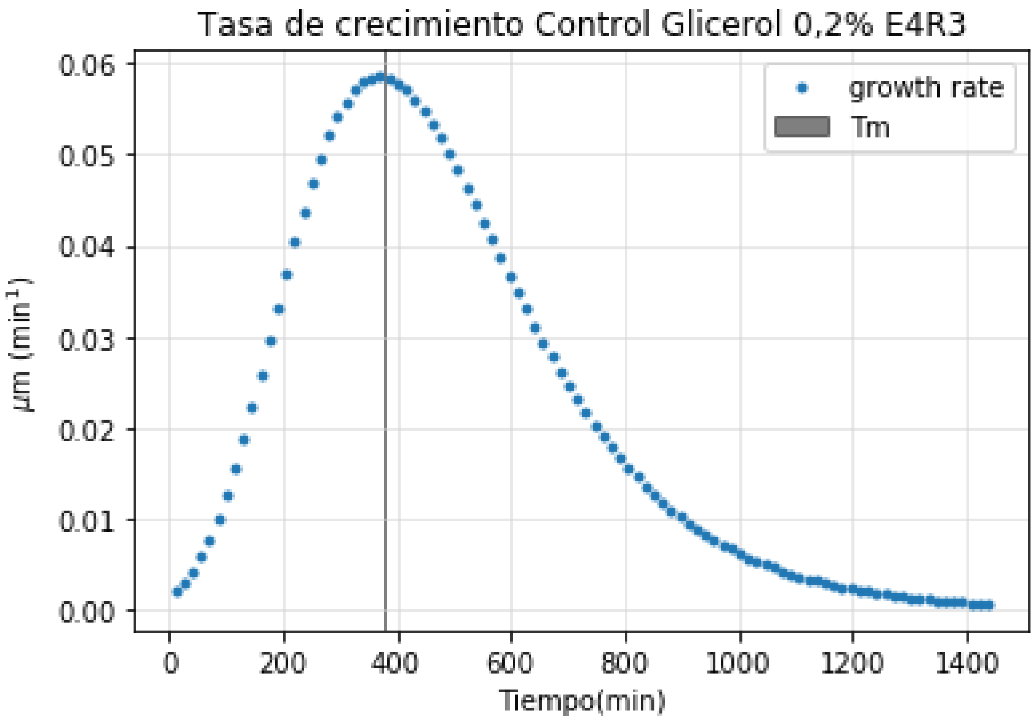


In [120]:
```
#tasa de crecimiento
ye17=((A17*np.exp(-np.exp((((um17*np.exp(1))/A17)*(l17-tt))+1))))
#Con diff
dy17=(np.diff(ye17))
plt.figure()
plt.title('Tasa de crecimiento Control Glicerol 0,2% E4R2')
plt.xlabel('Tiempo(min)')
plt.ylabel(r'$\mu$m (min$^1$)')
plt.axvspan(tm17,tm17, color='k', alpha=0.5, label="Tm")
plt.plot(tt[:-1],dy17,'.',label='growth rate')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc='upper right')
```

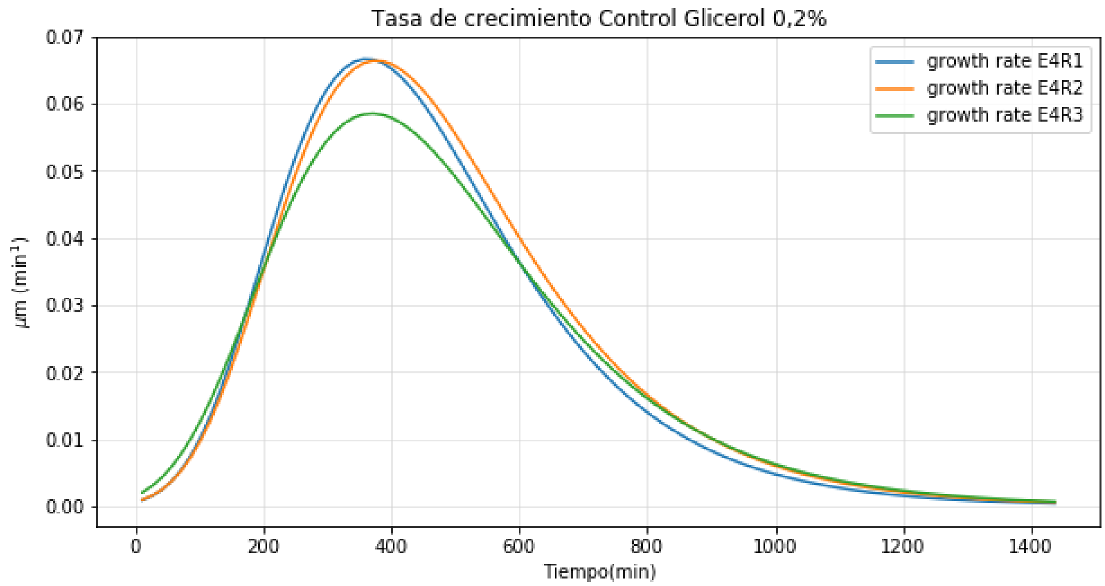
Out[120]:
```
<matplotlib.legend.Legend at 0x23666612d68>
```



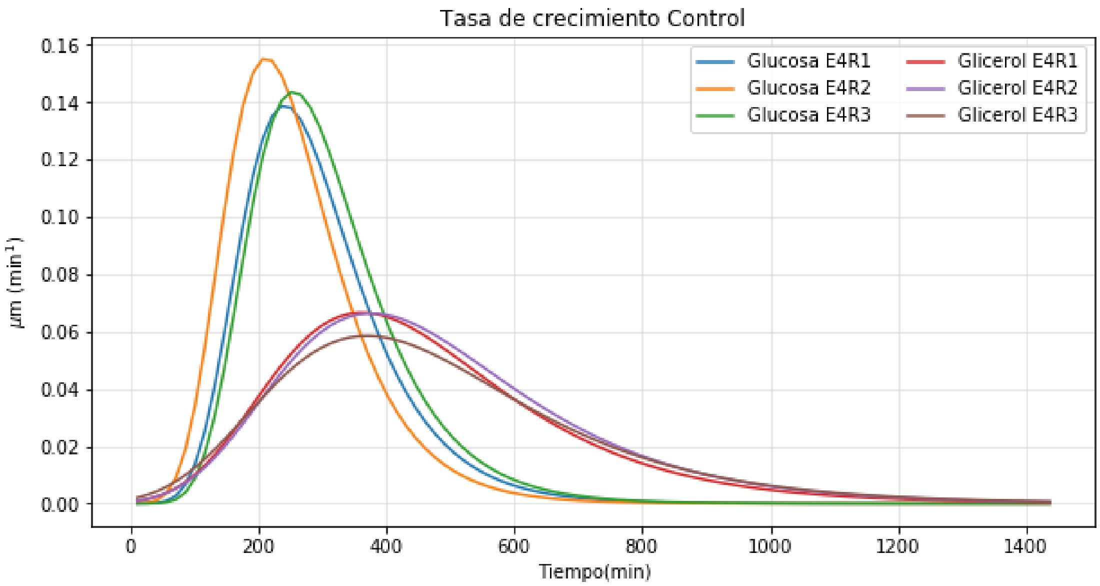

```
In [121]: #tasa de crecimiento
          ye18=((A18*np.exp(-np.exp((((um18*np.exp(1))/A18)*(l18-tt))+1))))
          #Con diff
          dy18=(np.diff(ye18))
          plt.figure()
          plt.title('Tasa de crecimiento Control Glicerol 0,2% E4R3')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm18,tm18, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy18,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[121]: <matplotlib.legend.Legend at 0x236666e2c18>
```



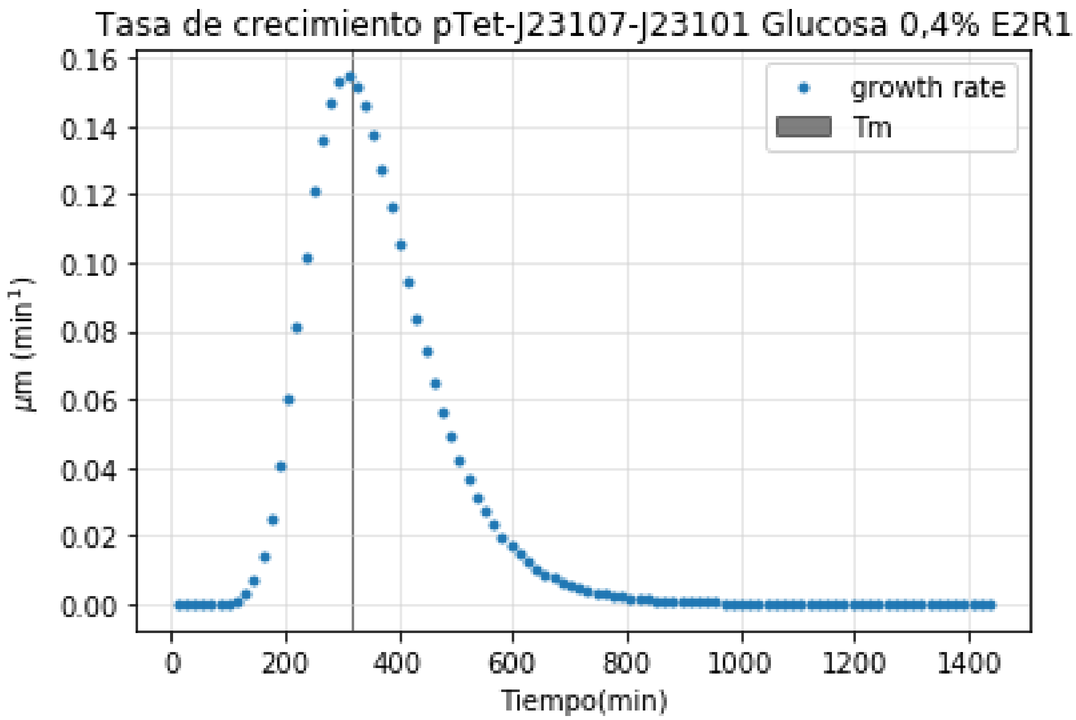

```
In [122]: #Tasas control réplicas glicerol
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento Control Glicerol 0,2%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy16,label='growth rate E4R1')
          plt.plot(tt[:-1],dy17,label='growth rate E4R2')
          plt.plot(tt[:-1],dy18,label='growth rate E4R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[122]: <matplotlib.legend.Legend at 0x236667b9a20>
```



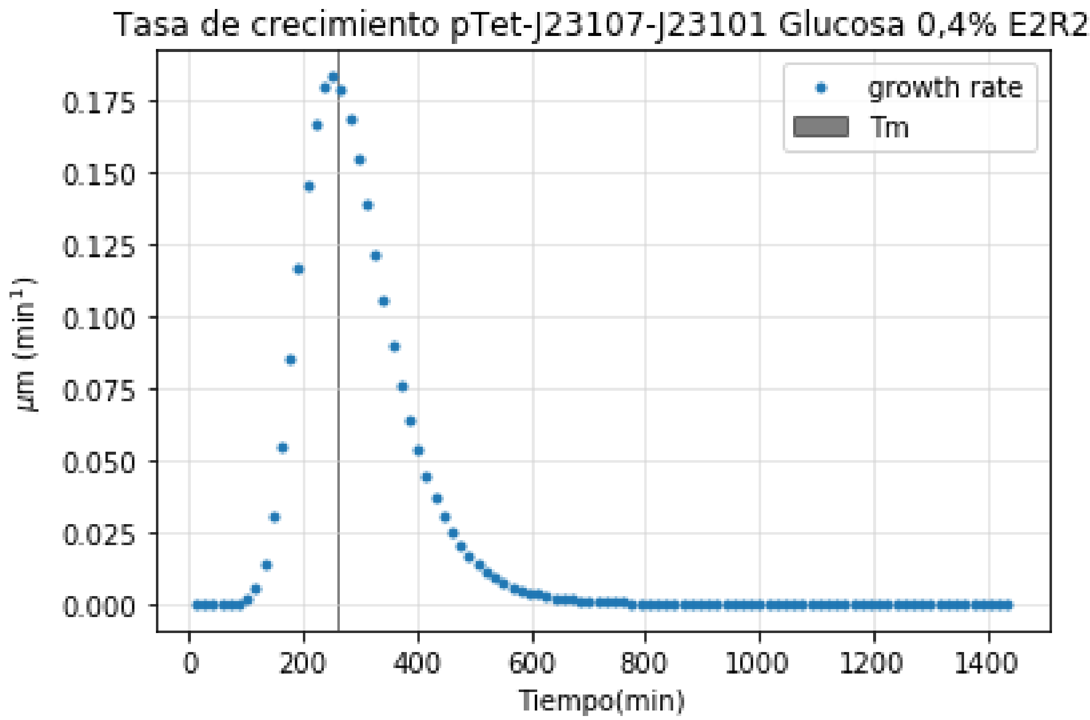

```
In [123]: #Tasas control réplicas controles
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento Control')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy13,label='Glucosa E4R1')
          plt.plot(tt[:-1],dy14,label='Glucosa E4R2')
          plt.plot(tt[:-1],dy15,label='Glucosa E4R3')
          plt.plot(tt[:-1],dy16,label='Glicerol E4R1')
          plt.plot(tt[:-1],dy17,label='Glicerol E4R2')
          plt.plot(tt[:-1],dy18,label='Glicerol E4R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right',ncol=2)

Out[123]: <matplotlib.legend.Legend at 0x236668a3c50>
```



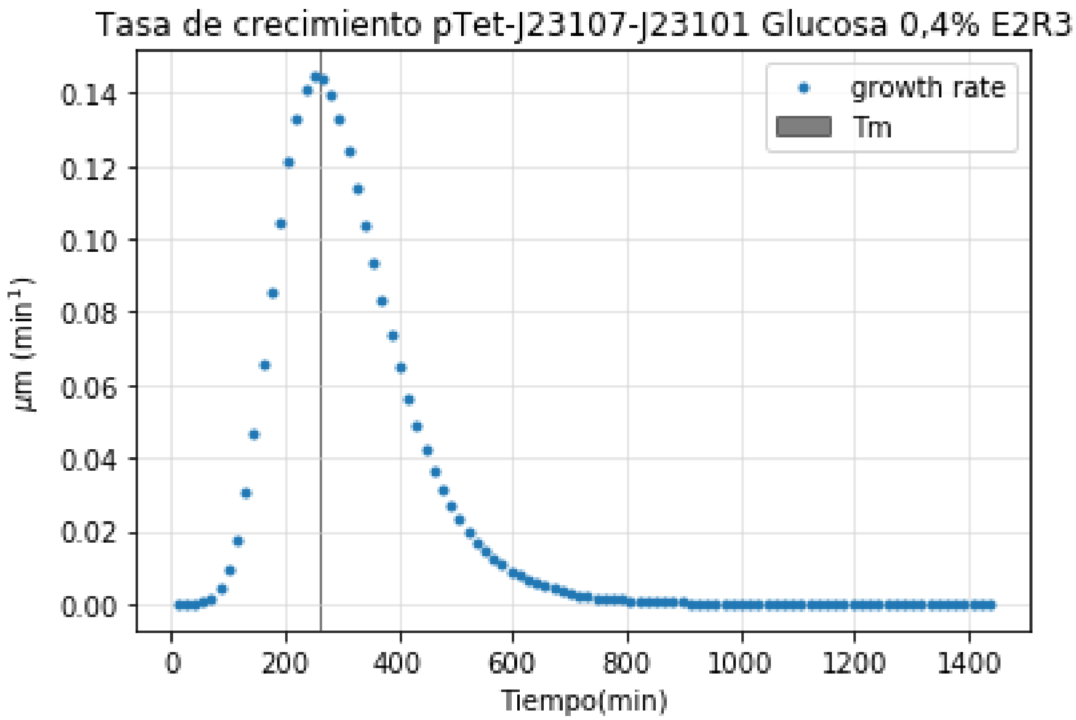

```
In [124]: #tasa de crecimiento
          ye19=((A19*np.exp(-np.exp((((um19*np.exp(1))/A19)*(l19-tt))+1))))
          #Con diff
          dy19=(np.diff(ye19))
          plt.figure()
          plt.title('Tasa de crecimiento pTet-J23107-J23101 Glucosa 0,4% E2R1')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm19,tm19, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy19,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[124]: <matplotlib.legend.Legend at 0x23666985eb8>
```



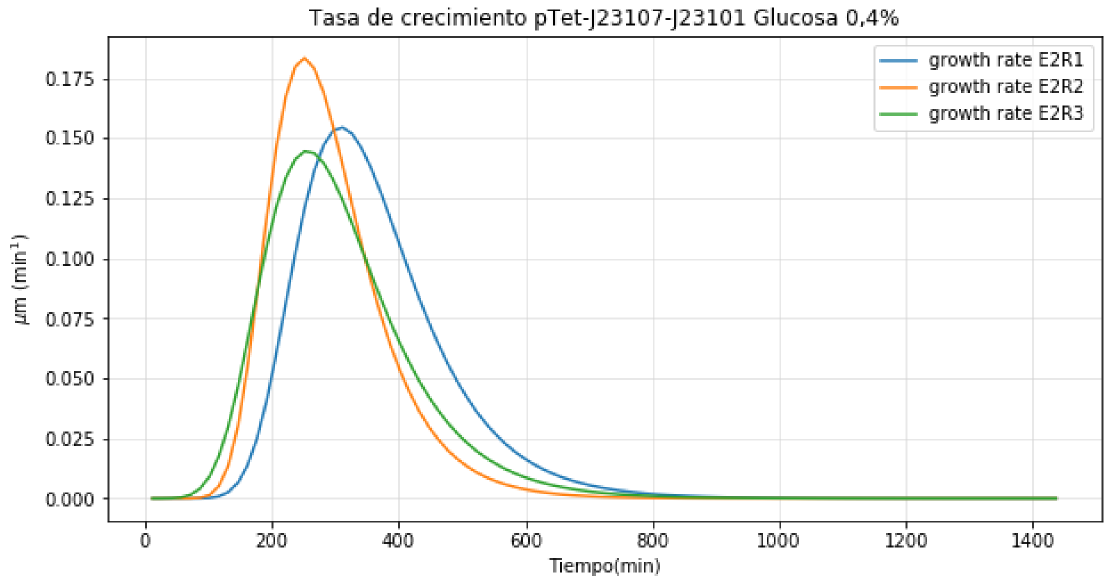

```
In [125]: #tasa de crecimiento
          ye20=((A20*np.exp(-np.exp((((um20*np.exp(1))/A20)*(l20-tt))+1))))
          #Con diff
          dy20=(np.diff(ye20))
          plt.figure()
          plt.title('Tasa de crecimiento pTet-J23107-J23101 Glucosa 0,4% E2R2')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm20,tm20, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy20,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[125]: <matplotlib.legend.Legend at 0x23666a61a58>
```



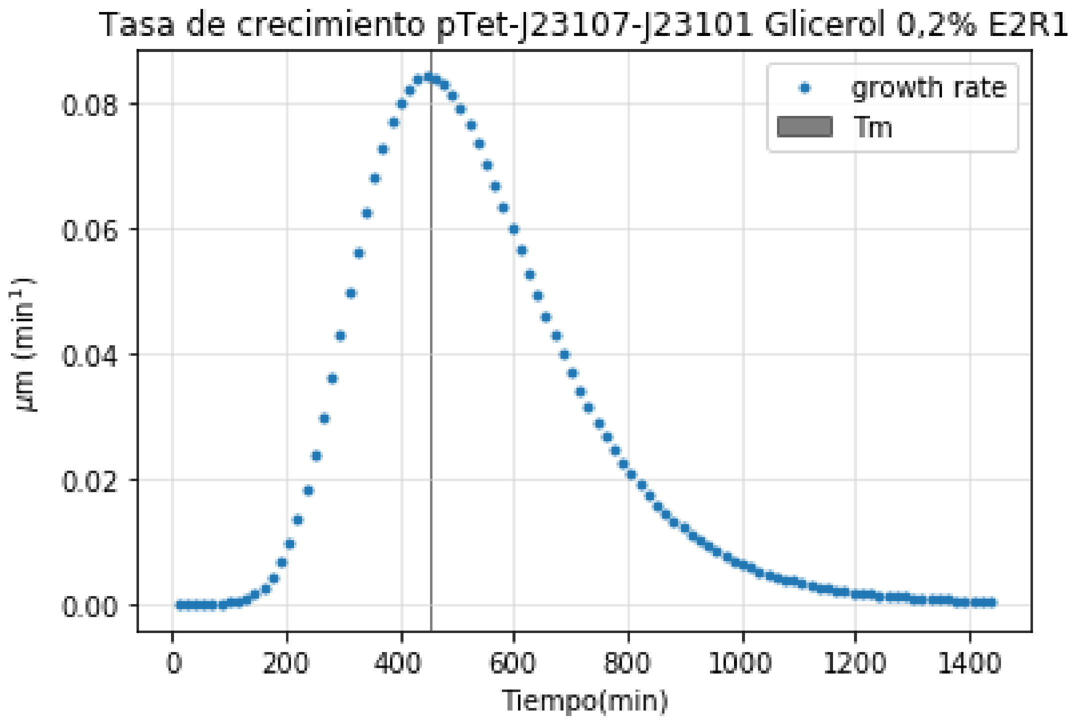

```
In [126]: #tasa de crecimiento
          ye21=((A21*np.exp(-np.exp((((um21*np.exp(1))/A21)*(l21-tt))+1))))
          #Con diff
          dy21=(np.diff(ye21))
          plt.figure()
          plt.title('Tasa de crecimiento pTet-J23107-J23101 Glucosa 0,4% E2R3')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm21,tm21, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy21,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[126]: <matplotlib.legend.Legend at 0x23666b418d0>
```



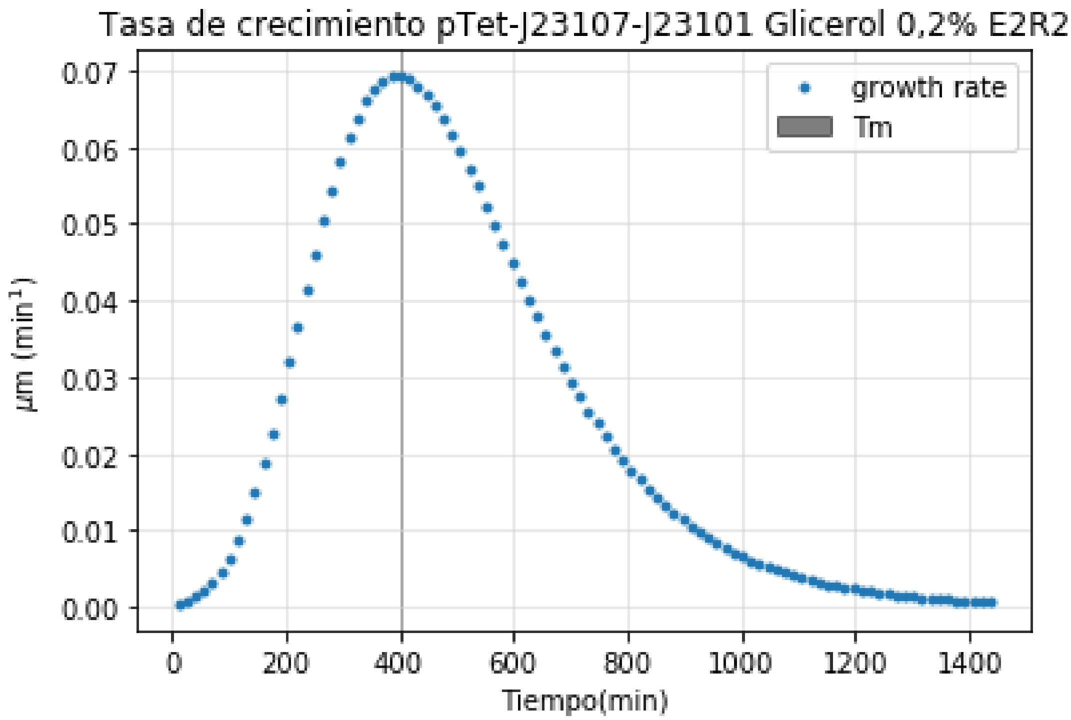

```
In [127]: #Tasas pLux-J23101-J23101 réplicas glucosa
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento pTet-J23107-J23101 Glucosa 0,4%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy19,label='growth rate E2R1')
          plt.plot(tt[:-1],dy20,label='growth rate E2R2')
          plt.plot(tt[:-1],dy21,label='growth rate E2R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[127]: <matplotlib.legend.Legend at 0x23666c13828>
```



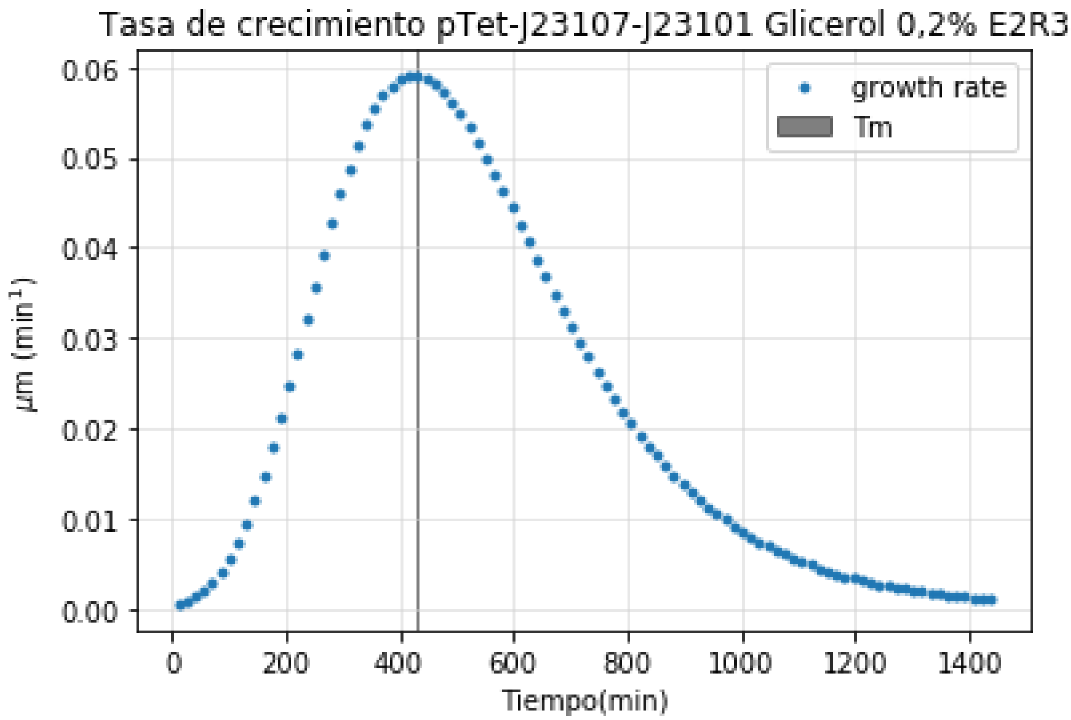

```
In [128]: #tasa de crecimiento
          ye22=((A22*np.exp(-np.exp((((um22*np.exp(1))/A22)*(l22-tt))+1))))
          #Con diff
          dy22=(np.diff(ye22))
          plt.figure()
          plt.title('Tasa de crecimiento pTet-J23107-J23101 Glicerol 0,2% E2R1')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm22,tm22, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy22,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[128]: <matplotlib.legend.Legend at 0x23667cc9d68>
```



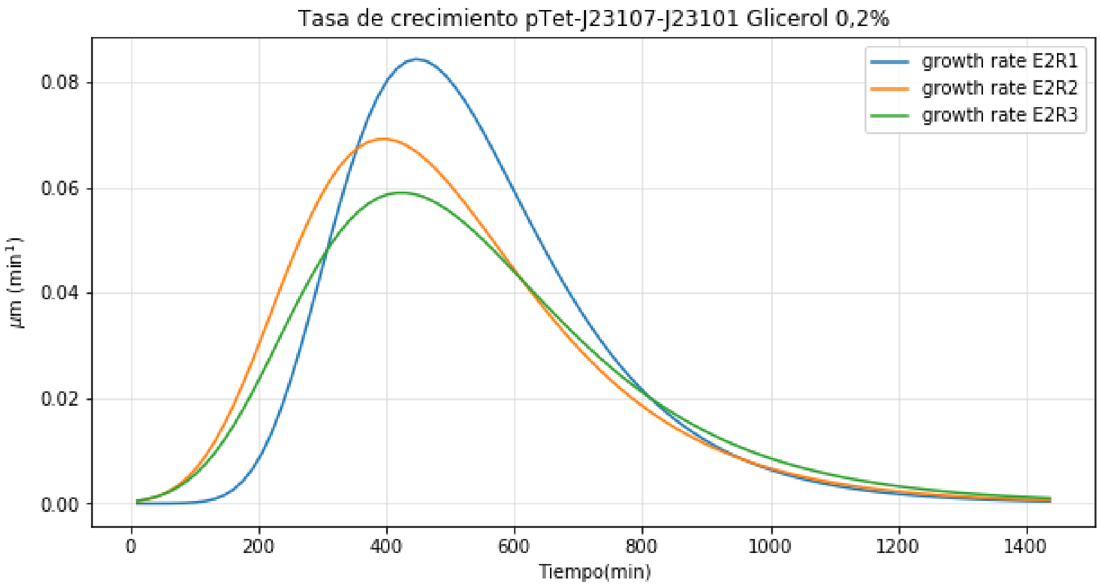

```
In [129]: #tasa de crecimiento
          ye23=((A23*np.exp(-np.exp((((um23*np.exp(1))/A23)*(l23-tt))+1))))
          #Con diff
          dy23=(np.diff(ye23))
          plt.figure()
          plt.title('Tasa de crecimiento pTet-J23107-J23101 Glicerol 0,2% E2R2')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm23,tm23, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy23,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[129]: <matplotlib.legend.Legend at 0x23667d96a20>
```



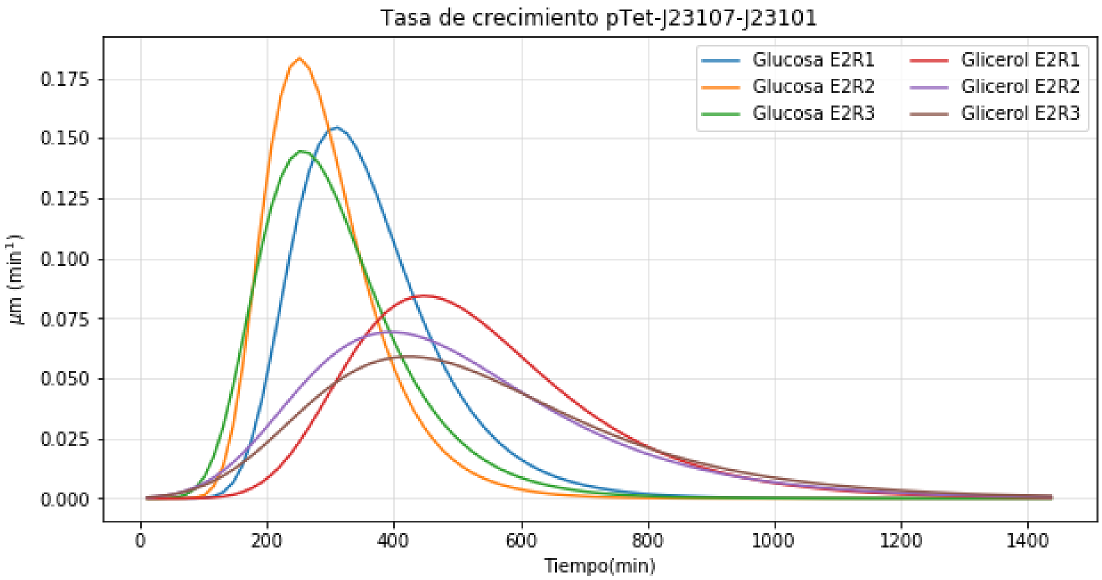

```
In [130]: #tasa de crecimiento
          ye24=((A24*np.exp(-np.exp((((um24*np.exp(1))/A24)*(l24-tt))+1))))
          #Con diff
          dy24=(np.diff(ye24))
          plt.figure()
          plt.title('Tasa de crecimiento pTet-J23107-J23101 Glicerol 0,2% E2R3')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm24,tm24, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy24,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[130]: <matplotlib.legend.Legend at 0x23667e6aac8>
```



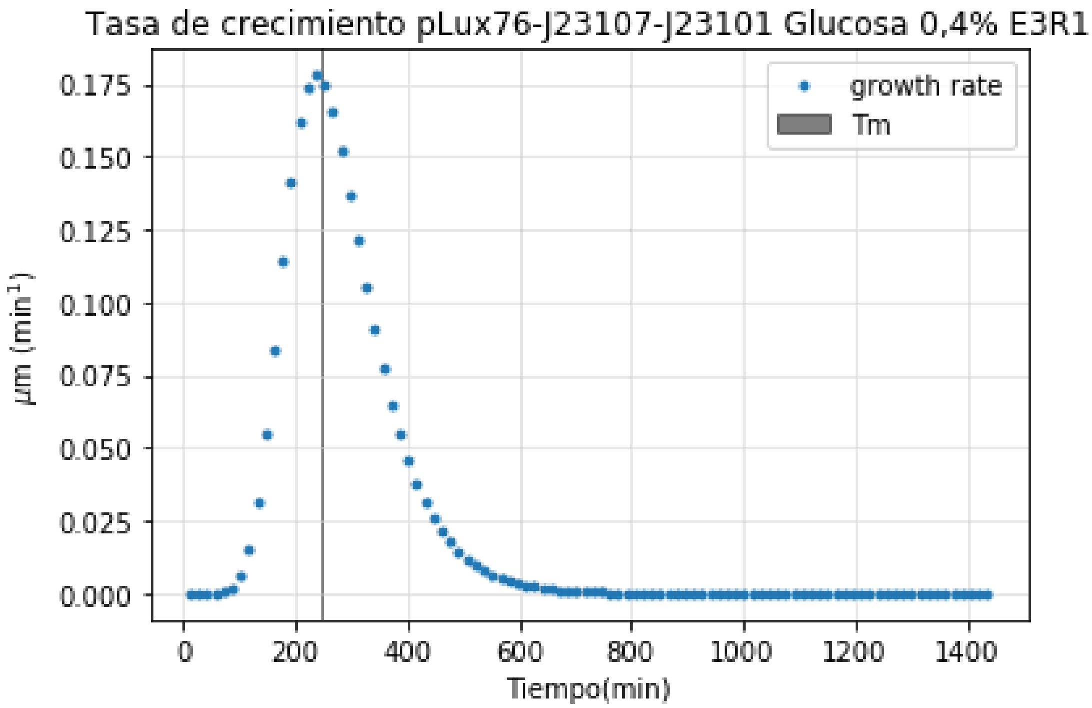

```
In [131]: #Tasas control réplicas glicerol
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento pTet-J23107-J23101 Glicerol 0,2%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy22,label='growth rate E2R1')
          plt.plot(tt[:-1],dy23,label='growth rate E2R2')
          plt.plot(tt[:-1],dy24,label='growth rate E2R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[131]: <matplotlib.legend.Legend at 0x23667f3e898>
```



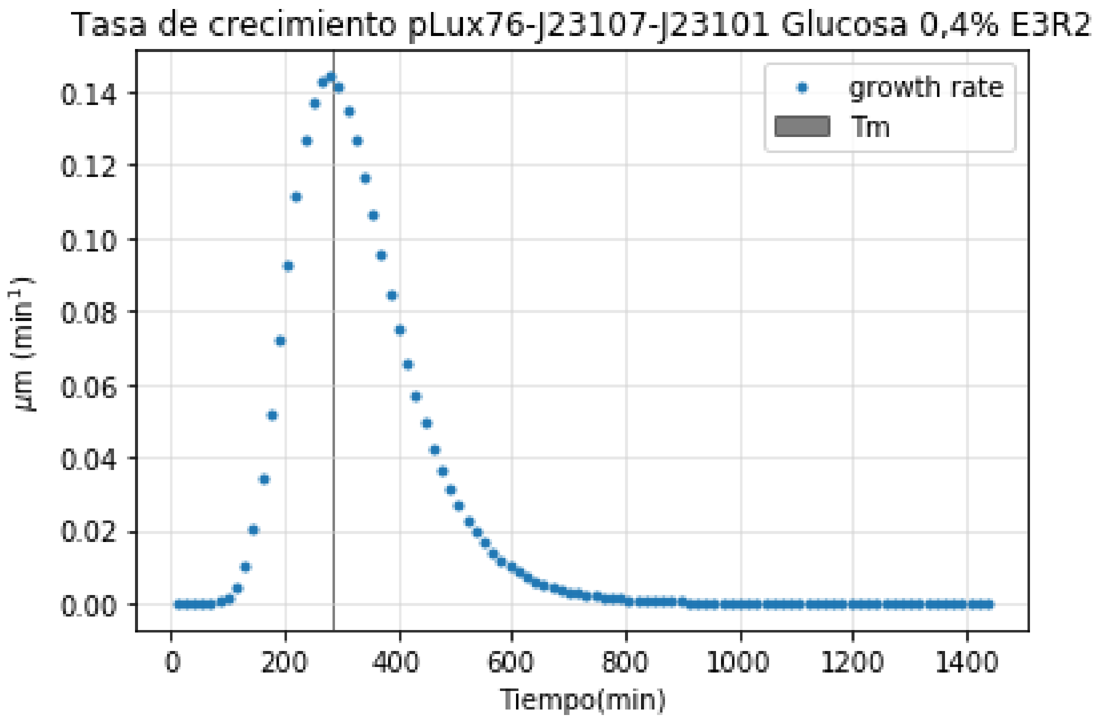

```
In [132]: #Tasas
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento pTet-J23107-J23101')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy19,label='Glucosa E2R1')
          plt.plot(tt[:-1],dy20,label='Glucosa E2R2')
          plt.plot(tt[:-1],dy21,label='Glucosa E2R3')
          plt.plot(tt[:-1],dy22,label='Glicerol E2R1')
          plt.plot(tt[:-1],dy23,label='Glicerol E2R2')
          plt.plot(tt[:-1],dy24,label='Glicerol E2R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right',ncol=2)

Out[132]: <matplotlib.legend.Legend at 0x236669b4da0>
```



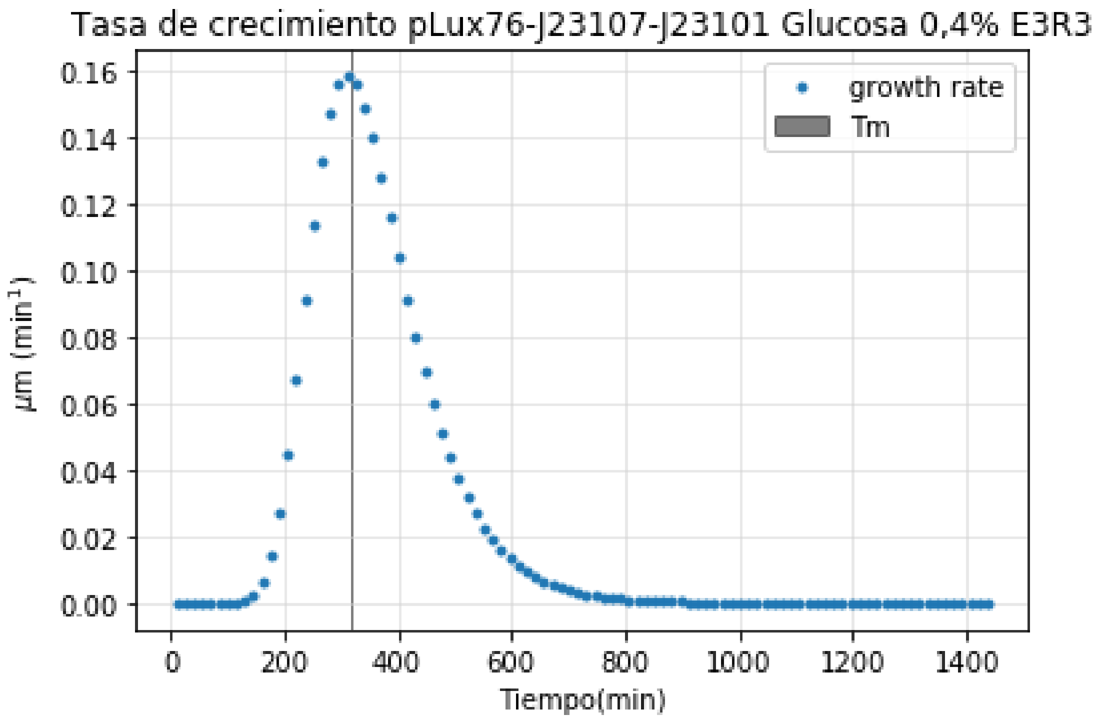

```
In [133]: #tasa de crecimiento
          ye25=((A25*np.exp(-np.exp((((um25*np.exp(1))/A25)*(l25-tt))+1))))
          #Con diff
          dy25=(np.diff(ye25))
          plt.figure()
          plt.title('Tasa de crecimiento pLux76-J23107-J23101 Glucosa 0,4% E3R1')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm25,tm25, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy25,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[133]: <matplotlib.legend.Legend at 0x23661c037f0>
```



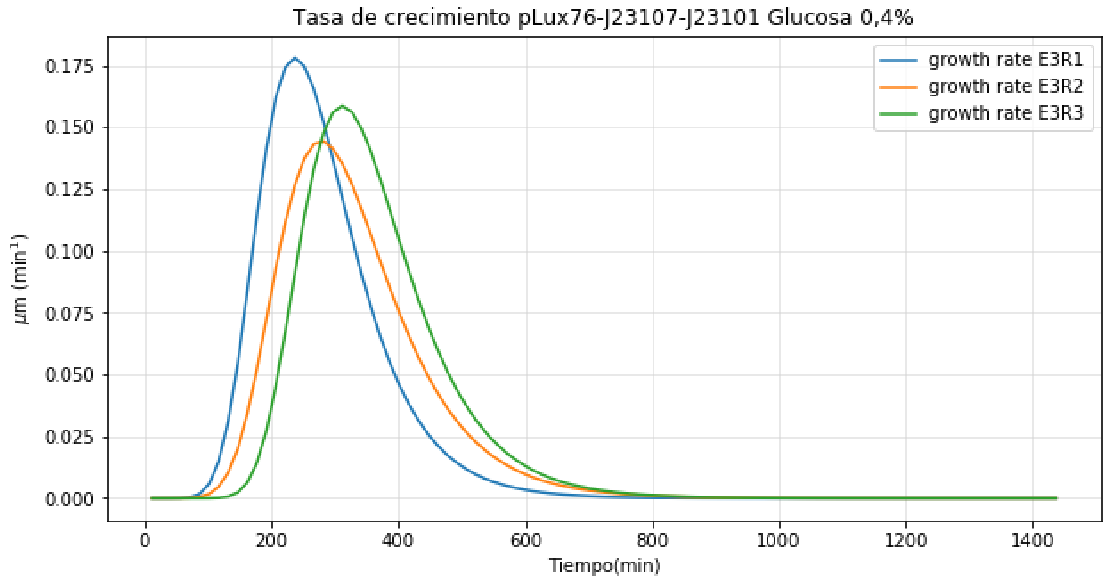

```
In [134]: #tasa de crecimiento
          ye26=((A26*np.exp(-np.exp((((um26*np.exp(1))/A26)*(l26-tt))+1))))
          #Con diff
          dy26=(np.diff(ye26))
          plt.figure()
          plt.title('Tasa de crecimiento pLux76-J23107-J23101 Glucosa 0,4% E3R2')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm26,tm26, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy26,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[134]: <matplotlib.legend.Legend at 0x23667fe8a20>
```



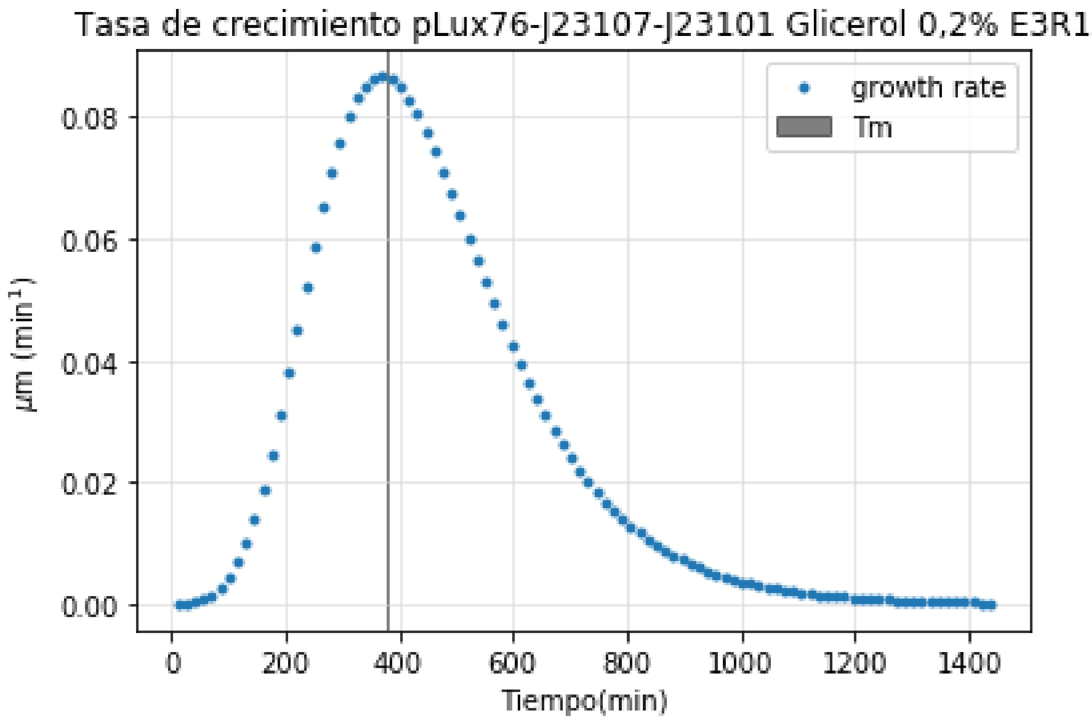

```
In [135]: #tasa de crecimiento
          ye27=((A27*np.exp(-np.exp((((um27*np.exp(1))/A27)*(l27-tt))+1))))
          #Con diff
          dy27=(np.diff(ye27))
          plt.figure()
          plt.title('Tasa de crecimiento pLux76-J23107-J23101 Glucosa 0,4% E3R3')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm27,tm27, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy27,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[135]: <matplotlib.legend.Legend at 0x23668084e80>
```



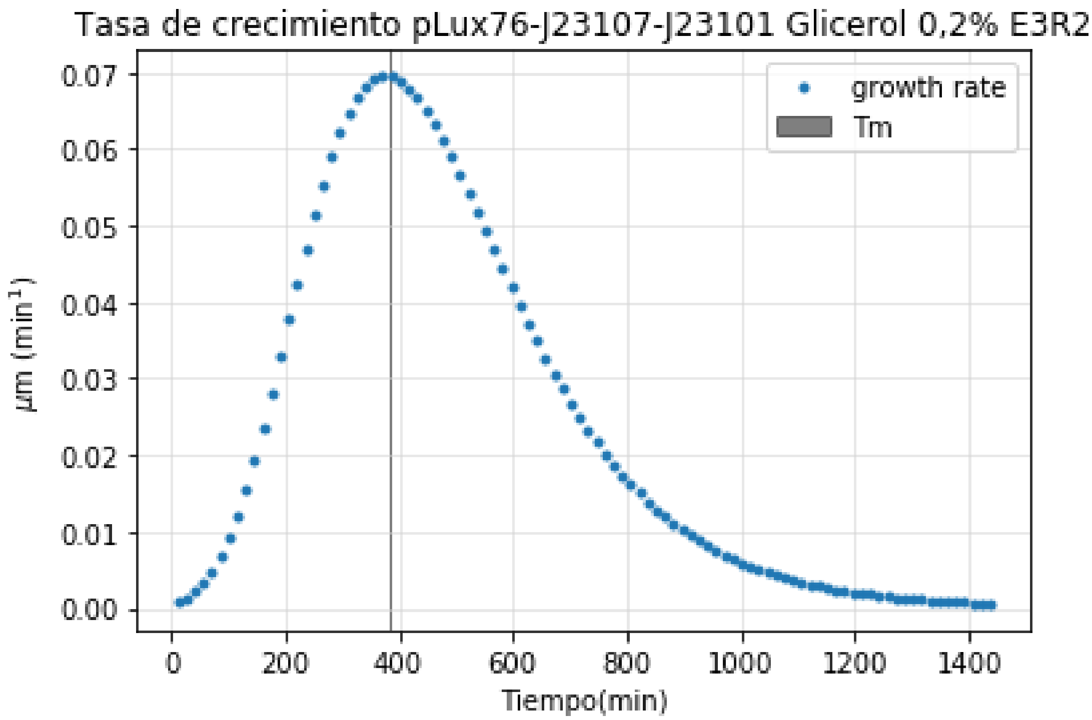

```
In [136]: #Tasas pLux-J23101-J23101 réplicas glucosa
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento pLux76-J23107-J23101 Glucosa 0,4%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy25,label='growth rate E3R1')
          plt.plot(tt[:-1],dy26,label='growth rate E3R2')
          plt.plot(tt[:-1],dy27,label='growth rate E3R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[136]: <matplotlib.legend.Legend at 0x2366812f6a0>
```



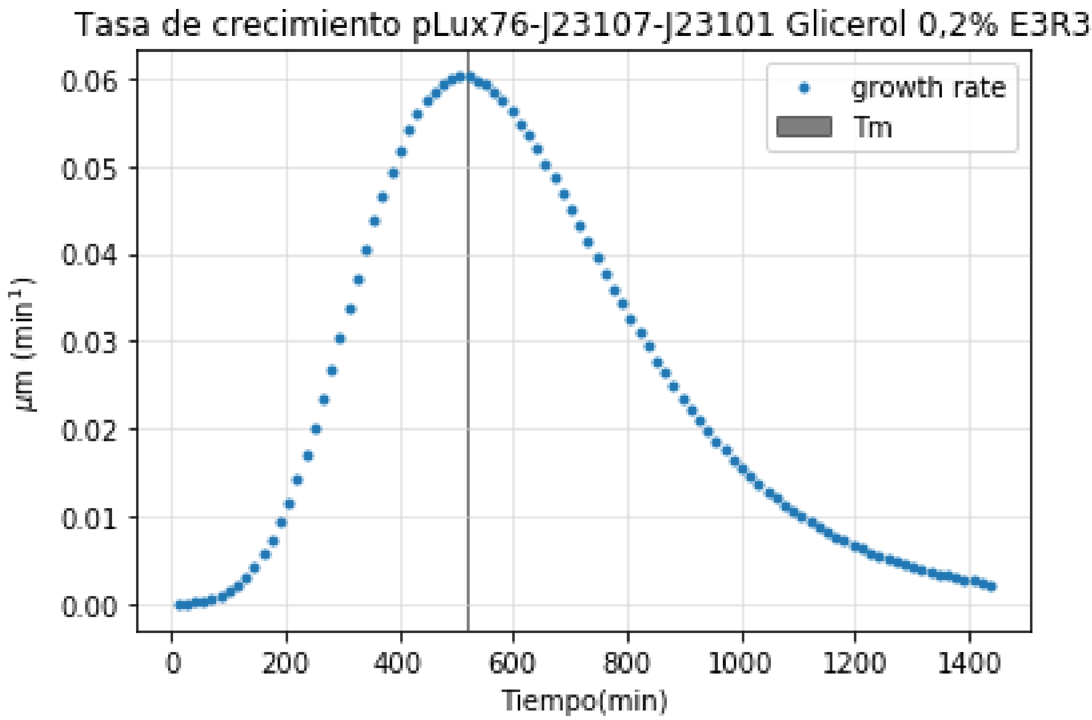

```
In [137]: #tasa de crecimiento
          ye28=((A28*np.exp(-np.exp((((um28*np.exp(1))/A28)*(l28-tt))+1))))
          #Con diff
          dy28=(np.diff(ye28))
          plt.figure()
          plt.title('Tasa de crecimiento pLux76-J23107-J23101 Glicerol 0,2% E3R1')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm28,tm28, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy28,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[137]: <matplotlib.legend.Legend at 0x23668201ba8>
```



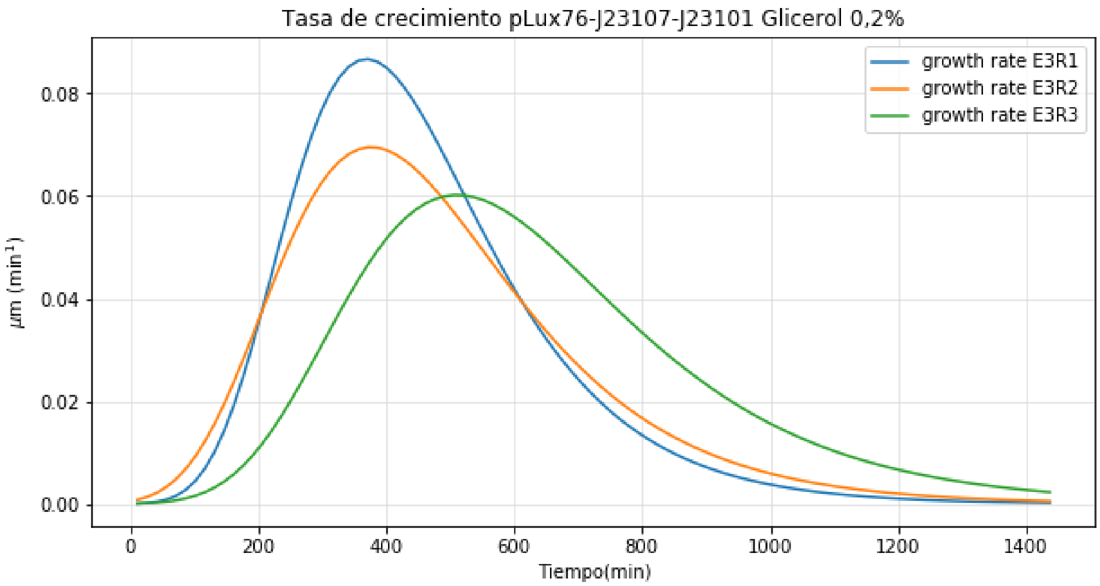

```
In [138]: #tasa de crecimiento
          ye29=((A29*np.exp(-np.exp((((um29*np.exp(1))/A29)*(l29-tt))+1))))
          #Con diff
          dy29=(np.diff(ye29))
          plt.figure()
          plt.title('Tasa de crecimiento pLux76-J23107-J23101 Glicerol 0,2% E3R2')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm29,tm29, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy29,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[138]: <matplotlib.legend.Legend at 0x236682d4860>
```



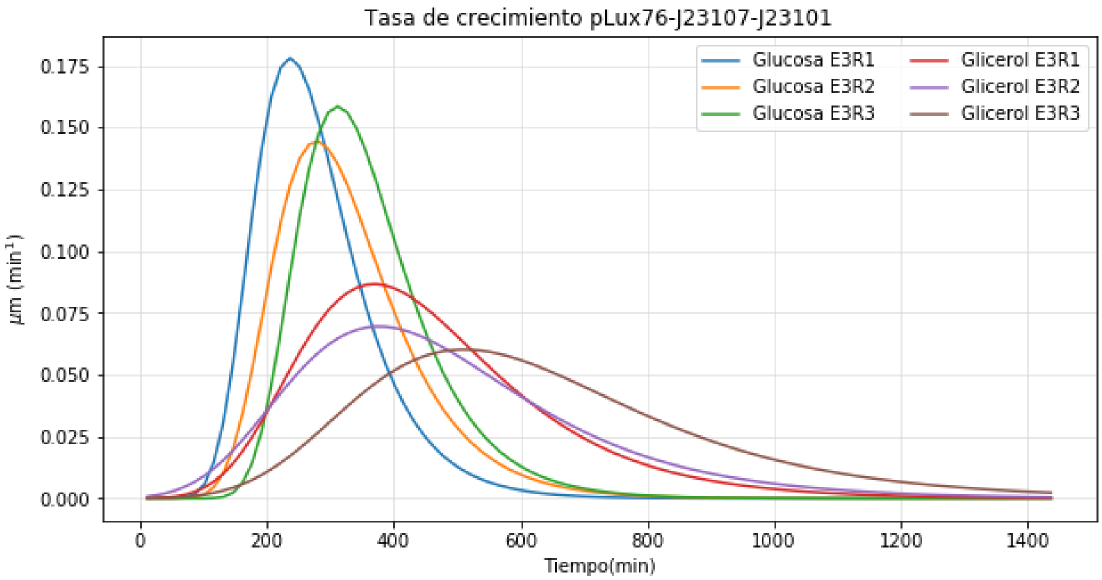

```
In [139]: #tasa de crecimiento
          ye30=((A30*np.exp(-np.exp((((um30*np.exp(1))/A30)*(l30-tt))+1))))
          #Con diff
          dy30=(np.diff(ye30))
          plt.figure()
          plt.title('Tasa de crecimiento pLux76-J23107-J23101 Glicerol 0,2% E3R3')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm30,tm30, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy30,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[139]: <matplotlib.legend.Legend at 0x236683a3fd0>
```



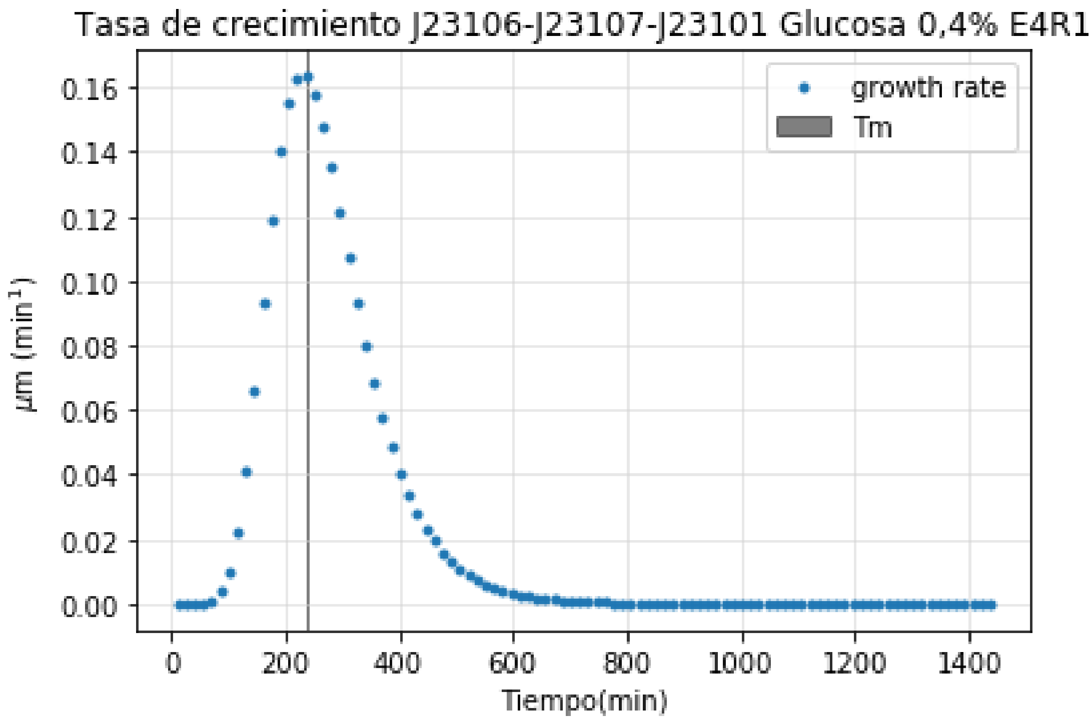

```
In [140]: #Tasas control réplicas glicerol
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento pLux76-J23107-J23101 Glicerol 0,2%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy28,label='growth rate E3R1')
          plt.plot(tt[:-1],dy29,label='growth rate E3R2')
          plt.plot(tt[:-1],dy30,label='growth rate E3R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[140]: <matplotlib.legend.Legend at 0x23668471710>
```



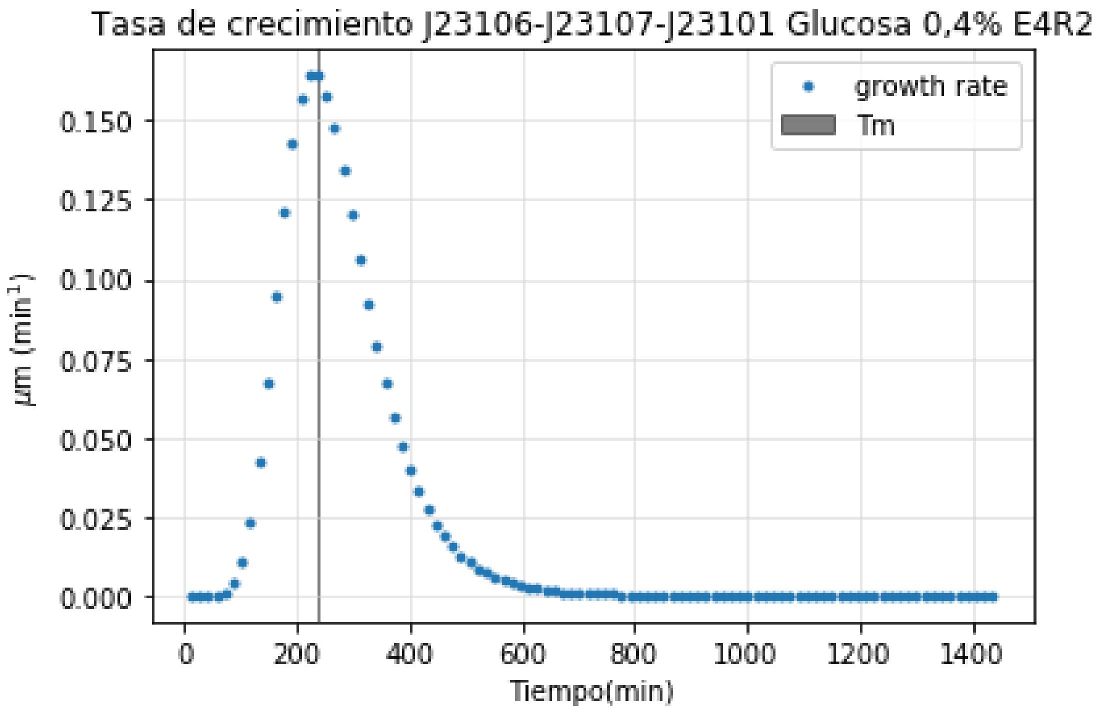

```
In [141]: #Tasas control réplicas
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento pLux76-J23107-J23101')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy25,label='Glucosa E3R1')
          plt.plot(tt[:-1],dy26,label='Glucosa E3R2')
          plt.plot(tt[:-1],dy27,label='Glucosa E3R3')
          plt.plot(tt[:-1],dy28,label='Glicerol E3R1')
          plt.plot(tt[:-1],dy29,label='Glicerol E3R2')
          plt.plot(tt[:-1],dy30,label='Glicerol E3R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right',ncol=2)

Out[141]: <matplotlib.legend.Legend at 0x23668555cc0>
```




```
In [142]: #tasa de crecimiento
          ye31=((A31*np.exp(-np.exp((((um31*np.exp(1))/A31)*(l31-tt))+1))))
          #Con diff
          dy31=(np.diff(ye31))
          plt.figure()
          plt.title('Tasa de crecimiento J23106-J23107-J23101 Glucosa 0,4% E4R1')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm31,tm31, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy31,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[142]: <matplotlib.legend.Legend at 0x2366862be48>
```

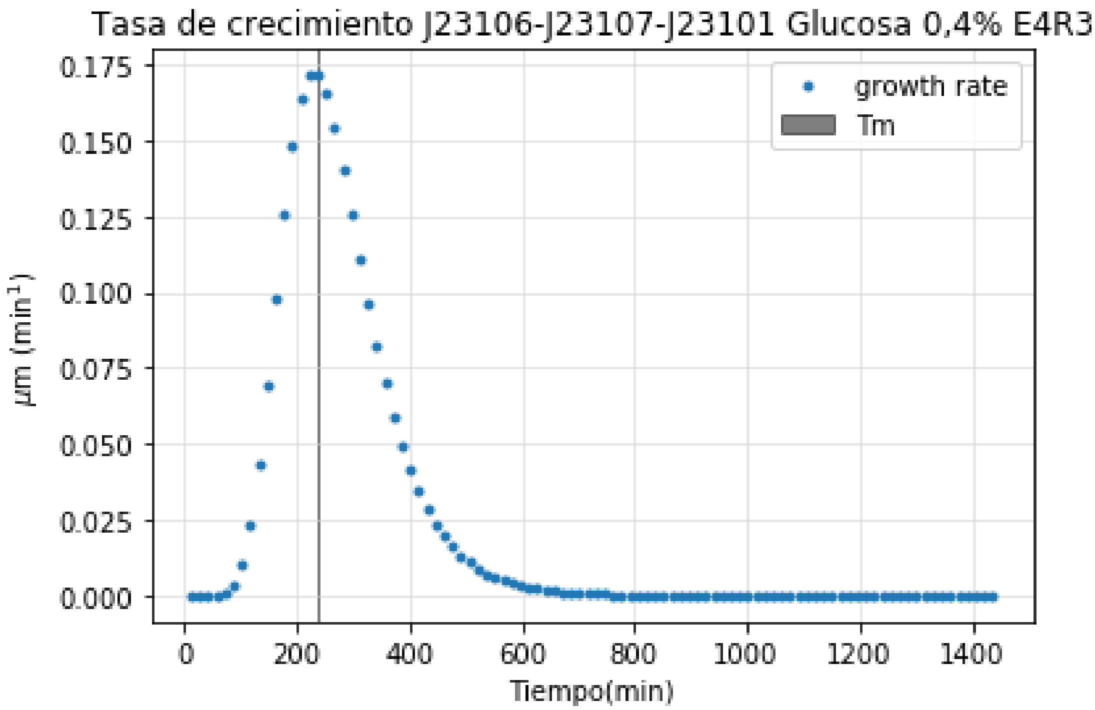



```
In [143]: #tasa de crecimiento
          ye32=((A32*np.exp(-np.exp((((um32*np.exp(1))/A32)*(l32-tt))+1))))
          #Con diff
          dy32=(np.diff(ye32))
          plt.figure()
          plt.title('Tasa de crecimiento J23106-J23107-J23101 Glucosa 0,4% E4R2')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm32,tm32, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy32,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[143]: <matplotlib.legend.Legend at 0x23668706b00>
```

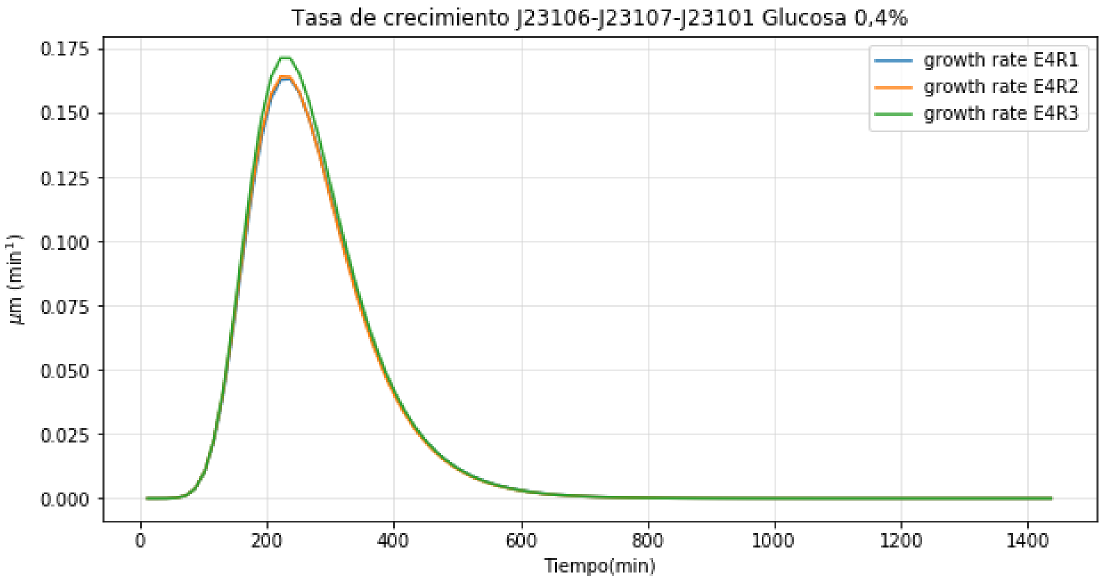


In [144]:
```
#tasa de crecimiento
ye33=((A33*np.exp(-np.exp((((um33*np.exp(1))/A33)*(l33-tt))+1))))
#Con diff
dy33=(np.diff(ye33))
plt.figure()
plt.title('Tasa de crecimiento J23106-J23107-J23101 Glucosa 0,4% E4R3')
plt.xlabel('Tiempo(min)')
plt.ylabel(r'$\mu$m (min$^1$)')
plt.axvspan(tm33,tm33, color='k', alpha=0.5, label="Tm")
plt.plot(tt[:-1],dy33,'.',label='growth rate')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc='upper right')
```

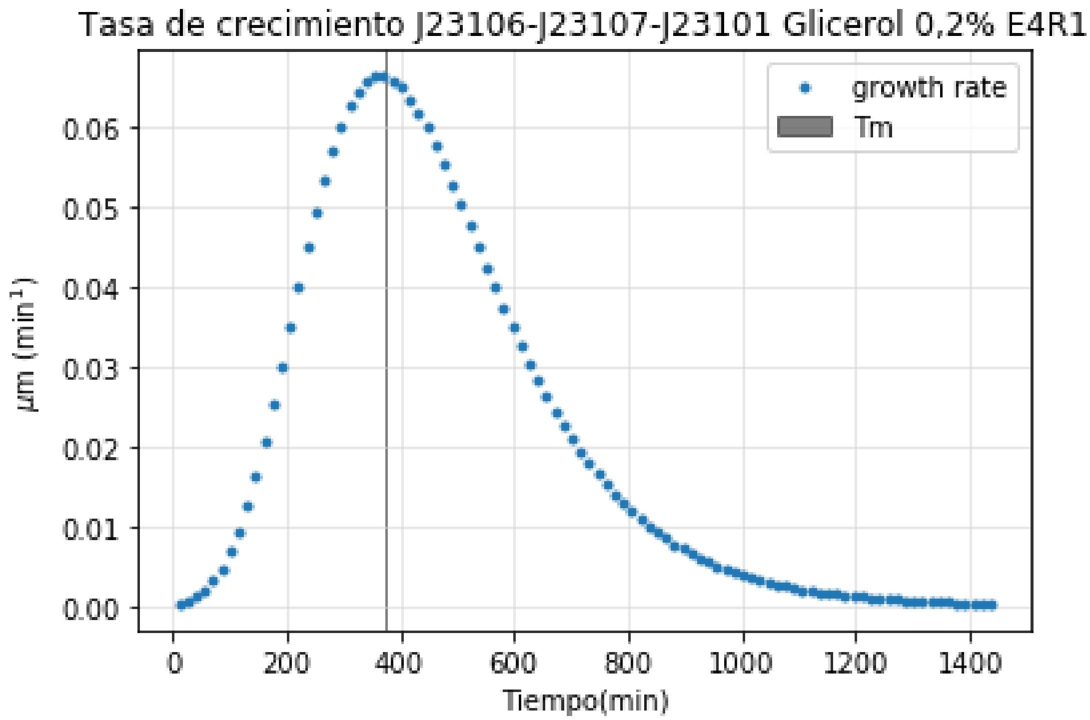
Out[144]: <matplotlib.legend.Legend at 0x236687d8940>



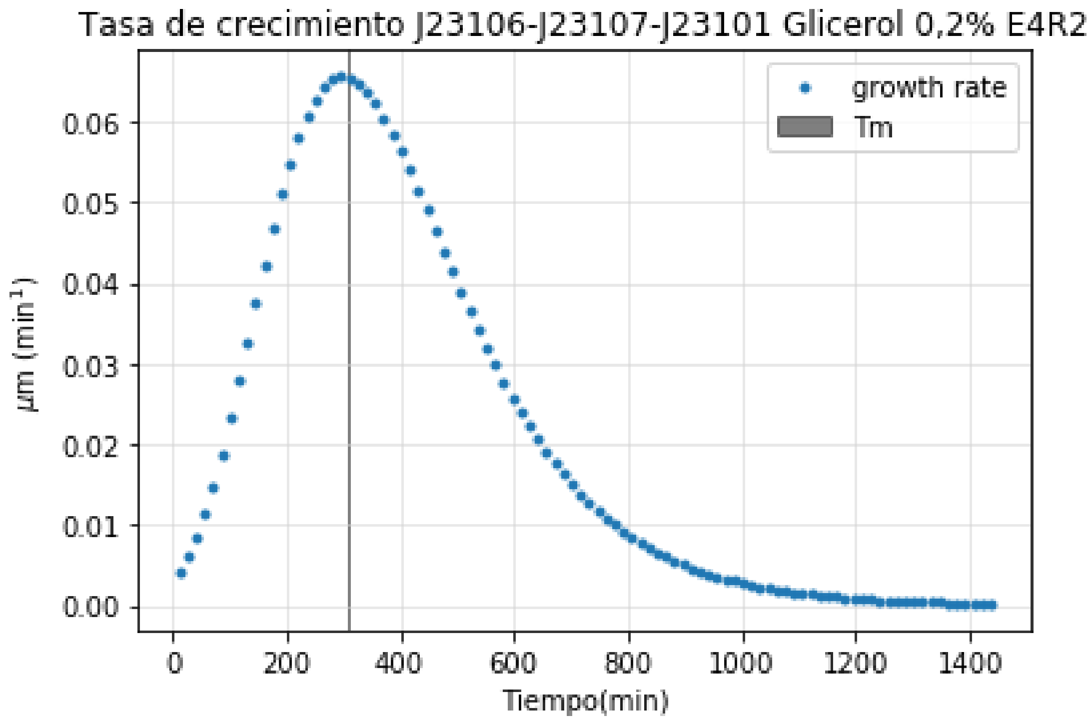

```
In [145]: #Tasas J23101-J23101-J23101 réplicas glucosa
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento J23106-J23107-J23101 Glucosa 0,4%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy31,label='growth rate E4R1')
          plt.plot(tt[:-1],dy32,label='growth rate E4R2')
          plt.plot(tt[:-1],dy33,label='growth rate E4R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[145]: <matplotlib.legend.Legend at 0x23669881fd0>
```



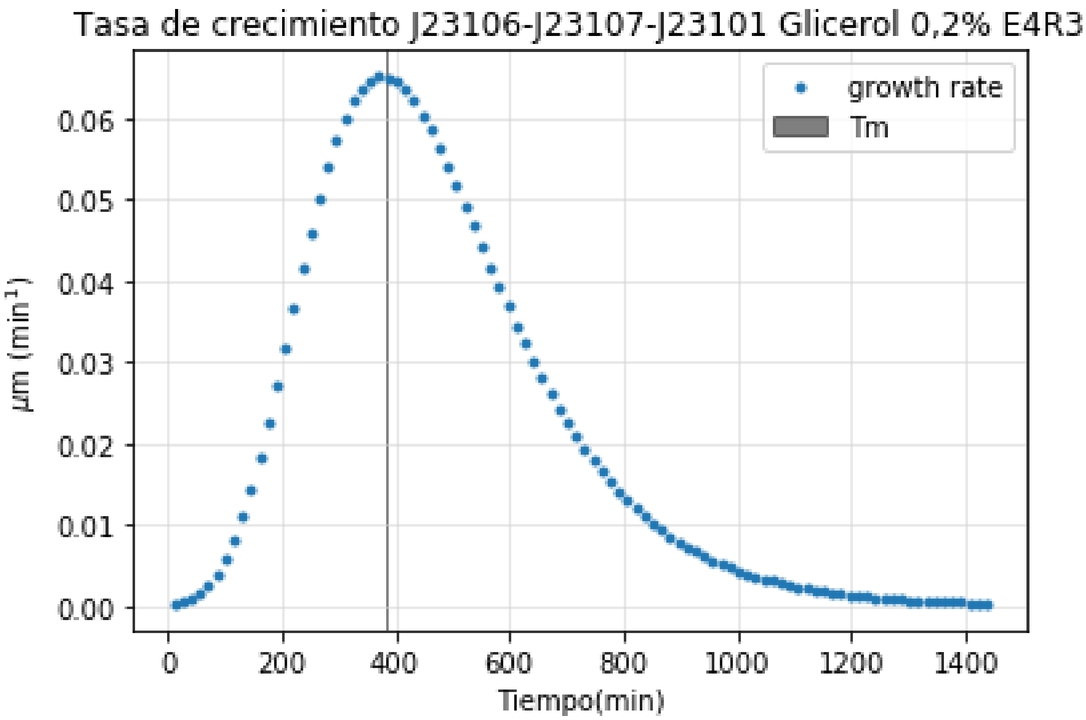

```
In [146]: #tasa de crecimiento
          ye34=((A34*np.exp(-np.exp((((um34*np.exp(1))/A34)*(l34-tt))+1))))
          #Con diff
          dy34=(np.diff(ye34))
          plt.figure()
          plt.title('Tasa de crecimiento J23106-J23107-J23101 Glicerol 0,2% E4R1')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm34,tm34, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy34,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[146]: <matplotlib.legend.Legend at 0x23669963e10>
```



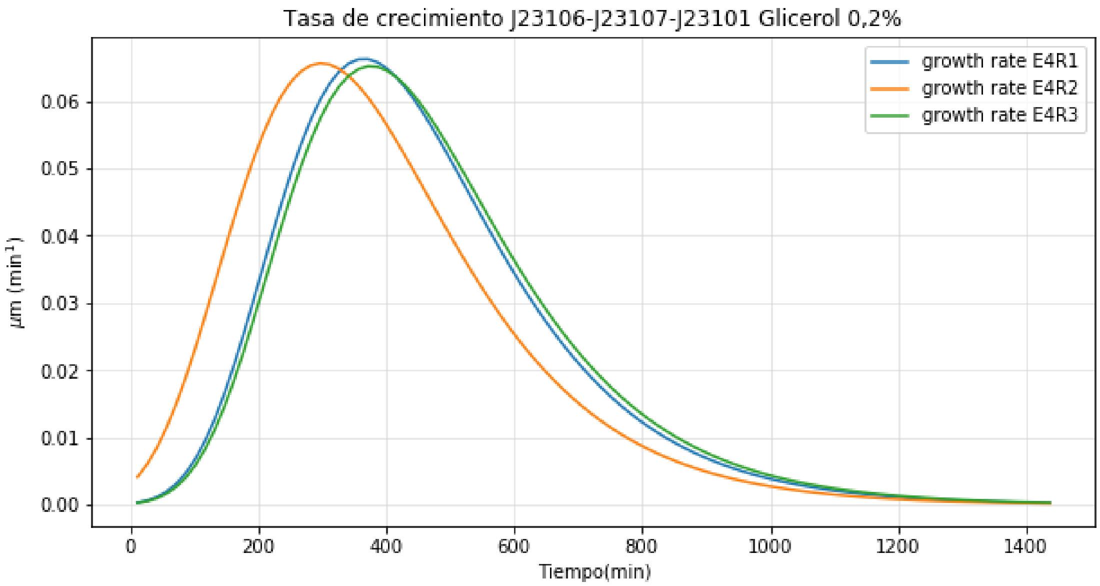

```
In [147]: #tasa de crecimiento
          ye35=((A35*np.exp(-np.exp((((um35*np.exp(1))/A35)*(l35-tt))+1))))
          #Con diff
          dy35=(np.diff(ye35))
          plt.figure()
          plt.title('Tasa de crecimiento J23106-J23107-J23101 Glicerol 0,2% E4R2')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm35,tm35, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy35,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[147]: <matplotlib.legend.Legend at 0x23669a2dc88>
```



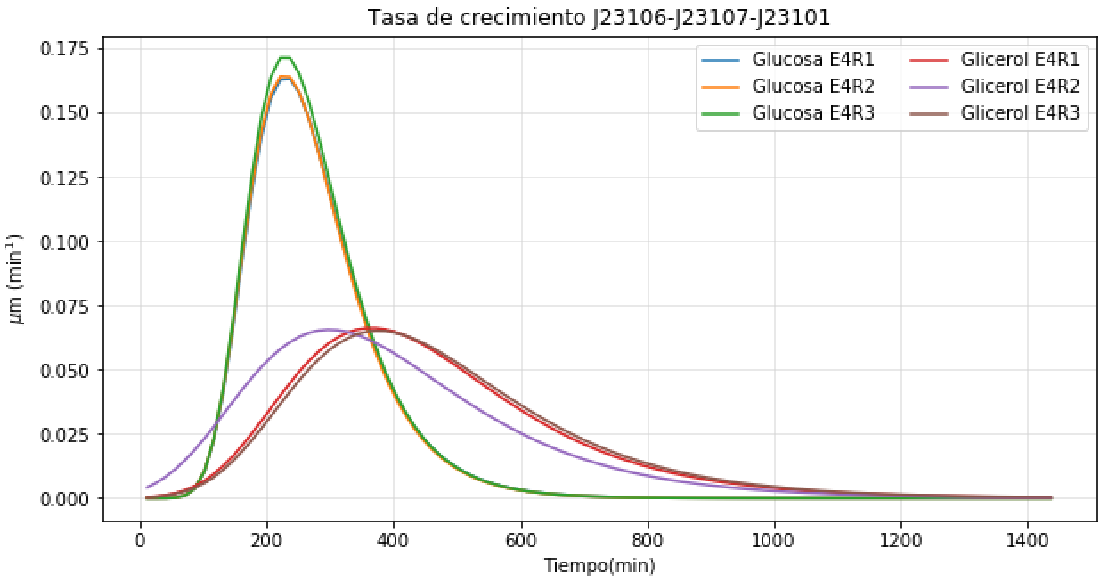

```
In [148]: #tasa de crecimiento
          ye36=((A36*np.exp(-np.exp((((um36*np.exp(1))/A36)*(l36-tt))+1))))
          #Con diff
          dy36=(np.diff(ye36))
          plt.figure()
          plt.title('Tasa de crecimiento J23106-J23107-J23101 Glicerol 0,2% E4R3')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.axvspan(tm36,tm36, color='k', alpha=0.5, label="Tm")
          plt.plot(tt[:-1],dy36,'.',label='growth rate')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[148]: <matplotlib.legend.Legend at 0x23669b01b38>
```



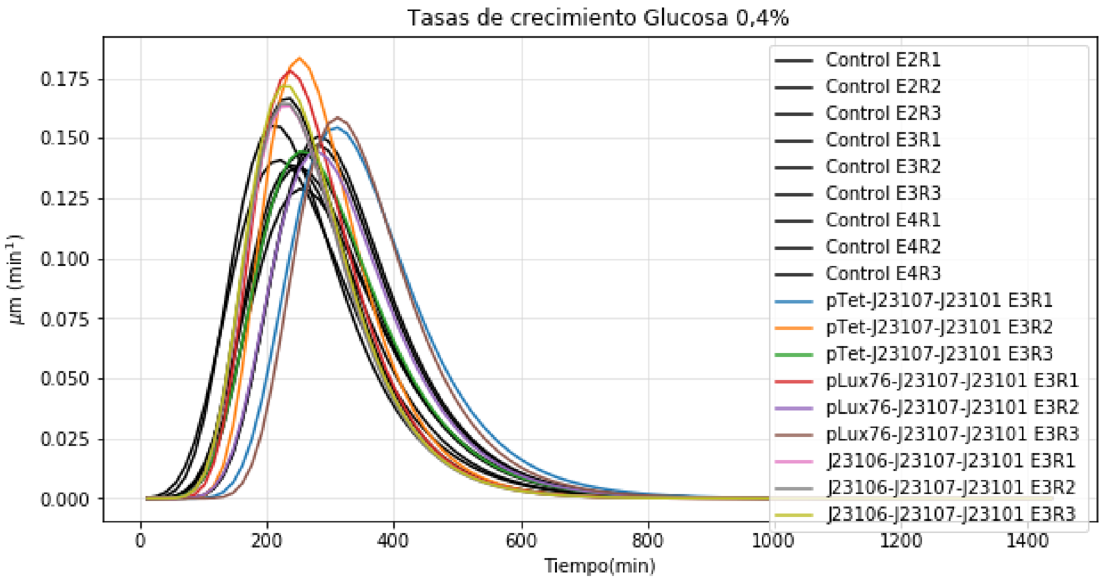

```
In [149]: #Tasas control réplicas glicerol
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento J23106-J23107-J23101 Glicerol 0,2%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy34,label='growth rate E4R1')
          plt.plot(tt[:-1],dy35,label='growth rate E4R2')
          plt.plot(tt[:-1],dy36,label='growth rate E4R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[149]: <matplotlib.legend.Legend at 0x23669bd6940>
```




```
In [150]: #Tasas control réplicas
          plt.figure(figsize=(10,5))
          plt.title('Tasa de crecimiento J23106-J23107-J23101')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy31,label='Glucosa E4R1')
          plt.plot(tt[:-1],dy32,label='Glucosa E4R2')
          plt.plot(tt[:-1],dy33,label='Glucosa E4R3')
          plt.plot(tt[:-1],dy34,label='Glicerol E4R1')
          plt.plot(tt[:-1],dy35,label='Glicerol E4R2')
          plt.plot(tt[:-1],dy36,label='Glicerol E4R3')
          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right',ncol=2)

Out[150]: <matplotlib.legend.Legend at 0x23669cc3710>
```

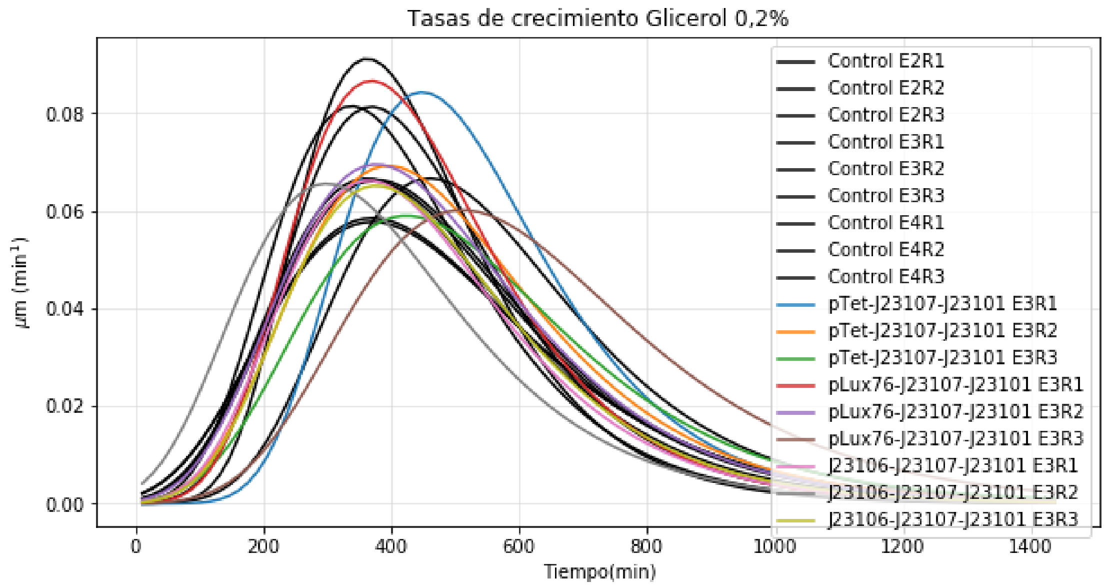



```
In [151]: #Tasas réplicas glucosa
          plt.figure(figsize=(10,5))
          plt.title('Tasas de crecimiento Glucosa 0,4%')
          plt.xlabel('Tiempo(min)')
          plt.ylabel(r'$\mu$m (min$^1$)')
          plt.plot(tt[:-1],dy1,'k',label='Control E2R1')
          plt.plot(tt[:-1],dy2,'k',label='Control E2R2')
          plt.plot(tt[:-1],dy3,'k',label='Control E2R3')
          plt.plot(tt[:-1],dy7,'k',label='Control E3R1')
          plt.plot(tt[:-1],dy8,'k',label='Control E3R2')
          plt.plot(tt[:-1],dy9,'k',label='Control E3R3')
          plt.plot(tt[:-1],dy13,'k',label='Control E4R1')
          plt.plot(tt[:-1],dy14,'k',label='Control E4R2')
          plt.plot(tt[:-1],dy15,'k',label='Control E4R3')
          plt.plot(tt[:-1],dy19,label='pTet-J23107-J23101 E3R1')
          plt.plot(tt[:-1],dy20,label='pTet-J23107-J23101 E3R2')
          plt.plot(tt[:-1],dy21,label='pTet-J23107-J23101 E3R3')
          plt.plot(tt[:-1],dy25,label='pLux76-J23107-J23101 E3R1')
          plt.plot(tt[:-1],dy26,label='pLux76-J23107-J23101 E3R2')
          plt.plot(tt[:-1],dy27,label='pLux76-J23107-J23101 E3R3')
          plt.plot(tt[:-1],dy31,label='J23106-J23107-J23101 E3R1')
          plt.plot(tt[:-1],dy32,label='J23106-J23107-J23101 E3R2')
          plt.plot(tt[:-1],dy33,label='J23106-J23107-J23101 E3R3')

          plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
          plt.legend(loc='upper right')

Out[151]: <matplotlib.legend.Legend at 0x23669ddfcc0>
```



In [152]:
```
#Tasas réplicas glucosa
plt.figure(figsize=(10,5))
plt.title('Tasas de crecimiento Glicerol 0,2%')
plt.xlabel('Tiempo(min)')
plt.ylabel(r'$\mu$m (min$^1$)')
plt.plot(tt[:-1],dy4,'k',label='Control E2R1')
plt.plot(tt[:-1],dy5,'k',label='Control E2R2')
plt.plot(tt[:-1],dy6,'k',label='Control E2R3')
plt.plot(tt[:-1],dy10,'k',label='Control E3R1')
plt.plot(tt[:-1],dy11,'k',label='Control E3R2')
plt.plot(tt[:-1],dy12,'k',label='Control E3R3')
plt.plot(tt[:-1],dy16,'k',label='Control E4R1')
plt.plot(tt[:-1],dy17,'k',label='Control E4R2')
plt.plot(tt[:-1],dy18,'k',label='Control E4R3')
plt.plot(tt[:-1],dy22,label='pTet-J23107-J23101 E3R1')
plt.plot(tt[:-1],dy23,label='pTet-J23107-J23101 E3R2')
plt.plot(tt[:-1],dy24,label='pTet-J23107-J23101 E3R3')
plt.plot(tt[:-1],dy28,label='pLux76-J23107-J23101 E3R1')
plt.plot(tt[:-1],dy29,label='pLux76-J23107-J23101 E3R2')
plt.plot(tt[:-1],dy30,label='pLux76-J23107-J23101 E3R3')
plt.plot(tt[:-1],dy34,label='J23106-J23107-J23101 E3R1')
plt.plot(tt[:-1],dy35,label='J23106-J23107-J23101 E3R2')
plt.plot(tt[:-1],dy36,label='J23106-J23107-J23101 E3R3')

plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc='upper right')
```

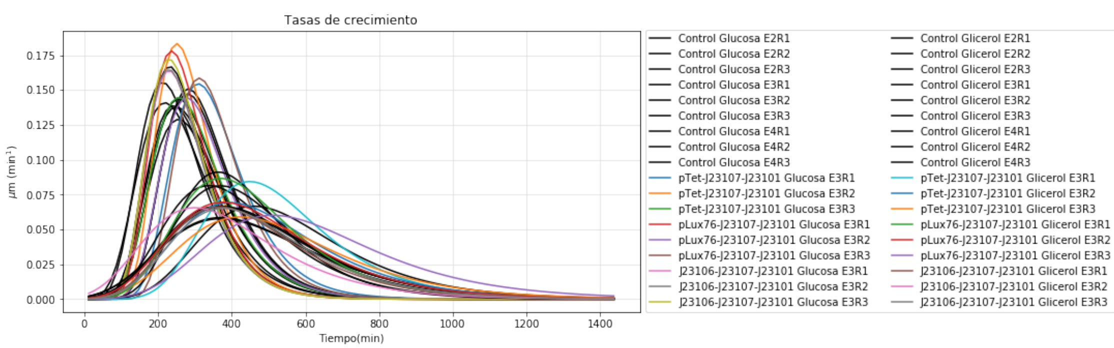
Out[152]: <matplotlib.legend.Legend at 0x23669f4bba8>



In [153]:
```
#Tasas réplicas glucosa
plt.figure(figsize=(10,5))
plt.title('Tasas de crecimiento')
plt.xlabel('Tiempo(min)')
plt.ylabel(r'$\mu$m (min$^1$)')
plt.plot(tt[:-1],dy1,'k',label='Control Glucosa E2R1')
plt.plot(tt[:-1],dy2,'k',label='Control Glucosa E2R2')
plt.plot(tt[:-1],dy3,'k',label='Control Glucosa E2R3')
plt.plot(tt[:-1],dy7,'k',label='Control Glucosa E3R1')
plt.plot(tt[:-1],dy8,'k',label='Control Glucosa E3R2')
plt.plot(tt[:-1],dy9,'k',label='Control Glucosa E3R3')
plt.plot(tt[:-1],dy13,'k',label='Control Glucosa E4R1')
plt.plot(tt[:-1],dy14,'k',label='Control Glucosa E4R2')
plt.plot(tt[:-1],dy15,'k',label='Control Glucosa E4R3')
plt.plot(tt[:-1],dy19,label='pTet-J23107-J23101 Glucosa E3R1')
plt.plot(tt[:-1],dy20,label='pTet-J23107-J23101 Glucosa E3R2')
plt.plot(tt[:-1],dy21,label='pTet-J23107-J23101 Glucosa E3R3')
plt.plot(tt[:-1],dy25,label='pLux76-J23107-J23101 Glucosa E3R1')
plt.plot(tt[:-1],dy26,label='pLux76-J23107-J23101 Glucosa E3R2')
plt.plot(tt[:-1],dy27,label='pLux76-J23107-J23101 Glucosa E3R3')
plt.plot(tt[:-1],dy31,label='J23106-J23107-J23101 Glucosa E3R1')
plt.plot(tt[:-1],dy32,label='J23106-J23107-J23101 Glucosa E3R2')
plt.plot(tt[:-1],dy33,label='J23106-J23107-J23101 Glucosa E3R3')


plt.plot(tt[:-1],dy4,'k',label='Control Glicerol E2R1')
plt.plot(tt[:-1],dy5,'k',label='Control Glicerol E2R2')
plt.plot(tt[:-1],dy6,'k',label='Control Glicerol E2R3')
```

```
plt.plot(tt[:-1],dy10,'k',label='Control Glicerol E3R1')
plt.plot(tt[:-1],dy11,'k',label='Control Glicerol E3R2')
plt.plot(tt[:-1],dy12,'k',label='Control Glicerol E3R3')
plt.plot(tt[:-1],dy16,'k',label='Control Glicerol E4R1')
plt.plot(tt[:-1],dy17,'k',label='Control Glicerol E4R2')
plt.plot(tt[:-1],dy18,'k',label='Control Glicerol E4R3')
plt.plot(tt[:-1],dy22,label='pTet-J23107-J23101 Glicerol E3R1')
plt.plot(tt[:-1],dy23,label='pTet-J23107-J23101 Glicerol E3R2')
plt.plot(tt[:-1],dy24,label='pTet-J23107-J23101 Glicerol E3R3')
plt.plot(tt[:-1],dy28,label='pLux76-J23107-J23101 Glicerol E3R1')
plt.plot(tt[:-1],dy29,label='pLux76-J23107-J23101 Glicerol E3R2')
plt.plot(tt[:-1],dy30,label='pLux76-J23107-J23101 Glicerol E3R3')
plt.plot(tt[:-1],dy34,label='J23106-J23107-J23101 Glicerol E3R1')
plt.plot(tt[:-1],dy35,label='J23106-J23107-J23101 Glicerol E3R2')
plt.plot(tt[:-1],dy36,label='J23106-J23107-J23101 Glicerol E3R3')
plt.grid(color='lightgray', linestyle='-', linewidth=0.5,zorder=0)
plt.legend(loc=(1.01,0.0),ncol=2)
```

Out[153]: <matplotlib.legend.Legend at 0x2366a11a9e8>



In [ ]:

In [ ]:

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