ACD6 modulators - variance explained in necrosis and fitness

Moi Exposito-Alonso

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Variance explained of necrosis

Variance explaiend separately

```
#############################################################################
####  necrosis
dat<-read.delim('../data-raw/accessionsnecrosis.tsv')
dm<-merge(fam, by.x='sample.ID', dat, by.y='Accession',all.x=T)
dm<-cbind(dm,sg)

dim(dm)
```

```
## [1] 1135   14
```

```
table(dat$Accession %in%fam$sample.ID)
```

```
##
## TRUE
##   85
```

```
lm(data = dm, Necrosis_severity ~ m1_22935037  ) %>%  summary
```

```
##
## Call:
## lm(formula = Necrosis_severity ~ m1_22935037, data = dm)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.3462 -0.3462  0.6539  0.6539  1.6923
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   4.3462     0.1246  34.894  < 2e-16 ***
## m1_22935037  -2.0385     0.2157  -9.449 1.85e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.8982 on 76 degrees of freedom
##   (1057 observations deleted due to missingness)
## Multiple R-squared:  0.5402, Adjusted R-squared:  0.5341
## F-statistic: 89.29 on 1 and 76 DF,  p-value: 1.85e-14
```

```
lm(data = dm, Necrosis_severity ~ m4_11019243 ) %>%  summary
```

```
##
## Call:
## lm(formula = Necrosis_severity ~ m4_11019243, data = dm)
```

```
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2.7556 -0.7556  0.2444  1.2444  1.2444
##
## Coefficients: (1 not defined because of singularities)
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   3.7556     0.2039   18.42   <2e-16 ***
## m4_11019243       NA         NA      NA       NA
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.368 on 44 degrees of freedom
##   (1090 observations deleted due to missingness)
```

```
# lm(data = dm, Necrosis_severity ~ m4_8298244 ) %>%  summary

# dmnona<-na.omit(dm)
# randomForest(data = dmnona, Necrosis_severity ~ m1_22935037 * m4_11019243)
```

Variance explaiend alltogether both modulators

```
lm(data = dm, Necrosis_severity ~ m1_22935037 * m4_11019243  ) %>%  summary
```

```
##
## Call:
## lm(formula = Necrosis_severity ~ m1_22935037 * m4_11019243, data = dm)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1.5385 -0.5385  0.4615  0.4615  1.8000
##
## Coefficients: (2 not defined because of singularities)
##                           Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 4.5385     0.1566  28.984  < 2e-16 ***
## m1_22935037                -2.3385     0.2589  -9.033  4.2e-11 ***
## m4_11019243                     NA         NA      NA       NA
## m1_22935037:m4_11019243         NA         NA      NA       NA
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7984 on 39 degrees of freedom
##   (1094 observations deleted due to missingness)
## Multiple R-squared:  0.6766, Adjusted R-squared:  0.6683
## F-statistic:  81.6 on 1 and 39 DF,  p-value: 4.199e-11
```

Fitness effect of alleles in the field experiments

```
#############################################################################
####  fitness
load('../../gws/data/field.s.rda')

fit<-field.s
```

```
head(sg)
```

```
##   m1_22935037 m4_11019243 m4_8298244
## 1           1           0          1
## 2           0           0          1
## 3           0           0          1
## 4           0           0          0
## 5           0           0          0
## 6           0           0          0
```

```
head(fam)
```

```
##   family.ID sample.ID paternal.ID maternal.ID sex affection
## 1        88        88           0           0   0        -9
## 2       108       108           0           0   0        -9
## 3       139       139           0           0   0        -9
## 4       159       159           0           0   0        -9
## 5       265       265           0           0   0        -9
## 6       350       350           0           0   0        -9
```

```
head(sg)
```

```
##   m1_22935037 m4_11019243 m4_8298244
## 1           1           0          1
## 2           0           0          1
## 3           0           0          1
## 4           0           0          0
## 5           0           0          0
## 6           0           0          0
```

```
genomemat<-data.frame(
  fam$sample.ID,
  sg
)
head(genomemat)
```

```
##   fam.sample.ID m1_22935037 m4_11019243 m4_8298244
## 1            88           1           0          1
## 2           108           0           0          1
## 3           139           0           0          1
## 4           159           0           0          0
## 5           265           0           0          0
## 6           350           0           0          0
```

```
fitg<-merge(fit,by.x='id',genomemat, by.y='fam.sample.ID')
# head(fitg)

# View (fitg)



lm(data = fieldfilter(fitg,'mli'), Fitness ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Fitness ~ m1_22935037 * m4_11019243 * m4_8298244,
```

```
##     data = fieldfilter(fitg, "mli"))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -1550.0  -975.0  -336.9   555.0  8600.2
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         1096.07     150.69   7.274 3.06e-12
## m1_22935037                          337.95     216.58   1.560   0.1197
## m4_11019243                          453.94     235.69   1.926   0.0550
## m4_8298244                            63.97     326.05   0.196   0.8446
## m1_22935037:m4_11019243             -648.16     387.93  -1.671   0.0958
## m1_22935037:m4_8298244              -185.05     440.37  -0.420   0.6746
## m4_11019243:m4_8298244              -645.94     607.50  -1.063   0.2885
## m1_22935037:m4_11019243:m4_8298244   221.19     843.40   0.262   0.7933
##
## (Intercept)                         ***
## m1_22935037
## m4_11019243                         .
## m4_8298244
## m1_22935037:m4_11019243             .
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1356 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.02341,    Adjusted R-squared:  0.0006233
## F-statistic: 1.027 on 7 and 300 DF,  p-value: 0.4118
```

```
lm(data = fieldfilter(fitg,'mlp'), Fitness ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Fitness ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "mlp"))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -17.594 -13.778 -10.358   4.732 145.719
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                          13.778      2.591   5.318 2.06e-07
## m1_22935037                          -0.456      3.737  -0.122   0.9029
## m4_11019243                           3.816      4.053   0.942   0.3472
## m4_8298244                           -1.661      5.606  -0.296   0.7673
## m1_22935037:m4_11019243             -11.816      6.677  -1.770   0.0778
## m1_22935037:m4_8298244               -1.304      7.578  -0.172   0.8635
## m4_11019243:m4_8298244               -6.846     10.445  -0.655   0.5127
## m1_22935037:m4_11019243:m4_8298244   10.274     14.505   0.708   0.4793
##
```

```
## (Intercept)                          ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243              .
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 23.32 on 299 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.02181,    Adjusted R-squared:  -0.001095
## F-statistic: 0.9522 on 7 and 299 DF,  p-value: 0.4665
```

```
lm(data = fieldfilter(fitg,'mhi'), Fitness ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Fitness ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "mhi"))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -16032.7  -2767.6   -106.9   2777.0  11529.8
##
## Coefficients:
##                                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)                           16216.7      436.6  37.147   <2e-16
## m1_22935037                            -184.0      627.5  -0.293    0.770
## m4_11019243                            -342.8      682.8  -0.502    0.616
## m4_8298244                             1510.5      944.6   1.599    0.111
## m1_22935037:m4_11019243                 889.4     1123.9   0.791    0.429
## m1_22935037:m4_8298244                  253.9     1275.8   0.199    0.842
## m4_11019243:m4_8298244                 -257.3     1760.0  -0.146    0.884
## m1_22935037:m4_11019243:m4_8298244    -3009.2     2443.4  -1.232    0.219
##
## (Intercept)                          ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3929 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.03062,    Adjusted R-squared:  0.008004
## F-statistic: 1.354 on 7 and 300 DF,  p-value: 0.2247
```

```r
lm(data = fieldfilter(fitg,'mhp'), Fitness ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Fitness ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "mhp"))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -578.11 -127.23    8.84  128.59  676.34
##
## Coefficients:
##                                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)                          723.370     21.506  33.635   <2e-16
## m1_22935037                            1.311     30.911   0.042    0.966
## m4_11019243                           11.900     33.638   0.354    0.724
## m4_8298244                            23.013     46.535   0.495    0.621
## m1_22935037:m4_11019243              -86.295     55.367  -1.559    0.120
## m1_22935037:m4_8298244               -16.682     62.852  -0.265    0.791
## m4_11019243:m4_8298244                -7.891     86.704  -0.091    0.928
## m1_22935037:m4_11019243:m4_8298244    32.329    120.374   0.269    0.788
##
## (Intercept)                          ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 193.6 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.016,  Adjusted R-squared:  -0.006956
## F-statistic: 0.6971 on 7 and 300 DF,  p-value: 0.6746
```

```r
lm(data = fieldfilter(fitg,'thi'), Fitness ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Fitness ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "thi"))
##
## Residuals:
##    Min     1Q Median     3Q    Max
##  -7338  -1404     21   1455   6086
##
## Coefficients:
##                                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)                          9662.69     254.80  37.922   <2e-16
## m1_22935037                          -258.04     366.22  -0.705    0.482
## m4_11019243                          -414.47     398.54  -1.040    0.299
```

```
## m4_8298244                             789.55     551.33   1.432    0.153
## m1_22935037:m4_11019243                -37.32     655.97  -0.057    0.955
## m1_22935037:m4_8298244                 334.59     744.65   0.449    0.654
## m4_11019243:m4_8298244                  41.14    1027.25   0.040    0.968
## m1_22935037:m4_11019243:m4_8298244     444.60    1426.16   0.312    0.755
##
## (Intercept)                           ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2293 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.04399,    Adjusted R-squared:  0.02169
## F-statistic: 1.972 on 7 and 300 DF,  p-value: 0.05859
```

```
lm(data = fieldfilter(fitg,'thp'), Fitness ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Fitness ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "thp"))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -338.24  -92.54    2.21   86.69  433.86
##
## Coefficients:
##                                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)                           349.702     15.341  22.796   <2e-16
## m1_22935037                            55.712     22.049   2.527   0.0120
## m4_11019243                            49.710     23.994   2.072   0.0391
## m4_8298244                             71.917     33.193   2.167   0.0311
## m1_22935037:m4_11019243               -71.044     39.493  -1.799   0.0730
## m1_22935037:m4_8298244                 -3.764     44.832  -0.084   0.9331
## m4_11019243:m4_8298244                  1.812     61.846   0.029   0.9767
## m1_22935037:m4_11019243:m4_8298244     -8.709     85.863  -0.101   0.9193
##
## (Intercept)                           ***
## m1_22935037                           *
## m4_11019243                           *
## m4_8298244                            *
## m1_22935037:m4_11019243               .
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 138.1 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.07199,    Adjusted R-squared:  0.05034
## F-statistic: 3.325 on 7 and 300 DF,  p-value: 0.002
```

```
lm(data = fieldfilter(fitg,'tlp'), Fitness ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Fitness ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "tlp"))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -60.532 -30.477  -6.412  25.276 155.709
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                          55.569      4.556  12.196   <2e-16
## m1_22935037                          -3.523      6.549  -0.538    0.591
## m4_11019243                          -9.108      7.127  -1.278    0.202
## m4_8298244                            4.964      9.859   0.503    0.615
## m1_22935037:m4_11019243              13.846     11.730   1.180    0.239
## m1_22935037:m4_8298244              -19.322     13.316  -1.451    0.148
## m4_11019243:m4_8298244              -29.194     18.369  -1.589    0.113
## m1_22935037:m4_11019243:m4_8298244   10.571     25.502   0.415    0.679
##
## (Intercept)                         ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 41.01 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.04649,    Adjusted R-squared:  0.02424
## F-statistic: 2.089 on 7 and 300 DF,  p-value: 0.04453
```

```
lm(data = fieldfilter(fitg,'tli'), Fitness ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Fitness ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "tli"))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2158.5  -669.3   -37.7   625.9  3277.4
##
## Coefficients:
```

```
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         2098.44     110.45  19.000   <2e-16
## m1_22935037                           60.06     158.74   0.378    0.705
## m4_11019243                          -48.40     172.75  -0.280    0.780
## m4_8298244                           -16.61     238.98  -0.069    0.945
## m1_22935037:m4_11019243              -47.42     284.33  -0.167    0.868
## m1_22935037:m4_8298244               -64.97     322.77  -0.201    0.841
## m4_11019243:m4_8298244              -344.88     445.27  -0.775    0.439
## m1_22935037:m4_11019243:m4_8298244  -348.34     618.18  -0.563    0.574
##
## (Intercept)                         ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 994 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.02611,    Adjusted R-squared:  0.003384
## F-statistic: 1.149 on 7 and 300 DF,  p-value: 0.3324
```

```
lm(data = fieldfilter(fitg,'mli'), Survival_fruit ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Survival_fruit ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "mli"))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.39507 -0.17974 -0.01601  0.15359  0.65066
##
## Coefficients:
##                                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         0.287566   0.026362  10.908   <2e-16
## m1_22935037                         0.061776   0.037890   1.630   0.1041
## m4_11019243                         0.058841   0.041233   1.427   0.1546
## m4_8298244                          0.018657   0.057041   0.327   0.7438
## m1_22935037:m4_11019243            -0.125399   0.067867  -1.848   0.0656
## m1_22935037:m4_8298244              0.027075   0.077042   0.351   0.7255
## m4_11019243:m4_8298244             -0.073993   0.106279  -0.696   0.4868
## m1_22935037:m4_11019243:m4_8298244 -0.009285   0.147551  -0.063   0.9499
##
## (Intercept)                         ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243             .
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
```

```
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2373 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.0261, Adjusted R-squared:  0.003378
## F-statistic: 1.149 on 7 and 300 DF,  p-value: 0.3326
```

```
lm(data = fieldfilter(fitg,'mlp'), Survival_fruit ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Survival_fruit ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "mlp"))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.1580 -0.1319 -0.1212  0.1181  0.8760
##
## Coefficients:
##                                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         0.1318930  0.0210216   6.274 1.23e-09
## m1_22935037                        -0.0078930  0.0303178  -0.260    0.795
## m4_11019243                         0.0157260  0.0328801   0.478    0.633
## m4_8298244                         -0.0106809  0.0454856  -0.235    0.815
## m1_22935037:m4_11019243            -0.0769055  0.0541763  -1.420    0.157
## m1_22935037:m4_8298244              0.0447269  0.0614857   0.727    0.468
## m4_11019243:m4_8298244             -0.0223548  0.0847494  -0.264    0.792
## m1_22935037:m4_11019243:m4_8298244  0.0004883  0.1176868   0.004    0.997
##
## (Intercept)
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1892 on 299 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.01748,    Adjusted R-squared:  -0.005527
## F-statistic: 0.7597 on 7 and 299 DF,  p-value: 0.6215
```

```
lm(data = fieldfilter(fitg,'mhi'), Survival_fruit ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Survival_fruit ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "mhi"))
##
## Residuals:
```

```
##      Min       1Q   Median       3Q      Max
## -0.90976 -0.07218  0.06461  0.09449  0.11318
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         0.905511   0.013934  64.985   <2e-16
## m1_22935037                         0.004247   0.020027   0.212    0.832
## m4_11019243                        -0.018692   0.021795  -0.858    0.392
## m4_8298244                          0.028471   0.030150   0.944    0.346
## m1_22935037:m4_11019243             0.008292   0.035872   0.231    0.817
## m1_22935037:m4_8298244             -0.002844   0.040722  -0.070    0.944
## m4_11019243:m4_8298244             -0.028386   0.056176  -0.505    0.614
## m1_22935037:m4_11019243:m4_8298244  0.004591   0.077991   0.059    0.953
##
## (Intercept)                        ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1254 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.01421,    Adjusted R-squared:  -0.008788
## F-statistic: 0.6179 on 7 and 300 DF,  p-value: 0.741
```

```
lm(data = fieldfilter(fitg,'mhp'), Survival_fruit ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summar
```

```
##
## Call:
## lm(formula = Survival_fruit ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "mhp"))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.54561 -0.10103  0.09897  0.11379  0.17564
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         0.90103    0.01774  50.784   <2e-16
## m1_22935037                        -0.02208    0.02550  -0.866    0.387
## m4_11019243                        -0.01323    0.02775  -0.477    0.634
## m4_8298244                         -0.02603    0.03839  -0.678    0.498
## m1_22935037:m4_11019243            -0.04136    0.04568  -0.905    0.366
## m1_22935037:m4_8298244              0.03329    0.05185   0.642    0.521
## m4_11019243:m4_8298244             -0.01594    0.07153  -0.223    0.824
## m1_22935037:m4_11019243:m4_8298244  0.08765    0.09931   0.883    0.378
##
## (Intercept)                        ***
## m1_22935037
## m4_11019243
```

```
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1597 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.01733,    Adjusted R-squared:  -0.005598
## F-statistic: 0.7559 on 7 and 300 DF,  p-value: 0.6248
```

```
lm(data = fieldfilter(fitg,'thi'), Survival_fruit ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Survival_fruit ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "thi"))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.58621 -0.04233 -0.01948  0.11724  0.12808
##
## Coefficients:
##                                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)                        0.89947    0.01355  66.406   <2e-16
## m1_22935037                       -0.01774    0.01947  -0.911    0.363
## m4_11019243                       -0.01671    0.02119  -0.789    0.431
## m4_8298244                        -0.02122    0.02931  -0.724    0.470
## m1_22935037:m4_11019243            0.02417    0.03487   0.693    0.489
## m1_22935037:m4_8298244             0.01141    0.03958   0.288    0.773
## m4_11019243:m4_8298244             0.01346    0.05461   0.247    0.805
## m1_22935037:m4_11019243:m4_8298244  0.03573    0.07581   0.471    0.638
##
## (Intercept)                       ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1219 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.009443,   Adjusted R-squared:  -0.01367
## F-statistic: 0.4086 on 7 and 300 DF,  p-value: 0.8968
```

```
lm(data = fieldfilter(fitg,'thp'), Survival_fruit ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
```

```
## lm(formula = Survival_fruit ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "thp"))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.50855 -0.10855  0.00574  0.12479  0.37337
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         0.62663    0.02068  30.299   <2e-16
## m1_22935037                         0.06884    0.02973   2.316   0.0212
## m4_11019243                         0.08191    0.03235   2.532   0.0118
## m4_8298244                          0.05021    0.04475   1.122   0.2628
## m1_22935037:m4_11019243            -0.11557    0.05324  -2.171   0.0307
## m1_22935037:m4_8298244              0.01606    0.06044   0.266   0.7907
## m4_11019243:m4_8298244             -0.02959    0.08338  -0.355   0.7229
## m1_22935037:m4_11019243:m4_8298244  0.06317    0.11576   0.546   0.5856
##
## (Intercept)                        ***
## m1_22935037                        *
## m4_11019243                        *
## m4_8298244
## m1_22935037:m4_11019243            *
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1861 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.0525, Adjusted R-squared:  0.03039
## F-statistic: 2.375 on 7 and 300 DF,  p-value: 0.0224
```

```
lm(data = fieldfilter(fitg,'tlp'), Survival_fruit ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Survival_fruit ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "tlp"))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.37051 -0.11276 -0.05364  0.11339  0.53882
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         0.31276    0.02316  13.506   <2e-16
## m1_22935037                        -0.01824    0.03328  -0.548   0.5841
## m4_11019243                        -0.02615    0.03622  -0.722   0.4709
## m4_8298244                          0.01149    0.05011   0.229   0.8189
## m1_22935037:m4_11019243             0.10215    0.05962   1.713   0.0877
## m1_22935037:m4_8298244             -0.04221    0.06768  -0.624   0.5333
## m4_11019243:m4_8298244             -0.08559    0.09336  -0.917   0.3600
## m1_22935037:m4_11019243:m4_8298244 -0.05420    0.12961  -0.418   0.6761
```

```
##
## (Intercept)                          ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243              .
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.2084 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.02733,    Adjusted R-squared:  0.004632
## F-statistic: 1.204 on 7 and 300 DF,  p-value: 0.3002
```

```
lm(data = fieldfilter(fitg,'tli'), Survival_fruit ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Survival_fruit ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "tli"))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.46916 -0.12468 -0.00435  0.13518  0.44724
##
## Coefficients:
##                                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)                          0.4099059  0.0195138  21.006   <2e-16
## m1_22935037                          0.0263409  0.0280469   0.939    0.348
## m4_11019243                          0.0004895  0.0305217   0.016    0.987
## m4_8298244                           0.0592499  0.0422230   1.403    0.162
## m1_22935037:m4_11019243             -0.0038151  0.0502366  -0.076    0.940
## m1_22935037:m4_8298244              -0.0289533  0.0570281  -0.508    0.612
## m4_11019243:m4_8298244              -0.1035739  0.0786706  -1.317    0.189
## m1_22935037:m4_11019243:m4_8298244 -0.0239297  0.1092208  -0.219    0.827
##
## (Intercept)                          ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1756 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.02549,    Adjusted R-squared:  0.002748
## F-statistic: 1.121 on 7 and 300 DF,  p-value: 0.3497
```

```r
lm(data = fieldfilter(fitg,'mli'), Seeds ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Seeds ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "mli"))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3953.7 -1715.1  -691.7   728.1 25744.4
##
## Coefficients:
##                                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)                           3689.4      400.3   9.217   <2e-16
## m1_22935037                            120.3      566.1   0.213    0.832
## m4_11019243                           1016.9      623.0   1.632    0.104
## m4_8298244                             906.8      836.7   1.084    0.280
## m1_22935037:m4_11019243               -767.0     1043.2  -0.735    0.463
## m1_22935037:m4_8298244               -1137.1     1120.1  -1.015    0.311
## m4_11019243:m4_8298244               -2389.1     1486.6  -1.607    0.109
## m1_22935037:m4_11019243:m4_8298244    1462.3     2141.6   0.683    0.495
##
## (Intercept)                          ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3202 on 245 degrees of freedom
##   (262 observations deleted due to missingness)
## Multiple R-squared:  0.02183,    Adjusted R-squared:  -0.00612
## F-statistic: 0.781 on 7 and 245 DF,  p-value: 0.6038
```

```r
lm(data = fieldfilter(fitg,'mlp'), Seeds ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Seeds ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "mlp"))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -3114.6 -1494.7  -430.1   836.6 11196.3
##
## Coefficients:
##                                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)                           2974.5      396.0   7.512 1.79e-11
## m1_22935037                            346.9      584.5   0.594   0.5541
## m4_11019243                           1058.4      617.9   1.713   0.0896
```

```
## m4_8298244                             -145.5      896.5  -0.162   0.8714
## m1_22935037:m4_11019243               -1780.5     1142.7  -1.558   0.1221
## m1_22935037:m4_8298244                -1376.7     1177.5  -1.169   0.2449
## m4_11019243:m4_8298244                -1356.2     1901.6  -0.713   0.4773
## m1_22935037:m4_11019243:m4_8298244     3409.5     2743.3   1.243   0.2166
##
## (Intercept)                           ***
## m1_22935037
## m4_11019243                           .
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2275 on 108 degrees of freedom
##   (398 observations deleted due to missingness)
## Multiple R-squared:  0.07741,    Adjusted R-squared:  0.01762
## F-statistic: 1.295 on 7 and 108 DF,  p-value: 0.2599
```

```
lm(data = fieldfilter(fitg,'mhi'), Seeds ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Seeds ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "mhi"))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -8100.0 -2515.5     0.4  2100.7 10666.4
##
## Coefficients:
##                                       Estimate Std. Error t value Pr(>|t|)
## (Intercept)                           17911.72     391.59  45.741   <2e-16
## m1_22935037                            -290.65     564.76  -0.515    0.607
## m4_11019243                              34.18     612.49   0.056    0.956
## m4_8298244                             1133.97     847.31   1.338    0.182
## m1_22935037:m4_11019243                 576.72    1009.20   0.571    0.568
## m1_22935037:m4_8298244                  217.86    1145.36   0.190    0.849
## m4_11019243:m4_8298244                  455.22    1578.71   0.288    0.773
## m1_22935037:m4_11019243:m4_8298244 -3472.45    2192.28  -1.584    0.114
##
## (Intercept)                           ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## Residual standard error: 3524 on 299 degrees of freedom
##   (208 observations deleted due to missingness)
## Multiple R-squared:  0.02698,    Adjusted R-squared:  0.004198
## F-statistic: 1.184 on 7 and 299 DF,  p-value: 0.3115
```

```
lm(data = fieldfilter(fitg,'mhp'), Seeds ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Seeds ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "mhp"))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -13558.3  -3074.2     -9.1   2781.5  17479.8
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                        24053.50     526.88  45.653   <2e-16
## m1_22935037                          497.33     757.27   0.657    0.512
## m4_11019243                          703.11     824.09   0.853    0.394
## m4_8298244                          1621.62    1140.03   1.422    0.156
## m1_22935037:m4_11019243            -1643.15    1356.40  -1.211    0.227
## m1_22935037:m4_8298244             -1309.95    1539.77  -0.851    0.396
## m4_11019243:m4_8298244                70.16    2124.12   0.033    0.974
## m1_22935037:m4_11019243:m4_8298244 -1280.05    2948.98  -0.434    0.665
##
## (Intercept)                        ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4742 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.0199, Adjusted R-squared:  -0.002972
## F-statistic:  0.87 on 7 and 300 DF,  p-value: 0.5305
```

```
lm(data = fieldfilter(fitg,'thi'), Seeds ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Seeds ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "thi"))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -5606.8 -1421.6   126.6  1311.2  5108.2
##
## Coefficients:
```

```
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                        10756.09     226.91  47.402   <2e-16
## m1_22935037                          -84.36     326.14  -0.259   0.7961
## m4_11019243                         -316.69     354.91  -0.892   0.3729
## m4_8298244                          1030.60     490.98   2.099   0.0366
## m1_22935037:m4_11019243             -356.22     584.16  -0.610   0.5425
## m1_22935037:m4_8298244               343.06     663.14   0.517   0.6053
## m4_11019243:m4_8298244               269.95     914.80   0.295   0.7681
## m1_22935037:m4_11019243:m4_8298244  -218.68    1270.04  -0.172   0.8634
##
## (Intercept)                        ***
## m1_22935037
## m4_11019243
## m4_8298244                         *
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2042 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.07522,    Adjusted R-squared:  0.05364
## F-statistic: 3.486 on 7 and 300 DF,  p-value: 0.001311
```

```
lm(data = fieldfilter(fitg,'thp'), Seeds ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Seeds ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "thp"))
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -14632.5  -2137.0     -9.7   2032.4  11942.5
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         16462.1      401.4  41.009   <2e-16
## m1_22935037                           983.4      577.0   1.704   0.0893
## m4_11019243                           647.5      627.9   1.031   0.3033
## m4_8298244                           1960.2      868.6   2.257   0.0247
## m1_22935037:m4_11019243             -1215.3     1033.4  -1.176   0.2405
## m1_22935037:m4_8298244               -890.9     1173.1  -0.759   0.4482
## m4_11019243:m4_8298244                751.3     1618.4   0.464   0.6428
## m1_22935037:m4_11019243:m4_8298244   -973.1     2246.8  -0.433   0.6653
##
## (Intercept)                        ***
## m1_22935037                        .
## m4_11019243
## m4_8298244                         *
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
```

```
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3613 on 300 degrees of freedom
##   (207 observations deleted due to missingness)
## Multiple R-squared:  0.04586,    Adjusted R-squared:  0.02359
## F-statistic:  2.06 on 7 and 300 DF,  p-value: 0.04775
```

```
lm(data = fieldfilter(fitg,'tlp'), Seeds ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Seeds ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "tlp"))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -4179.1 -1474.6  -367.9  1110.9 10185.1
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         5532.06     254.20  21.763   <2e-16
## m1_22935037                         -405.60     373.71  -1.085    0.279
## m4_11019243                         -681.18     415.71  -1.639    0.103
## m4_8298244                            11.02     596.15   0.018    0.985
## m1_22935037:m4_11019243               66.88     664.61   0.101    0.920
## m1_22935037:m4_8298244              -782.22     795.44  -0.983    0.326
## m4_11019243:m4_8298244             -1594.78    1275.43  -1.250    0.212
## m1_22935037:m4_11019243:m4_8298244  1711.41    1636.91   1.046    0.297
##
## (Intercept)                        ***
## m1_22935037
## m4_11019243
## m4_8298244
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2157 on 244 degrees of freedom
##   (263 observations deleted due to missingness)
## Multiple R-squared:  0.05387,    Adjusted R-squared:  0.02673
## F-statistic: 1.985 on 7 and 244 DF,  p-value: 0.05777
```

```
lm(data = fieldfilter(fitg,'tli'), Seeds ~ m1_22935037 * m4_11019243 *m4_8298244 ) %>%  summary
```

```
##
## Call:
## lm(formula = Seeds ~ m1_22935037 * m4_11019243 * m4_8298244,
##     data = fieldfilter(fitg, "tli"))
##
## Residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -3750.7  -925.2   -68.0   752.5  6078.4
##
## Coefficients:
##                                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)                         5074.35     151.19  33.563   <2e-16
## m1_22935037                         -120.68     217.34  -0.555   0.5792
## m4_11019243                          -62.04     238.16  -0.261   0.7947
## m4_8298244                          -694.30     331.56  -2.094   0.0371
## m1_22935037:m4_11019243              -81.30     389.14  -0.209   0.8347
## m1_22935037:m4_8298244               450.63     444.26   1.014   0.3113
## m4_11019243:m4_8298244               464.66     636.41   0.730   0.4659
## m1_22935037:m4_11019243:m4_8298244 -1162.38     863.51  -1.346   0.1793
##
## (Intercept)                        ***
## m1_22935037
## m4_11019243
## m4_8298244                         *
## m1_22935037:m4_11019243
## m1_22935037:m4_8298244
## m4_11019243:m4_8298244
## m1_22935037:m4_11019243:m4_8298244
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1352 on 294 degrees of freedom
##   (213 observations deleted due to missingness)
## Multiple R-squared:  0.03738,    Adjusted R-squared:  0.01446
## F-statistic: 1.631 on 7 and 294 DF,  p-value: 0.1263
```