WK14

2025-10-01

```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.2     v tibble    3.2.1
## v lubridate 1.9.4     v tidyr     1.3.1
## v purrr     1.0.4
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(readxl)
library(lubridate)
library(janitor)
```

```
##
## Attaching package: 'janitor'
##
## The following objects are masked from 'package:stats':
##
##     chisq.test, fisher.test
```

```
library(purrr)
library(readr)
library(ggthemes)
library(ggeffects)
library(lme4)
```

```
## Loading required package: Matrix
##
## Attaching package: 'Matrix'
##
## The following objects are masked from 'package:tidyr':
##
##     expand, pack, unpack
```

```
library(dplyr)
library(ggplot2)
```

mixed-effect model by including time as fixed-effect for 2022 to 2023

```r
pl_lt <- read.csv("Data/pl_lt.csv")%>% mutate(survey_date = as.Date(survey_date))
pl_lt <- pl_lt %>%
  arrange(survey_date) %>%
  mutate(
    week = as.integer((as.numeric(survey_date - min(survey_date)) %/% 7) + 1)
  )
pl_lt$week_f <- as.factor(pl_lt$week)
pl_lt_t.lmer <- lmer(
  daily_growth ~ mean_light_ly_day2 + (1 + mean_light_ly_day2 | pop) + (week|pop),
  data = pl_lt, REML = TRUE
)
```

```
## boundary (singular) fit: see help('isSingular')
```

```r
summary  (pl_lt_t.lmer)
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: daily_growth ~ mean_light_ly_day2 + (1 + mean_light_ly_day2 |
##     pop) + (week | pop)
##    Data: pl_lt
##
## REML criterion at convergence: 1643.8
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.1993 -0.2980 -0.0511  0.1353  8.5496
##
## Random effects:
##  Groups   Name               Variance  Std.Dev. Corr
##  pop      (Intercept)        2.677e-02 0.163623
##           mean_light_ly_day2 6.163e-03 0.078502 1.00
##  pop.1    (Intercept)        3.558e-04 0.018863
##           week               4.772e-05 0.006908 1.00
##  Residual                    1.127e-01 0.335689
## Number of obs: 2415, groups:  pop, 23
##
## Fixed effects:
##                     Estimate Std. Error t value
## (Intercept)          0.13735    0.04730   2.904
## mean_light_ly_day2   0.07728    0.02340   3.303
##
## Correlation of Fixed Effects:
##             (Intr)
## mn_lght_l_2 0.956
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see help('isSingular')
```

```r
save(pl_lt_t.lmer, file = "pl_lt_t_lmer.RData")
```

mixed-effect model for 2023

```
plant_with_light <- read.csv("Data/plant_with_light.csv")%>% mutate(survey_date = as.Date(survey_date))
plant_with_light <- plant_with_light %>%
  arrange(survey_date) %>%
  mutate(
    week = as.integer((as.numeric(survey_date - min(survey_date)) %/% 7) + 1)
  )
plant_with_light$week_f <- as.factor(plant_with_light$week)
growth_light_time.lmer <- lmer(
  daily_growth ~ weekly_avg_SlrW2 + (1 + weekly_avg_SlrW2 | parent_pop) + (week|parent_pop),
  data = plant_with_light, REML = TRUE
)
```

```
## Warning in checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv, :
## Model failed to converge with max|grad| = 0.0217028 (tol = 0.002, component 1)
```

```
summary(growth_light_time.lmer)
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula:
## daily_growth ~ weekly_avg_SlrW2 + (1 + weekly_avg_SlrW2 | parent_pop) +
##     (week | parent_pop)
##    Data: plant_with_light
##
## REML criterion at convergence: -6527.6
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -6.2933 -0.4697  0.0025  0.4434  8.4371
##
## Random effects:
##  Groups       Name             Variance  Std.Dev. Corr
##  parent_pop   (Intercept)      1.101e-03 0.033179
##               weekly_avg_SlrW2 2.749e-04 0.016579 -0.25
##  parent_pop.1 (Intercept)      3.392e-03 0.058238
##               week             5.054e-05 0.007109 -0.94
##  Residual                      1.879e-02 0.137089
## Number of obs: 5870, groups:  parent_pop, 22
##
## Fixed effects:
##                  Estimate Std. Error t value
## (Intercept)      0.018090   0.008599   2.104
## weekly_avg_SlrW2 0.028739   0.004629   6.208
##
## Correlation of Fixed Effects:
##             (Intr)
## wkly_vg_SW2 -0.121
## optimizer (nloptwrap) convergence code: 0 (OK)
## Model failed to converge with max|grad| = 0.0217028 (tol = 0.002, component 1)
```

```
save(growth_light_time.lmer, file = "growth_light_time.lmer.RData")
```