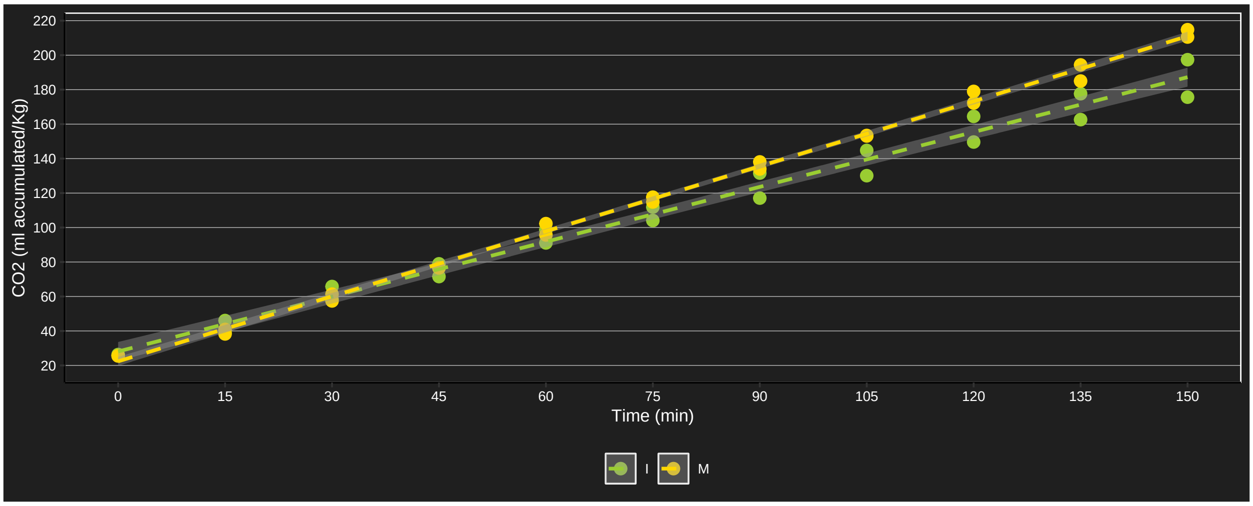
Ensayo 1

Respiración acumulada en frutos I y M

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.

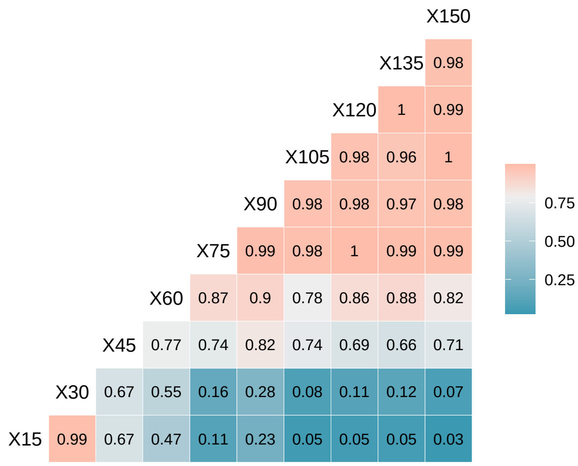
CO2 acumulation



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
##    <fct>    <fct>       <int>          <dbl>        <dbl>         <dbl>
##  1 15       I               2           42.5        4.97           39.0
##  2 15       M               2           39.6        1.86           38.3
##  3 30       I               2           62.2        5.13           58.5
##  4 30       M               2           59.4        2.79           57.4
##  5 45       I               2           75.2        5.23           71.5
##  6 45       M               2           76.6        0.110          76.6
##  7 60       I               2           94.9        5.39           91.1
##  8 60       M               2           99.0        4.66           95.7
##  9 75       I               2          108.         5.50          104.
## 10 75       M               2          116.         1.97          115.
## 11 90       I               2          124.        10.3           117.
## 12 90       M               2          136.         2.91          134.
## 13 105      I               2          137.        10.4           130.
## 14 105      M               2          153.         0.221         153.
## 15 120      I               2          157.        10.5           150.
## 16 120      M               2          176.         4.77          172.
## 17 135      I               2          170.        10.6           163.
## 18 135      M               2          190.         6.59          185.
## 19 150      I               2          186.        15.4           176.
## 20 150      M               2          213.         3.02          211.
## # i 1 more variable: carbon_ac_max <dbl>
```

Correlations over time



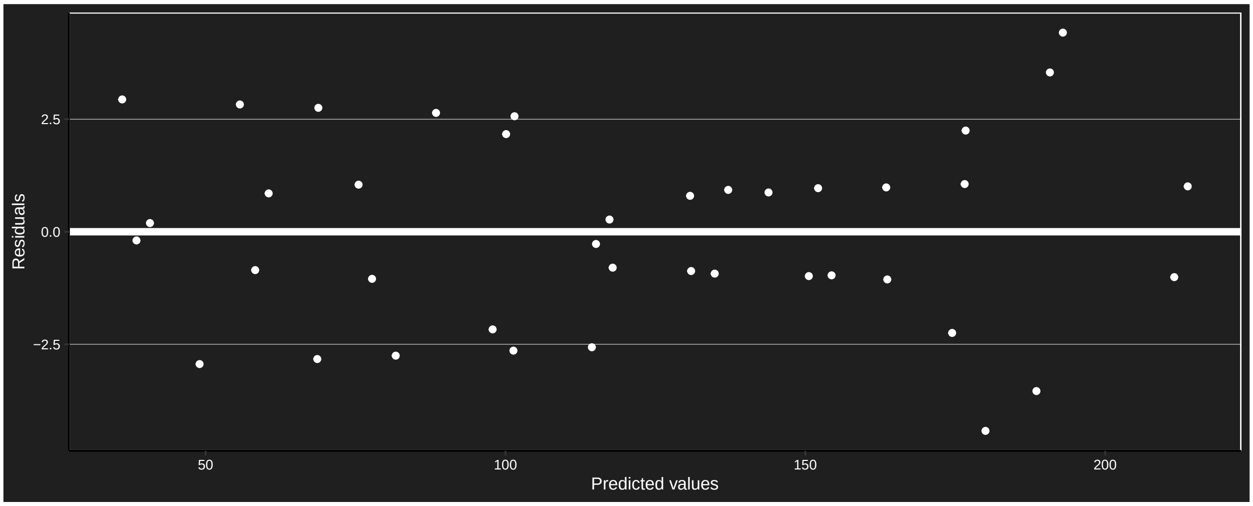
Covariance matrix

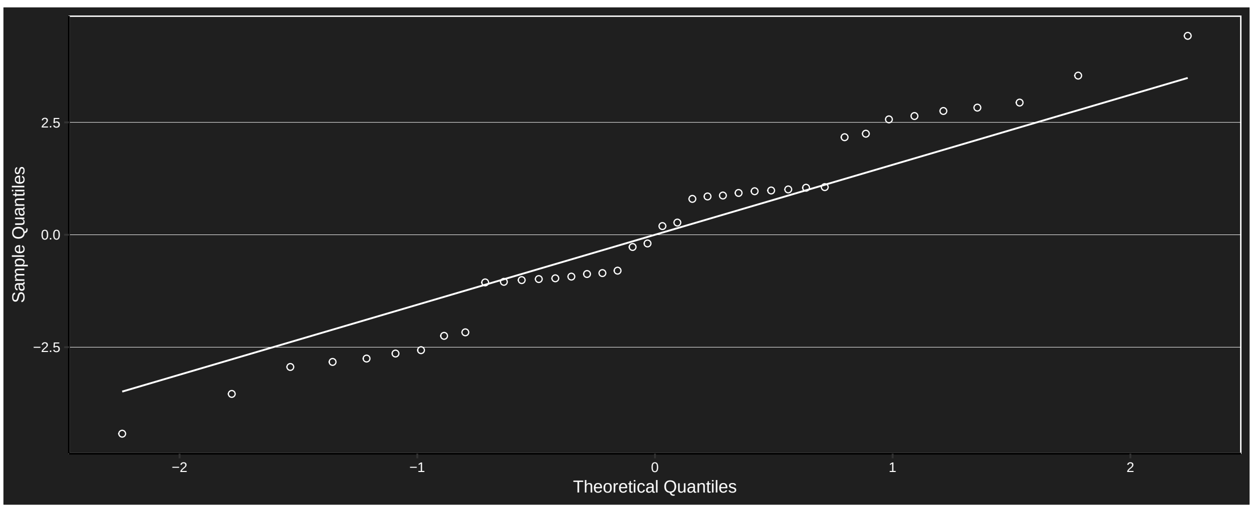
```
##         15    30    45    60     75     90    105    120    135    150
## 15   12.28 12.95  7.38  7.79   2.21   7.31   1.73   2.14   2.50   1.66
## 30   12.95 13.93  7.77  9.75   3.59   9.42   3.25   5.23   6.22   4.90
## 45    7.38  7.77  9.77 11.46  13.46  23.37  25.37  27.07  27.76  38.97
## 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
##   -1088.309859117      19.625054307      32.708423844      52.333478151
##         time_min75        time_min90       time_min105       time_min120
##      65.416847689      81.789723552      94.873093090     114.498147397
##        time_min135       time_min150             matuM             basal
##     127.581516934     143.954392798      24.020301930      43.217057762
##  time_min30:matuM  time_min45:matuM  time_min60:matuM  time_min75:matuM
```

```
##       0.171220178       4.327249699       7.055345302      11.211374823
##  time_min90:matuM time_min105:matuM time_min120:matuM time_min135:matuM
##      14.634773444      18.790802965      21.518898568      22.485337162
## time_min150:matuM
##      29.098326710
```

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

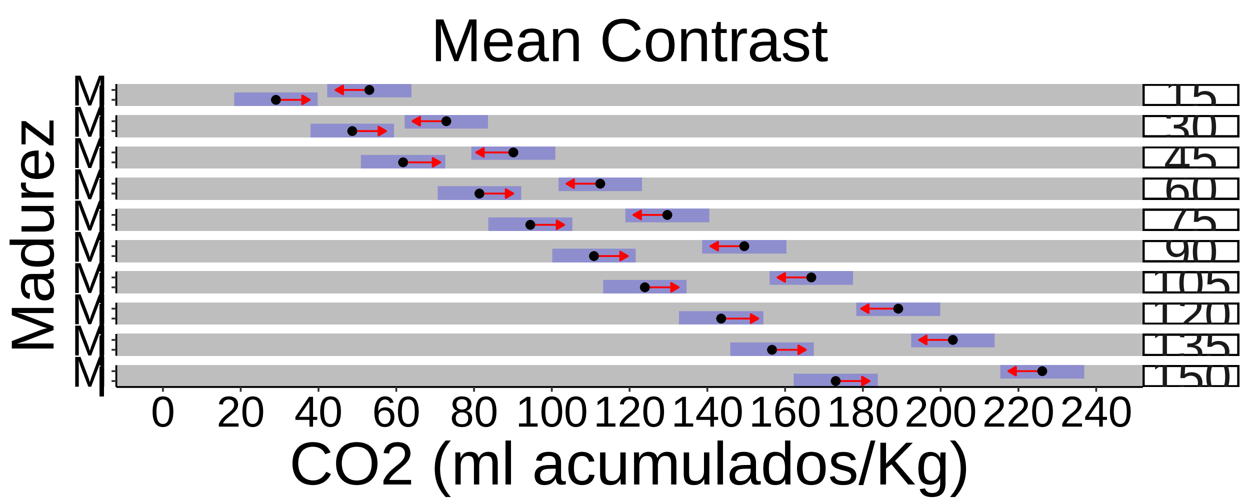
```
## $emmeans
## time_min = 15:
##  matu      emmean         SE   df    lower.CL    upper.CL
##  I     29.0559310 3.99641289 4.38  18.3274684  39.7843936
##  M     53.0762329 3.99641289 4.26  42.2426703  63.9097956
##
## time_min = 30:
##  matu      emmean         SE   df    lower.CL    upper.CL
##  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
##
```

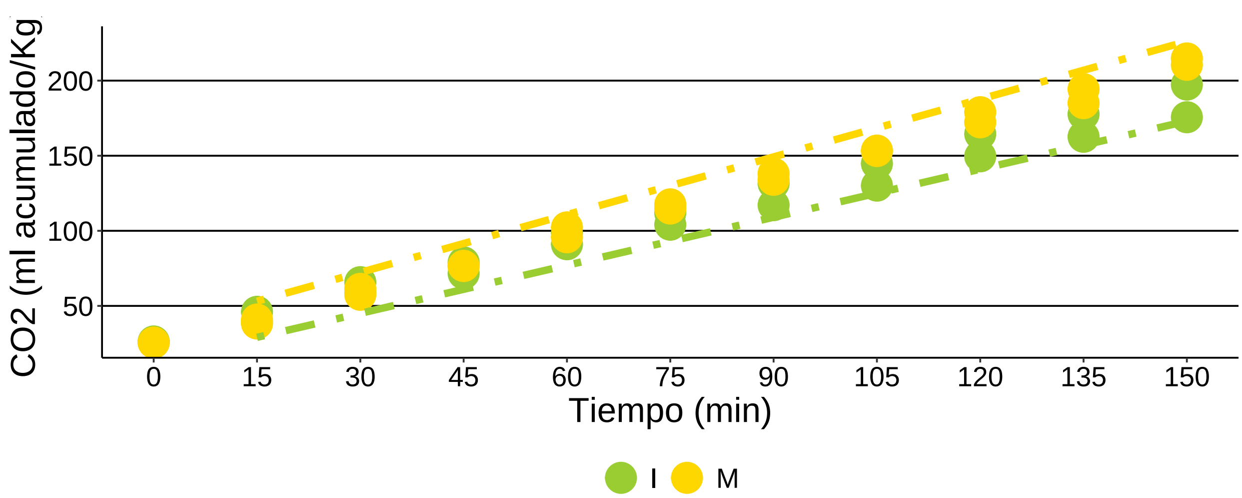
```
## time_min = 135:
##  contrast    estimate          SE   df t.ratio p.value
##  I - M    -46.5056391 7.19762359 6.28  -6.461  0.0005
##
## time_min = 150:
##  contrast    estimate          SE   df t.ratio p.value
##  I - M    -53.1186286 7.19762359 6.24  -7.380  0.0003
##
## Note: contrasts are 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 CO_2 accumulated

CO_2 acumulation

Respiration. Essay 1 with ml CO_2

Boxplot for CO_2 emission for two stages of maturity in time.

CO_2 emission for two stages of maturity in time. Shapes indicate different repetitions.

Correlation between the concentration of CO_2 and O_2 for mature and immature fruits.

O_2 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