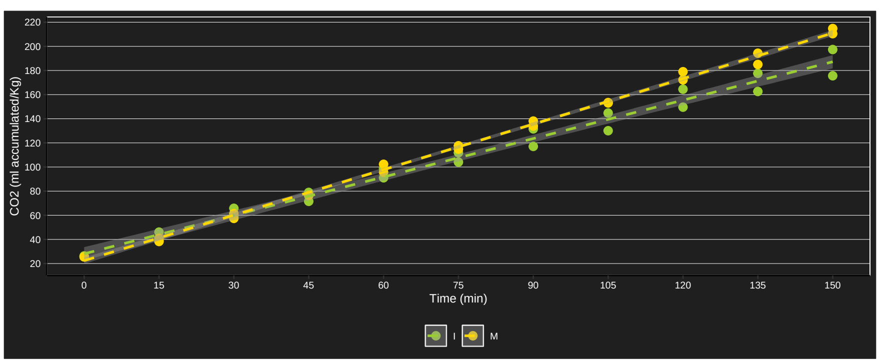
Ensayo 1

Immature and mature ubajay fruits were selected and randomly distributed in 4 jars, 2 immature and 2 mature, then respiration was quantified from accumulated CO2 every 15 minutes for 150 minutes.

CO2 acumulation

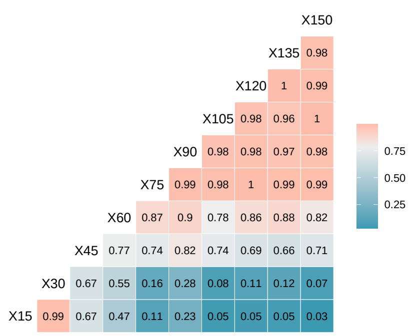


Descriptive table

```
## # A tibble: 20 x 7
## # Groups:   time_min [10]
##    time_min matu  carbon_ac_n carbon_ac_Mean carbon_ac_sd carbon_ac_min carbon_ac_max
##    <fct>    <fct>       <int>          <dbl>        <dbl>         <dbl>         <dbl>
##  1 15       I               2           42.5         4.97          39.0          46.1
```

```
##   2 15        M                2           39.6        1.86           38.3           40.9
##   3 30        I                2           62.2        5.13           58.5           65.8
##   4 30        M                2           59.4        2.79           57.4           61.4
##   5 45        I                2           75.2        5.23           71.5           78.9
##   6 45        M                2           76.6        0.110          76.6           76.7
##   7 60        I                2           94.9        5.39           91.1           98.7
##   8 60        M                2           99.0        4.66           95.7          102.
##   9 75        I                2          108.         5.50          104.           112.
##  10 75        M                2          116.         1.97          115.           118.
##  11 90        I                2          124.        10.3           117.           132.
##  12 90        M                2          136.         2.91          134.           138.
##  13 105       I                2          137.        10.4           130.           145.
##  14 105       M                2          153.         0.221         153.           153.
##  15 120       I                2          157.        10.5           150.           164.
##  16 120       M                2          176.         4.77          172.           179.
##  17 135       I                2          170.        10.6           163.           178.
##  18 135       M                2          190.         6.59          185.           194.
##  19 150       I                2          186.        15.4           176.           197.
##  20 150       M                2          213.         3.02          211.           215.
```

Correlations over time



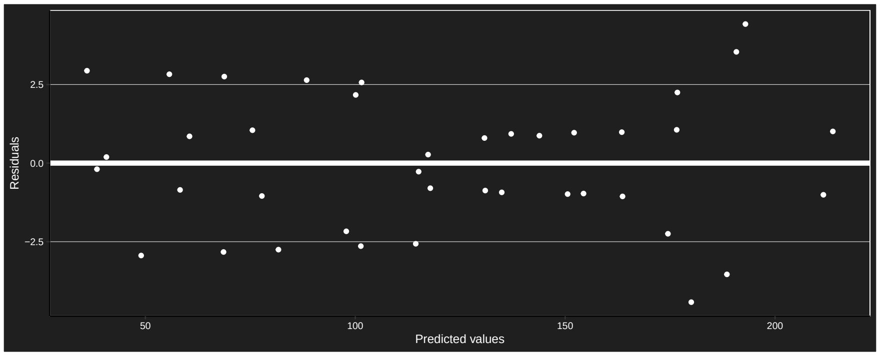
Covariance matrix

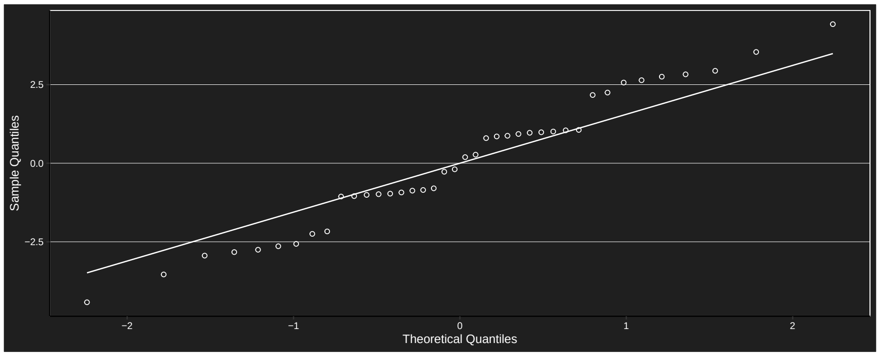
```
##         15    30    45    60     75     90    105    120    135    150
## 15   12.28 12.95  7.38  7.79   2.21   7.31   1.73   2.14   2.50   1.66
## 30   12.95 13.93  7.77  9.75   3.59   9.42   3.25   5.23   6.22   4.90
## 45    7.38  7.77  9.77 11.46  13.46  23.37  25.37  27.07  27.76  38.97
## 60    7.79  9.75 11.46 22.55  24.26  38.94  40.66  51.74  56.09  68.14
## 75    2.21  3.59 13.46 24.26  34.14  52.90  62.77  73.57  77.63 102.21
## 90    7.31  9.42 23.37 38.94  52.90  83.40  97.35 112.92 118.82 157.38
## 105   1.73  3.25 25.37 40.66  62.77  97.35 119.47 134.76 140.36 191.45
## 120   2.14  5.23 27.07 51.74  73.57 112.92 134.76 159.43 168.68 220.61
## 135   2.50  6.22 27.76 56.09  77.63 118.82 140.36 168.68 179.37 231.42
## 150   1.66  4.90 38.97 68.14 102.21 157.38 191.45 220.61 231.42 309.86
```

Marginal model with first-order autoregressive structure

```
## gls(model = (carbon_ac) ~ time_min * matu + basal, data = resp2w,
##     correlation = corAR1(form = ~1 | rep))
```

Assumptions






```
##
##  Shapiro-Wilk normality test
##
## data:  e
## W = 0.9761627, p-value = 0.549824
```

Model coefficients

```
##       (Intercept)         time_min30         time_min45         time_min60         time_min75         time
##   -1088.309859117       19.625054307       32.708423844       52.333478151       65.416847689       81.789
##             basal  time_min30:matuM  time_min45:matuM  time_min60:matuM  time_min75:matuM  time_min90
##      43.217057762        0.171220178        4.327249699        7.055345302       11.211374823       14.634
```

Anova

```
## Denom. DF: 19
##               numDF     F-value p-value
## (Intercept)       1 12422.59816  <.0001
## time_min          9   497.67981  <.0001
## matu              1    23.52445  0.0001
## basal             1    18.30623  0.0004
## time_min:matu     9     4.64451  0.0024
```

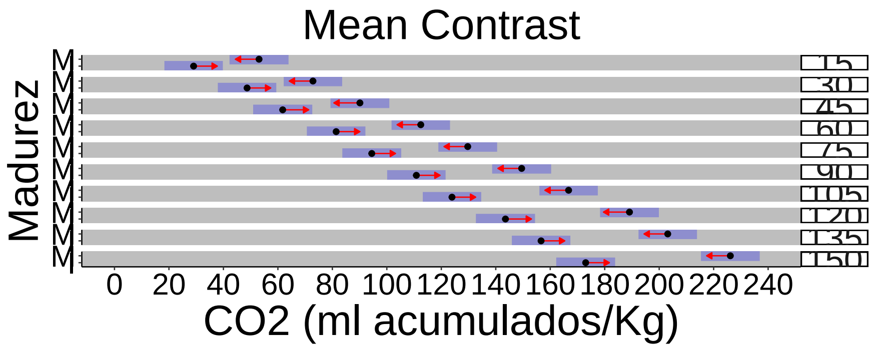
Simple effects

```
## $emmeans
## time_min = 15:
##  matu      emmean         SE   df    lower.CL    upper.CL
##  I      29.0559310 3.99641289 4.38  18.3274684  39.7843936
##  M      53.0762329 3.99641289 4.26  42.2426703  63.9097956
##
## time_min = 30:
##  matu      emmean         SE   df    lower.CL    upper.CL
##  I      48.6809853 3.99641289 4.37  37.9473496  59.4146210
##  M      72.8725074 3.99641289 4.38  62.1474410  83.5975738
##
## time_min = 45:
##  matu      emmean         SE   df    lower.CL    upper.CL
##  I      61.7643548 3.99641289 4.23  50.9066429  72.6220667
##  M      90.1119065 3.99641289 4.30  79.3151857 100.9086272
##
## time_min = 60:
##  matu      emmean         SE   df    lower.CL    upper.CL
##  I      81.3894091 3.99641289 4.35  70.6412810  92.1375372
##  M     112.4650564 3.99641289 4.37 101.7314207 123.1986921
##
## time_min = 75:
##  matu      emmean         SE   df    lower.CL    upper.CL
##  I      94.4727787 3.99641289 4.28  83.6565866 105.2889707
##  M     129.7044554 3.99641289 4.31 118.9126401 140.4962708
##
## time_min = 90:
##  matu      emmean         SE   df    lower.CL    upper.CL
##  I     110.8456545 3.99641289 4.38 100.1171919 121.5741172
##  M     149.5007299 3.99641289 4.26 138.6671673 160.3342926
##
## time_min = 105:
##  matu      emmean         SE   df    lower.CL    upper.CL
##  I     123.9290241 3.99641289 4.37 113.1953884 134.6626598
##  M     166.7401290 3.99641289 4.38 156.0150626 177.4651953
##
## time_min = 120:
##  matu      emmean         SE   df    lower.CL    upper.CL
##  I     143.5540784 3.99641289 4.23 132.6963665 154.4117903
##  M     189.0932789 3.99641289 4.30 178.2965581 199.8899996
##
## time_min = 135:
##  matu      emmean         SE   df    lower.CL    upper.CL
##  I     156.6374479 3.99641289 4.35 145.8893198 167.3855760
##  M     203.1430870 3.99641289 4.37 192.4094513 213.8767227
##
## time_min = 150:
##  matu      emmean         SE   df    lower.CL    upper.CL
##  I     173.0103238 3.99641289 4.28 162.1941317 183.8265159
##  M     226.1289524 3.99641289 4.31 215.3371371 236.9207678
##
## Degrees-of-freedom method: satterthwaite
```

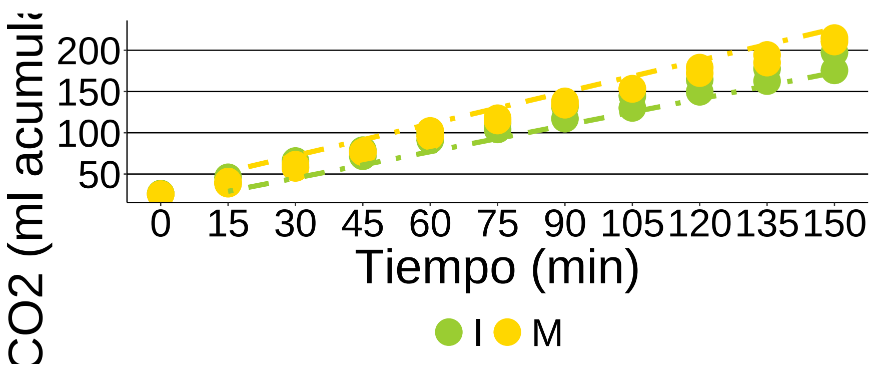
```
## Results are given on the ( (not the response) scale.
## Confidence level used: 0.95
##
## $contrasts
## time_min = 15:
##  contrast    estimate         SE   df t.ratio p.value
##  I - M    -24.0203019 7.19762359 6.29  -3.337  0.0146
##
## time_min = 30:
##  contrast    estimate         SE   df t.ratio p.value
##  I - M    -24.1915221 7.19762359 6.30  -3.361  0.0141
##
## time_min = 45:
##  contrast    estimate         SE   df t.ratio p.value
##  I - M    -28.3475516 7.19762359 4.51  -3.938  0.0135
##
## time_min = 60:
##  contrast    estimate         SE   df t.ratio p.value
##  I - M    -31.0756472 7.19762359 6.28  -4.317  0.0045
##
## time_min = 75:
##  contrast    estimate         SE   df t.ratio p.value
##  I - M    -35.2316768 7.19762359 6.24  -4.895  0.0024
##
## time_min = 90:
##  contrast    estimate         SE   df t.ratio p.value
##  I - M    -38.6550754 7.19762359 6.29  -5.371  0.0015
##
## time_min = 105:
##  contrast    estimate         SE   df t.ratio p.value
##  I - M    -42.8111049 7.19762359 6.30  -5.948  0.0008
##
## time_min = 120:
##  contrast    estimate         SE   df t.ratio p.value
##  I - M    -45.5392005 7.19762359 4.51  -6.327  0.0021
##
## time_min = 135:
##  contrast    estimate         SE   df t.ratio p.value
##  I - M    -46.5056391 7.19762359 6.28  -6.461  0.0005
##
## time_min = 150:
##  contrast    estimate         SE   df t.ratio p.value
##  I - M    -53.1186286 7.19762359 6.24  -7.380  0.0003
##
## Note: contrasts are still on the ( scale
## Degrees-of-freedom method: satterthwaite
```

Statistically significant differences were found in the CO2 respiration rate in each time between immature and mature Hexachlamys edulis fruits.

Comparison chart



Fitted model plot



Respiration. Essay 1 with CO2 accumulated

CO2 acumulation

Respiration. Essay 1 with ml CO2

Boxplot for CO2 emission for two stages of maturity in time.

CO2 emission for two stages of maturity in time. Shapes indicate different repetitions.

Correlation between the concentration of CO2 and O2 for mature and immature fruits.

O2 for mature and immature fruits over time.

Model

Assumptions

Assumptions are ok.

Anova

There is no interaction or significant differences.

Conclusion for respiration

There is no convincing evidence in this essay to affirm that the fruit of the ubajay is climacteric.

Análisis de con medidas repetidas en el tiempo