Emergence seedlings Poukawa

CT

March 2016

Purpose:

-Analysis of plant population -calculate the percentage of emergence

library(tidyr)  
library (dplyr)

##   
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

library (ggplot2)  
library(agricolae)  
library(knitr)  
library (lubridate)

##   
## Attaching package: 'lubridate'

## The following object is masked from 'package:base':  
##   
## date

library(mosaic)

## Warning: package 'mosaic' was built under R version 3.3.1

## Loading required package: lattice

## Warning: package 'lattice' was built under R version 3.3.1

## Loading required package: mosaicData

## Warning: package 'mosaicData' was built under R version 3.3.1

## Loading required package: Matrix

##   
## Attaching package: 'Matrix'

## The following object is masked from 'package:tidyr':  
##   
## expand

##   
## The 'mosaic' package masks several functions from core packages in order to add additional features.   
## The original behavior of these functions should not be affected by this.

##   
## Attaching package: 'mosaic'

## The following object is masked from 'package:Matrix':  
##   
## mean

## The following objects are masked from 'package:dplyr':  
##   
## count, do, tally

## The following objects are masked from 'package:stats':  
##   
## binom.test, cor, cov, D, fivenum, IQR, median, prop.test,  
## quantile, sd, t.test, var

## The following objects are masked from 'package:base':  
##   
## max, mean, min, prod, range, sample, sum

library(lattice)

setwd("C:\\Users\\EdCarmen\\Documents\\CarmenProjects2016\\GitSubclover\\EmergencePoukawa")  
getwd()

## [1] "C:/Users/EdCarmen/Documents/CarmenProjects2016/GitSubclover/EmergencePoukawa"

#create file  
df\_emerg <- read.table("PlantPopPok.txt",header=TRUE)  
  
# define factors for the ones that "look like" values  
df\_emerg$Plot <- as.factor(df\_emerg$Plot)  
df\_emerg$Block <- as.factor(df\_emerg$Block)  
  
 df\_emerg <- df\_emerg %>%  
 mutate(SowingDate = dmy(SowingDate),   
 ReadingDate = dmy(ReadingDate),  
 PlantPop = (Sub1+Sub2+Sub3)/3/0.01)  
  
str(df\_emerg)

## 'data.frame': 1296 obs. of 11 variables:  
## $ SowTreat : Factor w/ 8 levels "S1","S2","S3",..: 1 1 1 1 1 1 1 1 1 1 ...  
## $ Cultivar : Factor w/ 6 levels "Antas","Denmark",..: 1 4 2 3 5 6 1 6 2 4 ...  
## $ Block : Factor w/ 3 levels "1","2","3": 1 1 1 1 1 1 2 2 2 2 ...  
## $ Plot : Factor w/ 144 levels "1","2","3","4",..: 1 2 3 4 5 6 7 8 9 10 ...  
## $ SowingDate : Date, format: "2016-02-19" "2016-02-19" ...  
## $ ReadingDate: Date, format: "2016-02-19" "2016-02-19" ...  
## $ DAS : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ Sub1 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ Sub2 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ Sub3 : int 0 0 0 0 0 0 0 0 0 0 ...  
## $ PlantPop : num 0 0 0 0 0 0 0 0 0 0 ...

head(df\_emerg)

## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1 Sub2  
## 1 S1 Antas 1 1 2016-02-19 2016-02-19 0 0 0  
## 2 S1 Monti 1 2 2016-02-19 2016-02-19 0 0 0  
## 3 S1 Denmark 1 3 2016-02-19 2016-02-19 0 0 0  
## 4 S1 Leura 1 4 2016-02-19 2016-02-19 0 0 0  
## 5 S1 Narrikup 1 5 2016-02-19 2016-02-19 0 0 0  
## 6 S1 Woogenellup 1 6 2016-02-19 2016-02-19 0 0 0  
## Sub3 PlantPop  
## 1 0 0  
## 2 0 0  
## 3 0 0  
## 4 0 0  
## 5 0 0  
## 6 0 0

tail(df\_emerg)

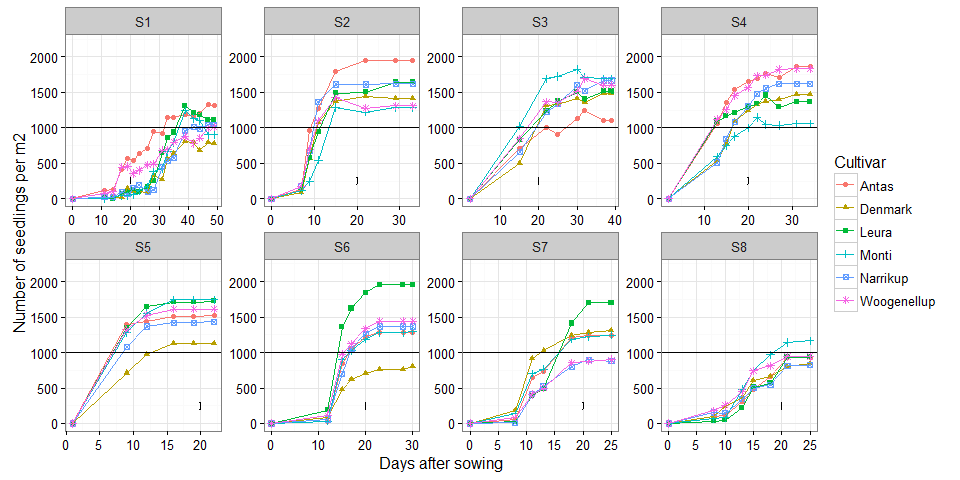
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1 Sub2  
## 1291 S8 Leura 3 139 2017-01-05 2017-01-30 25 6 7  
## 1292 S8 Monti 3 140 2017-01-05 2017-01-30 25 19 12  
## 1293 S8 Woogenellup 3 141 2017-01-05 2017-01-30 25 6 5  
## 1294 S8 Antas 3 142 2017-01-05 2017-01-30 25 6 6  
## 1295 S8 Denmark 3 143 2017-01-05 2017-01-30 25 13 5  
## 1296 S8 Narrikup 3 144 2017-01-05 2017-01-30 25 5 5  
## Sub3 PlantPop  
## 1291 12 833.3333  
## 1292 12 1433.3333  
## 1293 18 966.6667  
## 1294 11 766.6667  
## 1295 24 1400.0000  
## 1296 3 433.3333

df\_emerg %>% filter(Plot ==1) %>% summary()

## SowTreat Cultivar Block Plot SowingDate   
## S1 :17 Antas :17 1:17 1 :17 Min. :2016-02-19   
## S2 : 0 Denmark : 0 2: 0 2 : 0 1st Qu.:2016-02-19   
## S3 : 0 Leura : 0 3: 0 3 : 0 Median :2016-02-19   
## S4 : 0 Monti : 0 4 : 0 Mean :2016-02-19   
## S5 : 0 Narrikup : 0 5 : 0 3rd Qu.:2016-02-19   
## S6 : 0 Woogenellup: 0 6 : 0 Max. :2016-02-19   
## (Other): 0 (Other): 0   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-02-19 Min. : 0.00 Min. : 0.000 Min. :0.000   
## 1st Qu.:2016-03-09 1st Qu.:19.00 1st Qu.: 1.000 1st Qu.:1.000   
## Median :2016-03-18 Median :28.00 Median : 6.000 Median :2.000   
## Mean :2016-03-18 Mean :28.18 Mean : 7.765 Mean :1.588   
## 3rd Qu.:2016-03-29 3rd Qu.:39.00 3rd Qu.:13.000 3rd Qu.:2.000   
## Max. :2016-04-08 Max. :49.00 Max. :18.000 Max. :3.000   
##   
## Sub3 PlantPop   
## Min. : 0.000 Min. : 0.0   
## 1st Qu.: 4.000 1st Qu.:233.3   
## Median : 7.000 Median :533.3   
## Mean : 6.118 Mean :515.7   
## 3rd Qu.: 9.000 3rd Qu.:733.3   
## Max. :10.000 Max. :966.7   
##

# Graph it   
  
  
#Graph   
 df\_emerg %>% group\_by(Cultivar, SowTreat, DAS) %>%  
 #filter(SowTreat =="S2"& SowTreat =="S4")%>%  
 #dplyr::select(-SowingDate, - ReadingDate) %>%  
 summarise\_each(funs(mean)) %>%  
 ggplot(aes(x=DAS, y=PlantPop)) +   
 geom\_point(aes(colour=Cultivar,shape=Cultivar)) +  
 geom\_line(aes(colour=Cultivar)) +  
 #add error bar  
 geom\_errorbar(aes(x=20,ymin=200,ymax=300,width=0.2))+  
 facet\_wrap(~SowTreat,ncol=4, scales = "free")+  
 theme\_bw()+  
 ylim(0, 2200)+  
 labs(y="Number of seedlings per m2",x="Days after sowing") +  
 geom\_abline(intercept = 1000, slope = 0)

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## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA  
  
## Warning in mean.default(x, ..., na.rm = na.rm): argument is not numeric or  
## logical: returning NA



#compare max plant population among Sowing dates and cultivars  
  
df\_emerg\_perc3 <- df\_emerg %>%  
group\_by(Plot) %>%  
mutate(FinalPop= round(max(PlantPop)\*1,digits=2))  
  
head(df\_emerg\_perc3)

## Source: local data frame [6 x 12]  
## Groups: Plot [6]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S1 Antas 1 1 2016-02-19 2016-02-19 0 0  
## 2 S1 Monti 1 2 2016-02-19 2016-02-19 0 0  
## 3 S1 Denmark 1 3 2016-02-19 2016-02-19 0 0  
## 4 S1 Leura 1 4 2016-02-19 2016-02-19 0 0  
## 5 S1 Narrikup 1 5 2016-02-19 2016-02-19 0 0  
## 6 S1 Woogenellup 1 6 2016-02-19 2016-02-19 0 0  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl)

summary (df\_emerg\_perc3)

## SowTreat Cultivar Block Plot   
## S1 :306 Antas :216 1:432 1 : 17   
## S4 :180 Denmark :216 2:432 2 : 17   
## S2 :144 Leura :216 3:432 3 : 17   
## S3 :144 Monti :216 4 : 17   
## S6 :144 Narrikup :216 5 : 17   
## S8 :144 Woogenellup:216 6 : 17   
## (Other):234 (Other):1194   
## SowingDate ReadingDate DAS   
## Min. :2016-02-19 Min. :2016-02-19 Min. : 0.00   
## 1st Qu.:2016-03-30 1st Qu.:2016-04-07 1st Qu.:12.00   
## Median :2016-07-05 Median :2016-07-21 Median :19.50   
## Mean :2016-07-07 Mean :2016-07-27 Mean :20.03   
## 3rd Qu.:2016-10-11 3rd Qu.:2016-10-31 3rd Qu.:28.00   
## Max. :2017-01-05 Max. :2017-01-30 Max. :49.00   
##   
## Sub1 Sub2 Sub3 PlantPop   
## Min. : 0.000 Min. : 0.000 Min. : 0.000 Min. : 0.0   
## 1st Qu.: 1.000 1st Qu.: 2.000 1st Qu.: 2.000 1st Qu.: 166.7   
## Median : 8.000 Median : 7.000 Median : 8.000 Median : 866.7   
## Mean : 8.755 Mean : 8.155 Mean : 8.628 Mean : 851.3   
## 3rd Qu.:14.000 3rd Qu.:13.000 3rd Qu.:14.000 3rd Qu.:1366.7   
## Max. :25.000 Max. :25.000 Max. :25.000 Max. :2466.7   
##   
## FinalPop   
## Min. : 233.3   
## 1st Qu.: 966.7   
## Median :1366.7   
## Mean :1353.9   
## 3rd Qu.:1633.3   
## Max. :2466.7   
##

write.table(df\_emerg\_perc3, "df\_emerg\_perc3.txt")

then select each sowing date individually

df\_emerg\_S1 <-df\_emerg\_perc3 %>%  
filter(SowTreat=="S1")   
summary (df\_emerg\_S1)

## SowTreat Cultivar Block Plot SowingDate   
## S1 :306 Antas :51 1:102 1 : 17 Min. :2016-02-19   
## S2 : 0 Denmark :51 2:102 2 : 17 1st Qu.:2016-02-19   
## S3 : 0 Leura :51 3:102 3 : 17 Median :2016-02-19   
## S4 : 0 Monti :51 4 : 17 Mean :2016-02-19   
## S5 : 0 Narrikup :51 5 : 17 3rd Qu.:2016-02-19   
## S6 : 0 Woogenellup:51 6 : 17 Max. :2016-02-19   
## (Other): 0 (Other):204   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-02-19 Min. : 0.00 Min. : 0.000 Min. : 0.000   
## 1st Qu.:2016-03-09 1st Qu.:19.00 1st Qu.: 0.000 1st Qu.: 1.000   
## Median :2016-03-18 Median :28.00 Median : 2.000 Median : 3.000   
## Mean :2016-03-18 Mean :28.18 Mean : 5.124 Mean : 5.412   
## 3rd Qu.:2016-03-29 3rd Qu.:39.00 3rd Qu.: 9.000 3rd Qu.: 9.000   
## Max. :2016-04-08 Max. :49.00 Max. :25.000 Max. :25.000   
##   
## Sub3 PlantPop FinalPop   
## Min. : 0.000 Min. : 0.00 Min. : 800   
## 1st Qu.: 0.000 1st Qu.: 66.67 1st Qu.: 900   
## Median : 4.000 Median : 433.33 Median :1000   
## Mean : 5.222 Mean : 525.27 Mean :1165   
## 3rd Qu.: 8.000 3rd Qu.: 833.33 3rd Qu.:1433   
## Max. :25.000 Max. :1800.00 Max. :1800   
##

Run ANOVA pure numbers

#data transf  
file <- df\_emerg\_S1  
file$transf\_no <- 1\*(df\_emerg\_S1$FinalPop)  
head(file)

## Source: local data frame [6 x 13]  
## Groups: Plot [6]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S1 Antas 1 1 2016-02-19 2016-02-19 0 0  
## 2 S1 Monti 1 2 2016-02-19 2016-02-19 0 0  
## 3 S1 Denmark 1 3 2016-02-19 2016-02-19 0 0  
## 4 S1 Leura 1 4 2016-02-19 2016-02-19 0 0  
## 5 S1 Narrikup 1 5 2016-02-19 2016-02-19 0 0  
## 6 S1 Woogenellup 1 6 2016-02-19 2016-02-19 0 0  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

#-------------------------------------------------  
# ANOVA   
file.subset <- file   
  
head(file.subset, 50)

## Source: local data frame [50 x 13]  
## Groups: Plot [18]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S1 Antas 1 1 2016-02-19 2016-02-19 0 0  
## 2 S1 Monti 1 2 2016-02-19 2016-02-19 0 0  
## 3 S1 Denmark 1 3 2016-02-19 2016-02-19 0 0  
## 4 S1 Leura 1 4 2016-02-19 2016-02-19 0 0  
## 5 S1 Narrikup 1 5 2016-02-19 2016-02-19 0 0  
## 6 S1 Woogenellup 1 6 2016-02-19 2016-02-19 0 0  
## 7 S1 Antas 2 7 2016-02-19 2016-02-19 0 0  
## 8 S1 Woogenellup 2 8 2016-02-19 2016-02-19 0 0  
## 9 S1 Denmark 2 9 2016-02-19 2016-02-19 0 0  
## 10 S1 Monti 2 10 2016-02-19 2016-02-19 0 0  
## .. ... ... ... ... ... ... ... ...  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

summary(file.subset)

## SowTreat Cultivar Block Plot SowingDate   
## S1 :306 Antas :51 1:102 1 : 17 Min. :2016-02-19   
## S2 : 0 Denmark :51 2:102 2 : 17 1st Qu.:2016-02-19   
## S3 : 0 Leura :51 3:102 3 : 17 Median :2016-02-19   
## S4 : 0 Monti :51 4 : 17 Mean :2016-02-19   
## S5 : 0 Narrikup :51 5 : 17 3rd Qu.:2016-02-19   
## S6 : 0 Woogenellup:51 6 : 17 Max. :2016-02-19   
## (Other): 0 (Other):204   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-02-19 Min. : 0.00 Min. : 0.000 Min. : 0.000   
## 1st Qu.:2016-03-09 1st Qu.:19.00 1st Qu.: 0.000 1st Qu.: 1.000   
## Median :2016-03-18 Median :28.00 Median : 2.000 Median : 3.000   
## Mean :2016-03-18 Mean :28.18 Mean : 5.124 Mean : 5.412   
## 3rd Qu.:2016-03-29 3rd Qu.:39.00 3rd Qu.: 9.000 3rd Qu.: 9.000   
## Max. :2016-04-08 Max. :49.00 Max. :25.000 Max. :25.000   
##   
## Sub3 PlantPop FinalPop transf\_no   
## Min. : 0.000 Min. : 0.00 Min. : 800 Min. : 800   
## 1st Qu.: 0.000 1st Qu.: 66.67 1st Qu.: 900 1st Qu.: 900   
## Median : 4.000 Median : 433.33 Median :1000 Median :1000   
## Mean : 5.222 Mean : 525.27 Mean :1165 Mean :1165   
## 3rd Qu.: 8.000 3rd Qu.: 833.33 3rd Qu.:1433 3rd Qu.:1433   
## Max. :25.000 Max. :1800.00 Max. :1800 Max. :1800   
##

my.anova <- aov(transf\_no ~ Cultivar + Block,   
 data = file.subset)  
  
summary(my.anova)

## Df Sum Sq Mean Sq F value Pr(>F)   
## Cultivar 5 9109693 1821939 58.4 <2e-16 \*\*\*  
## Block 2 12323921 6161961 197.5 <2e-16 \*\*\*  
## Residuals 298 9297573 31200   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#Means separation   
(LSD.test(my.anova, c("Cultivar"), alpha= 0.05, p.adj="none") )

## $statistics  
## Mean CV MSerror LSD  
## 1164.814 15.16422 31199.91 68.83702  
##   
## $parameters  
## Df ntr t.value alpha test name.t  
## 298 6 1.967957 0.05 Fisher-LSD Cultivar  
##   
## $means  
## transf\_no std r LCL UCL Min Max  
## Antas 1400.000 344.41423 51 1351.3249 1448.6751 966.67 1800.00  
## Denmark 900.000 82.46211 51 851.3249 948.6751 800.00 1000.00  
## Leura 1311.110 301.52652 51 1262.4349 1359.7851 900.00 1600.00  
## Monti 1244.443 280.76458 51 1195.7682 1293.1185 1000.00 1633.33  
## Narrikup 1122.220 269.78888 51 1073.5449 1170.8951 933.33 1500.00  
## Woogenellup 1011.110 253.92063 51 962.4349 1059.7851 833.33 1366.67  
##   
## $comparison  
## NULL  
##   
## $groups  
## trt means M  
## 1 Antas 1400.000 a  
## 2 Leura 1311.110 b  
## 3 Monti 1244.443 b  
## 4 Narrikup 1122.220 c  
## 5 Woogenellup 1011.110 d  
## 6 Denmark 900.000 e

S2

df\_emerg\_S1 <-df\_emerg\_perc3 %>%  
filter(SowTreat=="S2")   
summary (df\_emerg\_S1)

## SowTreat Cultivar Block Plot SowingDate   
## S2 :144 Antas :24 1:48 19 : 8 Min. :2016-03-30   
## S1 : 0 Denmark :24 2:48 20 : 8 1st Qu.:2016-03-30   
## S3 : 0 Leura :24 3:48 21 : 8 Median :2016-03-30   
## S4 : 0 Monti :24 22 : 8 Mean :2016-03-30   
## S5 : 0 Narrikup :24 23 : 8 3rd Qu.:2016-03-30   
## S6 : 0 Woogenellup:24 24 : 8 Max. :2016-03-30   
## (Other): 0 (Other):96   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-03-30 Min. : 0.00 Min. : 0.000 Min. : 0.000   
## 1st Qu.:2016-04-07 1st Qu.: 8.50 1st Qu.: 2.000 1st Qu.: 3.000   
## Median :2016-04-12 Median :13.00 Median :10.000 Median : 8.000   
## Mean :2016-04-14 Mean :15.75 Mean : 9.708 Mean : 8.507   
## 3rd Qu.:2016-04-22 3rd Qu.:23.75 3rd Qu.:15.250 3rd Qu.:13.000   
## Max. :2016-05-02 Max. :33.00 Max. :25.000 Max. :25.000   
##   
## Sub3 PlantPop FinalPop   
## Min. : 0.00 Min. : 0.0 Min. :1200   
## 1st Qu.: 3.00 1st Qu.: 258.3 1st Qu.:1433   
## Median :12.00 Median :1166.7 Median :1567   
## Mean :11.36 Mean : 985.9 Mean :1617   
## 3rd Qu.:18.00 3rd Qu.:1466.7 3rd Qu.:1733   
## Max. :25.00 Max. :2333.3 Max. :2333   
##

#data transf  
file <- df\_emerg\_S1  
file$transf\_no <- 1\*(df\_emerg\_S1$FinalPop)  
head(file)

## Source: local data frame [6 x 13]  
## Groups: Plot [6]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S2 Narrikup 1 19 2016-03-30 2016-03-30 0 0  
## 2 S2 Monti 1 20 2016-03-30 2016-03-30 0 0  
## 3 S2 Woogenellup 1 21 2016-03-30 2016-03-30 0 0  
## 4 S2 Leura 1 22 2016-03-30 2016-03-30 0 0  
## 5 S2 Denmark 1 23 2016-03-30 2016-03-30 0 0  
## 6 S2 Antas 1 24 2016-03-30 2016-03-30 0 0  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

#-------------------------------------------------  
# ANOVA   
file.subset <- file   
  
head(file.subset, 50)

## Source: local data frame [50 x 13]  
## Groups: Plot [18]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S2 Narrikup 1 19 2016-03-30 2016-03-30 0 0  
## 2 S2 Monti 1 20 2016-03-30 2016-03-30 0 0  
## 3 S2 Woogenellup 1 21 2016-03-30 2016-03-30 0 0  
## 4 S2 Leura 1 22 2016-03-30 2016-03-30 0 0  
## 5 S2 Denmark 1 23 2016-03-30 2016-03-30 0 0  
## 6 S2 Antas 1 24 2016-03-30 2016-03-30 0 0  
## 7 S2 Leura 2 25 2016-03-30 2016-03-30 0 0  
## 8 S2 Woogenellup 2 26 2016-03-30 2016-03-30 0 0  
## 9 S2 Denmark 2 27 2016-03-30 2016-03-30 0 0  
## 10 S2 Narrikup 2 28 2016-03-30 2016-03-30 0 0  
## .. ... ... ... ... ... ... ... ...  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

summary(file.subset)

## SowTreat Cultivar Block Plot SowingDate   
## S2 :144 Antas :24 1:48 19 : 8 Min. :2016-03-30   
## S1 : 0 Denmark :24 2:48 20 : 8 1st Qu.:2016-03-30   
## S3 : 0 Leura :24 3:48 21 : 8 Median :2016-03-30   
## S4 : 0 Monti :24 22 : 8 Mean :2016-03-30   
## S5 : 0 Narrikup :24 23 : 8 3rd Qu.:2016-03-30   
## S6 : 0 Woogenellup:24 24 : 8 Max. :2016-03-30   
## (Other): 0 (Other):96   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-03-30 Min. : 0.00 Min. : 0.000 Min. : 0.000   
## 1st Qu.:2016-04-07 1st Qu.: 8.50 1st Qu.: 2.000 1st Qu.: 3.000   
## Median :2016-04-12 Median :13.00 Median :10.000 Median : 8.000   
## Mean :2016-04-14 Mean :15.75 Mean : 9.708 Mean : 8.507   
## 3rd Qu.:2016-04-22 3rd Qu.:23.75 3rd Qu.:15.250 3rd Qu.:13.000   
## Max. :2016-05-02 Max. :33.00 Max. :25.000 Max. :25.000   
##   
## Sub3 PlantPop FinalPop transf\_no   
## Min. : 0.00 Min. : 0.0 Min. :1200 Min. :1200   
## 1st Qu.: 3.00 1st Qu.: 258.3 1st Qu.:1433 1st Qu.:1433   
## Median :12.00 Median :1166.7 Median :1567 Median :1567   
## Mean :11.36 Mean : 985.9 Mean :1617 Mean :1617   
## 3rd Qu.:18.00 3rd Qu.:1466.7 3rd Qu.:1733 3rd Qu.:1733   
## Max. :25.00 Max. :2333.3 Max. :2333 Max. :2333   
##

my.anova <- aov(transf\_no ~ Cultivar + Block,   
 data = file.subset)  
  
summary(my.anova)

## Df Sum Sq Mean Sq F value Pr(>F)   
## Cultivar 5 5717018 1143404 36.52 < 2e-16 \*\*\*  
## Block 2 856276 428138 13.68 3.88e-06 \*\*\*  
## Residuals 136 4257765 31307   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#Means separation   
(LSD.test(my.anova, c("Cultivar"), alpha= 0.05, p.adj="none") )

## $statistics  
## Mean CV MSerror LSD  
## 1616.667 10.94463 31307.1 101.0091  
##   
## $parameters  
## Df ntr t.value alpha test name.t  
## 136 6 1.977561 0.05 Fisher-LSD Cultivar  
##   
## $means  
## transf\_no std r LCL UCL Min Max  
## Antas 1977.777 262.77253 24 1906.352 2049.201 1733.33 2333.33  
## Denmark 1466.670 144.46302 24 1395.246 1538.094 1266.67 1566.67  
## Leura 1644.447 256.82155 24 1573.022 1715.871 1466.67 2000.00  
## Monti 1411.110 57.87654 24 1339.686 1482.534 1333.33 1466.67  
## Narrikup 1744.443 115.74974 24 1673.019 1815.868 1633.33 1900.00  
## Woogenellup 1455.553 222.99250 24 1384.129 1526.978 1200.00 1733.33  
##   
## $comparison  
## NULL  
##   
## $groups  
## trt means M  
## 1 Antas 1977.777 a  
## 2 Narrikup 1744.443 b  
## 3 Leura 1644.447 b  
## 4 Denmark 1466.670 c  
## 5 Woogenellup 1455.553 c  
## 6 Monti 1411.110 c

S3

df\_emerg\_S1 <-df\_emerg\_perc3 %>%  
filter(SowTreat=="S3")   
summary (df\_emerg\_S1)

## SowTreat Cultivar Block Plot SowingDate   
## S3 :144 Antas :24 1:48 37 : 8 Min. :2016-05-30   
## S1 : 0 Denmark :24 2:48 38 : 8 1st Qu.:2016-05-30   
## S2 : 0 Leura :24 3:48 39 : 8 Median :2016-05-30   
## S4 : 0 Monti :24 40 : 8 Mean :2016-05-30   
## S5 : 0 Narrikup :24 41 : 8 3rd Qu.:2016-05-30   
## S6 : 0 Woogenellup:24 42 : 8 Max. :2016-05-30   
## (Other): 0 (Other):96   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-06-01 Min. : 2.00 Min. : 0.0 Min. : 0.00   
## 1st Qu.:2016-06-19 1st Qu.:20.25 1st Qu.: 6.0 1st Qu.: 7.75   
## Median :2016-06-26 Median :27.50 Median :10.0 Median :12.00   
## Mean :2016-06-24 Mean :25.25 Mean :12.1 Mean :11.51   
## 3rd Qu.:2016-07-02 3rd Qu.:33.25 3rd Qu.:21.0 3rd Qu.:15.00   
## Max. :2016-07-08 Max. :39.00 Max. :25.0 Max. :25.00   
##   
## Sub3 PlantPop FinalPop   
## Min. : 0.00 Min. : 0.0 Min. : 900   
## 1st Qu.: 5.00 1st Qu.: 858.3 1st Qu.:1433   
## Median :12.00 Median :1300.0 Median :1683   
## Mean :11.67 Mean :1175.7 Mean :1606   
## 3rd Qu.:17.00 3rd Qu.:1641.7 3rd Qu.:1867   
## Max. :25.00 Max. :2400.0 Max. :2400   
##

#data transf  
file <- df\_emerg\_S1  
file$transf\_no <- 1\*(df\_emerg\_S1$FinalPop)  
head(file)

## Source: local data frame [6 x 13]  
## Groups: Plot [6]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S3 Denmark 1 37 2016-05-30 2016-06-01 2 0  
## 2 S3 Antas 1 38 2016-05-30 2016-06-01 2 0  
## 3 S3 Woogenellup 1 39 2016-05-30 2016-06-01 2 0  
## 4 S3 Leura 1 40 2016-05-30 2016-06-01 2 0  
## 5 S3 Narrikup 1 41 2016-05-30 2016-06-01 2 0  
## 6 S3 Monti 1 42 2016-05-30 2016-06-01 2 0  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

#-------------------------------------------------  
# ANOVA   
file.subset <- file   
  
head(file.subset, 50)

## Source: local data frame [50 x 13]  
## Groups: Plot [18]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S3 Denmark 1 37 2016-05-30 2016-06-01 2 0  
## 2 S3 Antas 1 38 2016-05-30 2016-06-01 2 0  
## 3 S3 Woogenellup 1 39 2016-05-30 2016-06-01 2 0  
## 4 S3 Leura 1 40 2016-05-30 2016-06-01 2 0  
## 5 S3 Narrikup 1 41 2016-05-30 2016-06-01 2 0  
## 6 S3 Monti 1 42 2016-05-30 2016-06-01 2 0  
## 7 S3 Woogenellup 2 43 2016-05-30 2016-06-01 2 0  
## 8 S3 Leura 2 44 2016-05-30 2016-06-01 2 0  
## 9 S3 Narrikup 2 45 2016-05-30 2016-06-01 2 0  
## 10 S3 Antas 2 46 2016-05-30 2016-06-01 2 0  
## .. ... ... ... ... ... ... ... ...  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

summary(file.subset)

## SowTreat Cultivar Block Plot SowingDate   
## S3 :144 Antas :24 1:48 37 : 8 Min. :2016-05-30   
## S1 : 0 Denmark :24 2:48 38 : 8 1st Qu.:2016-05-30   
## S2 : 0 Leura :24 3:48 39 : 8 Median :2016-05-30   
## S4 : 0 Monti :24 40 : 8 Mean :2016-05-30   
## S5 : 0 Narrikup :24 41 : 8 3rd Qu.:2016-05-30   
## S6 : 0 Woogenellup:24 42 : 8 Max. :2016-05-30   
## (Other): 0 (Other):96   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-06-01 Min. : 2.00 Min. : 0.0 Min. : 0.00   
## 1st Qu.:2016-06-19 1st Qu.:20.25 1st Qu.: 6.0 1st Qu.: 7.75   
## Median :2016-06-26 Median :27.50 Median :10.0 Median :12.00   
## Mean :2016-06-24 Mean :25.25 Mean :12.1 Mean :11.51   
## 3rd Qu.:2016-07-02 3rd Qu.:33.25 3rd Qu.:21.0 3rd Qu.:15.00   
## Max. :2016-07-08 Max. :39.00 Max. :25.0 Max. :25.00   
##   
## Sub3 PlantPop FinalPop transf\_no   
## Min. : 0.00 Min. : 0.0 Min. : 900 Min. : 900   
## 1st Qu.: 5.00 1st Qu.: 858.3 1st Qu.:1433 1st Qu.:1433   
## Median :12.00 Median :1300.0 Median :1683 Median :1683   
## Mean :11.67 Mean :1175.7 Mean :1606 Mean :1606   
## 3rd Qu.:17.00 3rd Qu.:1641.7 3rd Qu.:1867 3rd Qu.:1867   
## Max. :25.00 Max. :2400.0 Max. :2400 Max. :2400   
##

my.anova <- aov(transf\_no ~ Cultivar + Block,   
 data = file.subset)  
  
summary(my.anova)

## Df Sum Sq Mean Sq F value Pr(>F)   
## Cultivar 5 4721471 944294 7.758 1.9e-06 \*\*\*  
## Block 2 719984 359992 2.957 0.0553 .   
## Residuals 136 16554169 121722   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#Means separation   
(LSD.test(my.anova, c("Cultivar"), alpha= 0.05, p.adj="none") )

## $statistics  
## Mean CV MSerror LSD  
## 1605.556 21.72996 121721.8 199.1698  
##   
## $parameters  
## Df ntr t.value alpha test name.t  
## 136 6 1.977561 0.05 Fisher-LSD Cultivar  
##   
## $means  
## transf\_no std r LCL UCL Min Max  
## Antas 1255.557 443.38197 24 1114.722 1396.391 900.00 1866.67  
## Denmark 1511.110 656.93427 24 1370.276 1651.944 900.00 2400.00  
## Leura 1655.557 84.93688 24 1514.722 1796.391 1566.67 1766.67  
## Monti 1822.223 64.20900 24 1681.389 1963.058 1733.33 1866.67  
## Narrikup 1688.890 272.87621 24 1548.056 1829.724 1500.00 2066.67  
## Woogenellup 1699.997 192.61736 24 1559.162 1840.831 1433.33 1833.33  
##   
## $comparison  
## NULL  
##   
## $groups  
## trt means M  
## 1 Monti 1822.223 a  
## 2 Woogenellup 1699.997 ab  
## 3 Narrikup 1688.890 ab  
## 4 Leura 1655.557 ab  
## 5 Denmark 1511.110 b  
## 6 Antas 1255.557 c

S4

df\_emerg\_S1 <-df\_emerg\_perc3 %>%  
filter(SowTreat=="S4")   
summary (df\_emerg\_S1)

## SowTreat Cultivar Block Plot SowingDate   
## S4 :180 Antas :30 1:60 55 : 10 Min. :2016-07-05   
## S1 : 0 Denmark :30 2:60 56 : 10 1st Qu.:2016-07-05   
## S2 : 0 Leura :30 3:60 57 : 10 Median :2016-07-05   
## S3 : 0 Monti :30 58 : 10 Mean :2016-07-05   
## S5 : 0 Narrikup :30 59 : 10 3rd Qu.:2016-07-05   
## S6 : 0 Woogenellup:30 60 : 10 Max. :2016-07-05   
## (Other): 0 (Other):120   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-07-07 Min. : 2.0 Min. : 0.00 Min. : 0.00   
## 1st Qu.:2016-07-20 1st Qu.:15.0 1st Qu.: 7.00 1st Qu.: 6.00   
## Median :2016-07-26 Median :21.0 Median :11.00 Median :12.00   
## Mean :2016-07-25 Mean :20.5 Mean :11.57 Mean :12.14   
## 3rd Qu.:2016-08-01 3rd Qu.:27.0 3rd Qu.:15.00 3rd Qu.:17.00   
## Max. :2016-08-08 Max. :34.0 Max. :25.00 Max. :25.00   
##   
## Sub3 PlantPop FinalPop   
## Min. : 0.00 Min. : 0.0 Min. : 666.7   
## 1st Qu.: 8.00 1st Qu.: 866.7 1st Qu.:1233.3   
## Median :12.50 Median :1233.3 Median :1583.3   
## Mean :11.94 Mean :1188.7 Mean :1577.8   
## 3rd Qu.:17.00 3rd Qu.:1633.3 3rd Qu.:1933.3   
## Max. :25.00 Max. :2466.7 Max. :2466.7   
##

#data transf  
file <- df\_emerg\_S1  
file$transf\_no <- 1\*(df\_emerg\_S1$FinalPop)  
head(file)

## Source: local data frame [6 x 13]  
## Groups: Plot [6]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S4 Narrikup 1 55 2016-07-05 2016-07-07 2 0  
## 2 S4 Antas 1 56 2016-07-05 2016-07-07 2 0  
## 3 S4 Denmark 1 57 2016-07-05 2016-07-07 2 0  
## 4 S4 Leura 1 58 2016-07-05 2016-07-07 2 0  
## 5 S4 Monti 1 59 2016-07-05 2016-07-07 2 0  
## 6 S4 Woogenellup 1 60 2016-07-05 2016-07-07 2 0  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

#-------------------------------------------------  
# ANOVA   
file.subset <- file   
  
head(file.subset, 50)

## Source: local data frame [50 x 13]  
## Groups: Plot [18]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S4 Narrikup 1 55 2016-07-05 2016-07-07 2 0  
## 2 S4 Antas 1 56 2016-07-05 2016-07-07 2 0  
## 3 S4 Denmark 1 57 2016-07-05 2016-07-07 2 0  
## 4 S4 Leura 1 58 2016-07-05 2016-07-07 2 0  
## 5 S4 Monti 1 59 2016-07-05 2016-07-07 2 0  
## 6 S4 Woogenellup 1 60 2016-07-05 2016-07-07 2 0  
## 7 S4 Antas 2 61 2016-07-05 2016-07-07 2 0  
## 8 S4 Woogenellup 2 62 2016-07-05 2016-07-07 2 0  
## 9 S4 Narrikup 2 63 2016-07-05 2016-07-07 2 0  
## 10 S4 Leura 2 64 2016-07-05 2016-07-07 2 0  
## .. ... ... ... ... ... ... ... ...  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

summary(file.subset)

## SowTreat Cultivar Block Plot SowingDate   
## S4 :180 Antas :30 1:60 55 : 10 Min. :2016-07-05   
## S1 : 0 Denmark :30 2:60 56 : 10 1st Qu.:2016-07-05   
## S2 : 0 Leura :30 3:60 57 : 10 Median :2016-07-05   
## S3 : 0 Monti :30 58 : 10 Mean :2016-07-05   
## S5 : 0 Narrikup :30 59 : 10 3rd Qu.:2016-07-05   
## S6 : 0 Woogenellup:30 60 : 10 Max. :2016-07-05   
## (Other): 0 (Other):120   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-07-07 Min. : 2.0 Min. : 0.00 Min. : 0.00   
## 1st Qu.:2016-07-20 1st Qu.:15.0 1st Qu.: 7.00 1st Qu.: 6.00   
## Median :2016-07-26 Median :21.0 Median :11.00 Median :12.00   
## Mean :2016-07-25 Mean :20.5 Mean :11.57 Mean :12.14   
## 3rd Qu.:2016-08-01 3rd Qu.:27.0 3rd Qu.:15.00 3rd Qu.:17.00   
## Max. :2016-08-08 Max. :34.0 Max. :25.00 Max. :25.00   
##   
## Sub3 PlantPop FinalPop transf\_no   
## Min. : 0.00 Min. : 0.0 Min. : 666.7 Min. : 666.7   
## 1st Qu.: 8.00 1st Qu.: 866.7 1st Qu.:1233.3 1st Qu.:1233.3   
## Median :12.50 Median :1233.3 Median :1583.3 Median :1583.3   
## Mean :11.94 Mean :1188.7 Mean :1577.8 Mean :1577.8   
## 3rd Qu.:17.00 3rd Qu.:1633.3 3rd Qu.:1933.3 3rd Qu.:1933.3   
## Max. :25.00 Max. :2466.7 Max. :2466.7 Max. :2466.7   
##

my.anova <- aov(transf\_no ~ Cultivar + Block,   
 data = file.subset)  
  
summary(my.anova)

## Df Sum Sq Mean Sq F value Pr(>F)   
## Cultivar 5 10437101 2087420 17.41 6.29e-14 \*\*\*  
## Block 2 7470284 3735142 31.15 2.86e-12 \*\*\*  
## Residuals 172 20626042 119919   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#Means separation   
(LSD.test(my.anova, c("Cultivar"), alpha= 0.05, p.adj="none") )

## $statistics  
## Mean CV MSerror LSD  
## 1577.778 21.94814 119918.8 176.487  
##   
## $parameters  
## Df ntr t.value alpha test name.t  
## 172 6 1.973852 0.05 Fisher-LSD Cultivar  
##   
## $means  
## transf\_no std r LCL UCL Min Max  
## Antas 1866.670 462.37766 30 1741.875 1991.465 1266.67 2366.67  
## Denmark 1466.667 199.61726 30 1341.872 1591.462 1200.00 1666.67  
## Leura 1455.557 444.92426 30 1330.762 1580.352 1066.67 2066.67  
## Monti 1177.777 403.36731 30 1052.982 1302.572 666.67 1633.33  
## Narrikup 1655.557 591.34010 30 1530.762 1780.352 1133.33 2466.67  
## Woogenellup 1844.443 69.66184 30 1719.648 1969.238 1766.67 1933.33  
##   
## $comparison  
## NULL  
##   
## $groups  
## trt means M  
## 1 Antas 1866.670 a  
## 2 Woogenellup 1844.443 a  
## 3 Narrikup 1655.557 b  
## 4 Denmark 1466.667 c  
## 5 Leura 1455.557 c  
## 6 Monti 1177.777 d

S5

df\_emerg\_S1 <-df\_emerg\_perc3 %>%  
filter(SowTreat=="S5")   
summary (df\_emerg\_S1)

## SowTreat Cultivar Block Plot SowingDate   
## S5 :108 Antas :18 1:36 73 : 6 Min. :2016-08-24   
## S1 : 0 Denmark :18 2:36 74 : 6 1st Qu.:2016-08-24   
## S2 : 0 Leura :18 3:36 75 : 6 Median :2016-08-24   
## S3 : 0 Monti :18 76 : 6 Mean :2016-08-24   
## S4 : 0 Narrikup :18 77 : 6 3rd Qu.:2016-08-24   
## S6 : 0 Woogenellup:18 78 : 6 Max. :2016-08-24   
## (Other): 0 (Other):72   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-08-25 Min. : 1.00 Min. : 0.00 Min. : 0.00   
## 1st Qu.:2016-09-02 1st Qu.: 9.00 1st Qu.: 6.00 1st Qu.: 8.00   
## Median :2016-09-07 Median :14.00 Median :15.00 Median :11.00   
## Mean :2016-09-06 Mean :13.17 Mean :13.25 Mean :11.63   
## 3rd Qu.:2016-09-12 3rd Qu.:19.00 3rd Qu.:21.00 3rd Qu.:19.25   
## Max. :2016-09-15 Max. :22.00 Max. :25.00 Max. :25.00   
##   
## Sub3 PlantPop FinalPop   
## Min. : 0.00 Min. : 0.0 Min. : 666.7   
## 1st Qu.: 7.00 1st Qu.: 966.7 1st Qu.:1366.7   
## Median :12.00 Median :1383.3 Median :1500.0   
## Mean :10.98 Mean :1195.4 Mean :1531.5   
## 3rd Qu.:16.25 3rd Qu.:1533.3 3rd Qu.:1766.7   
## Max. :23.00 Max. :2200.0 Max. :2200.0   
##

#data transf  
file <- df\_emerg\_S1  
file$transf\_no <- 1\*(df\_emerg\_S1$FinalPop)  
head(file)

## Source: local data frame [6 x 13]  
## Groups: Plot [6]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S5 Woogenellup 1 73 2016-08-24 2016-08-25 1 0  
## 2 S5 Leura 1 74 2016-08-24 2016-08-25 1 0  
## 3 S5 Antas 1 75 2016-08-24 2016-08-25 1 0  
## 4 S5 Narrikup 1 76 2016-08-24 2016-08-25 1 0  
## 5 S5 Monti 1 77 2016-08-24 2016-08-25 1 0  
## 6 S5 Denmark 1 78 2016-08-24 2016-08-25 1 0  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

#-------------------------------------------------  
# ANOVA   
file.subset <- file   
  
head(file.subset, 50)

## Source: local data frame [50 x 13]  
## Groups: Plot [18]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S5 Woogenellup 1 73 2016-08-24 2016-08-25 1 0  
## 2 S5 Leura 1 74 2016-08-24 2016-08-25 1 0  
## 3 S5 Antas 1 75 2016-08-24 2016-08-25 1 0  
## 4 S5 Narrikup 1 76 2016-08-24 2016-08-25 1 0  
## 5 S5 Monti 1 77 2016-08-24 2016-08-25 1 0  
## 6 S5 Denmark 1 78 2016-08-24 2016-08-25 1 0  
## 7 S5 Denmark 2 79 2016-08-24 2016-08-25 1 0  
## 8 S5 Monti 2 80 2016-08-24 2016-08-25 1 0  
## 9 S5 Leura 2 81 2016-08-24 2016-08-25 1 0  
## 10 S5 Woogenellup 2 82 2016-08-24 2016-08-25 1 0  
## .. ... ... ... ... ... ... ... ...  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

summary(file.subset)

## SowTreat Cultivar Block Plot SowingDate   
## S5 :108 Antas :18 1:36 73 : 6 Min. :2016-08-24   
## S1 : 0 Denmark :18 2:36 74 : 6 1st Qu.:2016-08-24   
## S2 : 0 Leura :18 3:36 75 : 6 Median :2016-08-24   
## S3 : 0 Monti :18 76 : 6 Mean :2016-08-24   
## S4 : 0 Narrikup :18 77 : 6 3rd Qu.:2016-08-24   
## S6 : 0 Woogenellup:18 78 : 6 Max. :2016-08-24   
## (Other): 0 (Other):72   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-08-25 Min. : 1.00 Min. : 0.00 Min. : 0.00   
## 1st Qu.:2016-09-02 1st Qu.: 9.00 1st Qu.: 6.00 1st Qu.: 8.00   
## Median :2016-09-07 Median :14.00 Median :15.00 Median :11.00   
## Mean :2016-09-06 Mean :13.17 Mean :13.25 Mean :11.63   
## 3rd Qu.:2016-09-12 3rd Qu.:19.00 3rd Qu.:21.00 3rd Qu.:19.25   
## Max. :2016-09-15 Max. :22.00 Max. :25.00 Max. :25.00   
##   
## Sub3 PlantPop FinalPop transf\_no   
## Min. : 0.00 Min. : 0.0 Min. : 666.7 Min. : 666.7   
## 1st Qu.: 7.00 1st Qu.: 966.7 1st Qu.:1366.7 1st Qu.:1366.7   
## Median :12.00 Median :1383.3 Median :1500.0 Median :1500.0   
## Mean :10.98 Mean :1195.4 Mean :1531.5 Mean :1531.5   
## 3rd Qu.:16.25 3rd Qu.:1533.3 3rd Qu.:1766.7 3rd Qu.:1766.7   
## Max. :23.00 Max. :2200.0 Max. :2200.0 Max. :2200.0   
##

my.anova <- aov(transf\_no ~ Cultivar + Block,   
 data = file.subset)  
  
summary(my.anova)

## Df Sum Sq Mean Sq F value Pr(>F)   
## Cultivar 5 4575146 915029 10.145 7.03e-08 \*\*\*  
## Block 2 438514 219257 2.431 0.0931 .   
## Residuals 100 9019249 90192   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#Means separation   
(LSD.test(my.anova, c("Cultivar"), alpha= 0.05, p.adj="none") )

## $statistics  
## Mean CV MSerror LSD  
## 1531.482 19.6098 90192.49 198.6092  
##   
## $parameters  
## Df ntr t.value alpha test name.t  
## 100 6 1.983972 0.05 Fisher-LSD Cultivar  
##   
## $means  
## transf\_no std r LCL UCL Min Max  
## Antas 1533.333 196.0388 18 1392.8954 1673.771 1366.67 1800.00  
## Denmark 1133.337 477.7398 18 992.8988 1273.775 666.67 1766.67  
## Leura 1722.223 347.9154 18 1581.7854 1862.661 1466.67 2200.00  
## Monti 1744.443 217.5314 18 1604.0054 1884.881 1533.33 2033.33  
## Narrikup 1444.443 106.0265 18 1304.0054 1584.881 1300.00 1533.33  
## Woogenellup 1611.113 331.7617 18 1470.6754 1751.551 1366.67 2066.67  
##   
## $comparison  
## NULL  
##   
## $groups  
## trt means M  
## 1 Monti 1744.443 a  
## 2 Leura 1722.223 ab  
## 3 Woogenellup 1611.113 abc  
## 4 Antas 1533.333 bc  
## 5 Narrikup 1444.443 c  
## 6 Denmark 1133.337 d

S6

df\_emerg\_S1 <-df\_emerg\_perc3 %>%  
filter(SowTreat=="S6")   
summary (df\_emerg\_S1)

## SowTreat Cultivar Block Plot SowingDate   
## S6 :144 Antas :24 1:48 91 : 8 Min. :2016-10-11   
## S1 : 0 Denmark :24 2:48 92 : 8 1st Qu.:2016-10-11   
## S2 : 0 Leura :24 3:48 93 : 8 Median :2016-10-11   
## S3 : 0 Monti :24 94 : 8 Mean :2016-10-11   
## S4 : 0 Narrikup :24 95 : 8 3rd Qu.:2016-10-11   
## S5 : 0 Woogenellup:24 96 : 8 Max. :2016-10-11   
## (Other): 0 (Other):96   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-10-11 Min. : 0.00 Min. : 0.00 Min. : 0.000   
## 1st Qu.:2016-10-25 1st Qu.:14.25 1st Qu.: 3.00 1st Qu.: 2.000   
## Median :2016-10-29 Median :18.50 Median :10.00 Median : 7.000   
## Mean :2016-10-29 Mean :18.12 Mean :10.47 Mean : 7.722   
## 3rd Qu.:2016-11-04 3rd Qu.:24.25 3rd Qu.:16.00 3rd Qu.:11.000   
## Max. :2016-11-10 Max. :30.00 Max. :25.00 Max. :25.000   
##   
## Sub3 PlantPop FinalPop   
## Min. : 0.000 Min. : 0.0 Min. : 766.7   
## 1st Qu.: 3.000 1st Qu.: 400.0 1st Qu.: 966.7   
## Median :10.000 Median : 933.3 Median :1300.0   
## Mean : 9.417 Mean : 920.4 Mean :1359.3   
## 3rd Qu.:14.000 3rd Qu.:1416.7 3rd Qu.:1700.0   
## Max. :25.000 Max. :2300.0 Max. :2300.0   
##

#data transf  
file <- df\_emerg\_S1  
file$transf\_no <- 1\*(df\_emerg\_S1$FinalPop)  
head(file)

## Source: local data frame [6 x 13]  
## Groups: Plot [6]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S6 Denmark 1 91 2016-10-11 2016-10-11 0 0  
## 2 S6 Monti 1 92 2016-10-11 2016-10-11 0 0  
## 3 S6 Woogenellup 1 93 2016-10-11 2016-10-11 0 0  
## 4 S6 Leura 1 94 2016-10-11 2016-10-11 0 0  
## 5 S6 Antas 1 95 2016-10-11 2016-10-11 0 0  
## 6 S6 Narrikup 1 96 2016-10-11 2016-10-11 0 0  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

#-------------------------------------------------  
# ANOVA   
file.subset <- file   
  
head(file.subset, 50)

## Source: local data frame [50 x 13]  
## Groups: Plot [18]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S6 Denmark 1 91 2016-10-11 2016-10-11 0 0  
## 2 S6 Monti 1 92 2016-10-11 2016-10-11 0 0  
## 3 S6 Woogenellup 1 93 2016-10-11 2016-10-11 0 0  
## 4 S6 Leura 1 94 2016-10-11 2016-10-11 0 0  
## 5 S6 Antas 1 95 2016-10-11 2016-10-11 0 0  
## 6 S6 Narrikup 1 96 2016-10-11 2016-10-11 0 0  
## 7 S6 Leura 2 97 2016-10-11 2016-10-11 0 0  
## 8 S6 Monti 2 98 2016-10-11 2016-10-11 0 0  
## 9 S6 Woogenellup 2 99 2016-10-11 2016-10-11 0 0  
## 10 S6 Denmark 2 100 2016-10-11 2016-10-11 0 0  
## .. ... ... ... ... ... ... ... ...  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

summary(file.subset)

## SowTreat Cultivar Block Plot SowingDate   
## S6 :144 Antas :24 1:48 91 : 8 Min. :2016-10-11   
## S1 : 0 Denmark :24 2:48 92 : 8 1st Qu.:2016-10-11   
## S2 : 0 Leura :24 3:48 93 : 8 Median :2016-10-11   
## S3 : 0 Monti :24 94 : 8 Mean :2016-10-11   
## S4 : 0 Narrikup :24 95 : 8 3rd Qu.:2016-10-11   
## S5 : 0 Woogenellup:24 96 : 8 Max. :2016-10-11   
## (Other): 0 (Other):96   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-10-11 Min. : 0.00 Min. : 0.00 Min. : 0.000   
## 1st Qu.:2016-10-25 1st Qu.:14.25 1st Qu.: 3.00 1st Qu.: 2.000   
## Median :2016-10-29 Median :18.50 Median :10.00 Median : 7.000   
## Mean :2016-10-29 Mean :18.12 Mean :10.47 Mean : 7.722   
## 3rd Qu.:2016-11-04 3rd Qu.:24.25 3rd Qu.:16.00 3rd Qu.:11.000   
## Max. :2016-11-10 Max. :30.00 Max. :25.00 Max. :25.000   
##   
## Sub3 PlantPop FinalPop transf\_no   
## Min. : 0.000 Min. : 0.0 Min. : 766.7 Min. : 766.7   
## 1st Qu.: 3.000 1st Qu.: 400.0 1st Qu.: 966.7 1st Qu.: 966.7   
## Median :10.000 Median : 933.3 Median :1300.0 Median :1300.0   
## Mean : 9.417 Mean : 920.4 Mean :1359.3 Mean :1359.3   
## 3rd Qu.:14.000 3rd Qu.:1416.7 3rd Qu.:1700.0 3rd Qu.:1700.0   
## Max. :25.000 Max. :2300.0 Max. :2300.0 Max. :2300.0   
##

my.anova <- aov(transf\_no ~ Cultivar + Block,   
 data = file.subset)  
  
summary(my.anova)

## Df Sum Sq Mean Sq F value Pr(>F)   
## Cultivar 5 16418694 3283739 147.5 <2e-16 \*\*\*  
## Block 2 6626188 3313094 148.8 <2e-16 \*\*\*  
## Residuals 136 3027145 22258   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#Means separation   
(LSD.test(my.anova, c("Cultivar"), alpha= 0.05, p.adj="none") )

## $statistics  
## Mean CV MSerror LSD  
## 1359.259 10.97602 22258.42 85.16995  
##   
## $parameters  
## Df ntr t.value alpha test name.t  
## 136 6 1.977561 0.05 Fisher-LSD Cultivar  
##   
## $means  
## transf\_no std r LCL UCL Min Max  
## Antas 1288.890 294.66584 24 1228.6658 1349.1142 966.67 1666.67  
## Denmark 800.000 27.79914 24 739.7758 860.2242 766.67 833.33  
## Leura 1955.553 278.48363 24 1895.3291 2015.7776 1633.33 2300.00  
## Monti 1300.000 320.62536 24 1239.7758 1360.2242 1000.00 1733.33  
## Narrikup 1366.667 327.78171 24 1306.4424 1426.8909 933.33 1700.00  
## Woogenellup 1444.443 210.51080 24 1384.2191 1504.6676 1266.67 1733.33  
##   
## $comparison  
## NULL  
##   
## $groups  
## trt means M  
## 1 Leura 1955.553 a  
## 2 Woogenellup 1444.443 b  
## 3 Narrikup 1366.667 bc  
## 4 Monti 1300.000 c  
## 5 Antas 1288.890 c  
## 6 Denmark 800.000 d

S7

df\_emerg\_S1 <-df\_emerg\_perc3 %>%  
filter(SowTreat=="S7")   
summary (df\_emerg\_S1)

## SowTreat Cultivar Block Plot SowingDate   
## S7 :126 Antas :21 1:42 109 : 7 Min. :2016-11-24   
## S1 : 0 Denmark :21 2:42 110 : 7 1st Qu.:2016-11-24   
## S2 : 0 Leura :21 3:42 111 : 7 Median :2016-11-24   
## S3 : 0 Monti :21 112 : 7 Mean :2016-11-24   
## S4 : 0 Narrikup :21 113 : 7 3rd Qu.:2016-11-24   
## S5 : 0 Woogenellup:21 114 : 7 Max. :2016-11-24   
## (Other): 0 (Other):84   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-11-24 Min. : 0.00 Min. : 0.000 Min. : 0.000   
## 1st Qu.:2016-12-02 1st Qu.: 8.00 1st Qu.: 1.000 1st Qu.: 1.000   
## Median :2016-12-07 Median :13.00 Median : 5.000 Median : 6.000   
## Mean :2016-12-07 Mean :13.71 Mean : 7.595 Mean : 6.381   
## 3rd Qu.:2016-12-15 3rd Qu.:21.00 3rd Qu.:11.000 3rd Qu.:10.000   
## Max. :2016-12-19 Max. :25.00 Max. :25.000 Max. :24.000   
##   
## Sub3 PlantPop FinalPop   
## Min. : 0.000 Min. : 0.0 Min. : 666.7   
## 1st Qu.: 1.000 1st Qu.: 141.7 1st Qu.: 866.7   
## Median : 6.500 Median : 700.0 Median :1100.0   
## Mean : 6.897 Mean : 695.8 Mean :1216.7   
## 3rd Qu.:11.000 3rd Qu.:1066.7 3rd Qu.:1500.0   
## Max. :25.000 Max. :2333.3 Max. :2333.3   
##

#data transf  
file <- df\_emerg\_S1  
file$transf\_no <- 1\*(df\_emerg\_S1$FinalPop)  
head(file)

## Source: local data frame [6 x 13]  
## Groups: Plot [6]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S7 Denmark 1 109 2016-11-24 2016-11-24 0 0  
## 2 S7 Antas 1 110 2016-11-24 2016-11-24 0 0  
## 3 S7 Woogenellup 1 111 2016-11-24 2016-11-24 0 0  
## 4 S7 Leura 1 112 2016-11-24 2016-11-24 0 0  
## 5 S7 Narrikup 1 113 2016-11-24 2016-11-24 0 0  
## 6 S7 Monti 1 114 2016-11-24 2016-11-24 0 0  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

#-------------------------------------------------  
# ANOVA   
file.subset <- file   
  
head(file.subset, 50)

## Source: local data frame [50 x 13]  
## Groups: Plot [18]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S7 Denmark 1 109 2016-11-24 2016-11-24 0 0  
## 2 S7 Antas 1 110 2016-11-24 2016-11-24 0 0  
## 3 S7 Woogenellup 1 111 2016-11-24 2016-11-24 0 0  
## 4 S7 Leura 1 112 2016-11-24 2016-11-24 0 0  
## 5 S7 Narrikup 1 113 2016-11-24 2016-11-24 0 0  
## 6 S7 Monti 1 114 2016-11-24 2016-11-24 0 0  
## 7 S7 Woogenellup 2 115 2016-11-24 2016-11-24 0 0  
## 8 S7 Leura 2 116 2016-11-24 2016-11-24 0 0  
## 9 S7 Narrikup 2 117 2016-11-24 2016-11-24 0 0  
## 10 S7 Antas 2 118 2016-11-24 2016-11-24 0 0  
## .. ... ... ... ... ... ... ... ...  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

summary(file.subset)

## SowTreat Cultivar Block Plot SowingDate   
## S7 :126 Antas :21 1:42 109 : 7 Min. :2016-11-24   
## S1 : 0 Denmark :21 2:42 110 : 7 1st Qu.:2016-11-24   
## S2 : 0 Leura :21 3:42 111 : 7 Median :2016-11-24   
## S3 : 0 Monti :21 112 : 7 Mean :2016-11-24   
## S4 : 0 Narrikup :21 113 : 7 3rd Qu.:2016-11-24   
## S5 : 0 Woogenellup:21 114 : 7 Max. :2016-11-24   
## (Other): 0 (Other):84   
## ReadingDate DAS Sub1 Sub2   
## Min. :2016-11-24 Min. : 0.00 Min. : 0.000 Min. : 0.000   
## 1st Qu.:2016-12-02 1st Qu.: 8.00 1st Qu.: 1.000 1st Qu.: 1.000   
## Median :2016-12-07 Median :13.00 Median : 5.000 Median : 6.000   
## Mean :2016-12-07 Mean :13.71 Mean : 7.595 Mean : 6.381   
## 3rd Qu.:2016-12-15 3rd Qu.:21.00 3rd Qu.:11.000 3rd Qu.:10.000   
## Max. :2016-12-19 Max. :25.00 Max. :25.000 Max. :24.000   
##   
## Sub3 PlantPop FinalPop transf\_no   
## Min. : 0.000 Min. : 0.0 Min. : 666.7 Min. : 666.7   
## 1st Qu.: 1.000 1st Qu.: 141.7 1st Qu.: 866.7 1st Qu.: 866.7   
## Median : 6.500 Median : 700.0 Median :1100.0 Median :1100.0   
## Mean : 6.897 Mean : 695.8 Mean :1216.7 Mean :1216.7   
## 3rd Qu.:11.000 3rd Qu.:1066.7 3rd Qu.:1500.0 3rd Qu.:1500.0   
## Max. :25.000 Max. :2333.3 Max. :2333.3 Max. :2333.3   
##

my.anova <- aov(transf\_no ~ Cultivar + Block,   
 data = file.subset)  
  
summary(my.anova)

## Df Sum Sq Mean Sq F value Pr(>F)   
## Cultivar 5 9337130 1867426 18.89 9.19e-14 \*\*\*  
## Block 2 2118113 1059056 10.71 5.30e-05 \*\*\*  
## Residuals 118 11663990 98847   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#Means separation   
(LSD.test(my.anova, c("Cultivar"), alpha= 0.05, p.adj="none") )

## $statistics  
## Mean CV MSerror LSD  
## 1216.668 25.84107 98847.37 192.1378  
##   
## $parameters  
## Df ntr t.value alpha test name.t  
## 118 6 1.980272 0.05 Fisher-LSD Cultivar  
##   
## $means  
## transf\_no std r LCL UCL Min Max  
## Antas 1244.4467 279.3500 21 1108.5847 1380.309 866.67 1500.00  
## Denmark 1311.1100 545.3144 21 1175.2481 1446.972 766.67 2033.33  
## Leura 1700.0000 469.1574 21 1564.1381 1835.862 1266.67 2333.33  
## Monti 1244.4433 216.6231 21 1108.5814 1380.305 1033.33 1533.33  
## Narrikup 900.0033 127.8019 21 764.1414 1035.865 766.67 1066.67  
## Woogenellup 900.0033 174.1647 21 764.1414 1035.865 666.67 1066.67  
##   
## $comparison  
## NULL  
##   
## $groups  
## trt means M  
## 1 Leura 1700.0000 a  
## 2 Denmark 1311.1100 b  
## 3 Antas 1244.4467 b  
## 4 Monti 1244.4433 b  
## 5 Narrikup 900.0033 c  
## 6 Woogenellup 900.0033 c

S8

df\_emerg\_S1 <-df\_emerg\_perc3 %>%  
filter(SowTreat=="S8")   
summary (df\_emerg\_S1)

## SowTreat Cultivar Block Plot SowingDate   
## S8 :144 Antas :24 1:48 127 : 8 Min. :2017-01-05   
## S1 : 0 Denmark :24 2:48 128 : 8 1st Qu.:2017-01-05   
## S2 : 0 Leura :24 3:48 129 : 8 Median :2017-01-05   
## S3 : 0 Monti :24 130 : 8 Mean :2017-01-05   
## S4 : 0 Narrikup :24 131 : 8 3rd Qu.:2017-01-05   
## S5 : 0 Woogenellup:24 132 : 8 Max. :2017-01-05   
## (Other): 0 (Other):96   
## ReadingDate DAS Sub1 Sub2   
## Min. :2017-01-05 Min. : 0.00 Min. : 0.000 Min. : 0.000   
## 1st Qu.:2017-01-14 1st Qu.: 9.50 1st Qu.: 1.000 1st Qu.: 1.000   
## Median :2017-01-19 Median :14.00 Median : 3.000 Median : 4.000   
## Mean :2017-01-18 Mean :13.75 Mean : 4.583 Mean : 4.674   
## 3rd Qu.:2017-01-23 3rd Qu.:18.75 3rd Qu.: 6.000 3rd Qu.: 6.000   
## Max. :2017-01-30 Max. :25.00 Max. :23.000 Max. :22.000   
##   
## Sub3 PlantPop FinalPop   
## Min. : 0.00 Min. : 0.00 Min. : 233.3   
## 1st Qu.: 0.00 1st Qu.: 66.67 1st Qu.: 833.3   
## Median : 3.00 Median : 416.67 Median : 966.7   
## Mean : 4.91 Mean : 472.22 Mean : 942.6   
## 3rd Qu.: 7.25 3rd Qu.: 833.33 3rd Qu.:1066.7   
## Max. :24.00 Max. :1433.33 Max. :1433.3   
##

#data transf  
file <- df\_emerg\_S1  
file$transf\_no <- 1\*(df\_emerg\_S1$FinalPop)  
head(file)

## Source: local data frame [6 x 13]  
## Groups: Plot [6]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S8 Antas 1 127 2017-01-05 2017-01-05 0 0  
## 2 S8 Leura 1 128 2017-01-05 2017-01-05 0 0  
## 3 S8 Denmark 1 129 2017-01-05 2017-01-05 0 0  
## 4 S8 Monti 1 130 2017-01-05 2017-01-05 0 0  
## 5 S8 Narrikup 1 131 2017-01-05 2017-01-05 0 0  
## 6 S8 Woogenellup 1 132 2017-01-05 2017-01-05 0 0  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

#-------------------------------------------------  
# ANOVA   
file.subset <- file   
  
head(file.subset, 50)

## Source: local data frame [50 x 13]  
## Groups: Plot [18]  
##   
## SowTreat Cultivar Block Plot SowingDate ReadingDate DAS Sub1  
## (fctr) (fctr) (fctr) (fctr) (date) (date) (int) (int)  
## 1 S8 Antas 1 127 2017-01-05 2017-01-05 0 0  
## 2 S8 Leura 1 128 2017-01-05 2017-01-05 0 0  
## 3 S8 Denmark 1 129 2017-01-05 2017-01-05 0 0  
## 4 S8 Monti 1 130 2017-01-05 2017-01-05 0 0  
## 5 S8 Narrikup 1 131 2017-01-05 2017-01-05 0 0  
## 6 S8 Woogenellup 1 132 2017-01-05 2017-01-05 0 0  
## 7 S8 Denmark 2 133 2017-01-05 2017-01-05 0 0  
## 8 S8 Woogenellup 2 134 2017-01-05 2017-01-05 0 0  
## 9 S8 Narrikup 2 135 2017-01-05 2017-01-05 0 0  
## 10 S8 Leura 2 136 2017-01-05 2017-01-05 0 0  
## .. ... ... ... ... ... ... ... ...  
## Variables not shown: Sub2 (int), Sub3 (int), PlantPop (dbl), FinalPop  
## (dbl), transf\_no (dbl)

summary(file.subset)

## SowTreat Cultivar Block Plot SowingDate   
## S8 :144 Antas :24 1:48 127 : 8 Min. :2017-01-05   
## S1 : 0 Denmark :24 2:48 128 : 8 1st Qu.:2017-01-05   
## S2 : 0 Leura :24 3:48 129 : 8 Median :2017-01-05   
## S3 : 0 Monti :24 130 : 8 Mean :2017-01-05   
## S4 : 0 Narrikup :24 131 : 8 3rd Qu.:2017-01-05   
## S5 : 0 Woogenellup:24 132 : 8 Max. :2017-01-05   
## (Other): 0 (Other):96   
## ReadingDate DAS Sub1 Sub2   
## Min. :2017-01-05 Min. : 0.00 Min. : 0.000 Min. : 0.000   
## 1st Qu.:2017-01-14 1st Qu.: 9.50 1st Qu.: 1.000 1st Qu.: 1.000   
## Median :2017-01-19 Median :14.00 Median : 3.000 Median : 4.000   
## Mean :2017-01-18 Mean :13.75 Mean : 4.583 Mean : 4.674   
## 3rd Qu.:2017-01-23 3rd Qu.:18.75 3rd Qu.: 6.000 3rd Qu.: 6.000   
## Max. :2017-01-30 Max. :25.00 Max. :23.000 Max. :22.000   
##   
## Sub3 PlantPop FinalPop transf\_no   
## Min. : 0.00 Min. : 0.00 Min. : 233.3 Min. : 233.3   
## 1st Qu.: 0.00 1st Qu.: 66.67 1st Qu.: 833.3 1st Qu.: 833.3   
## Median : 3.00 Median : 416.67 Median : 966.7 Median : 966.7   
## Mean : 4.91 Mean : 472.22 Mean : 942.6 Mean : 942.6   
## 3rd Qu.: 7.25 3rd Qu.: 833.33 3rd Qu.:1066.7 3rd Qu.:1066.7   
## Max. :24.00 Max. :1433.33 Max. :1433.3 Max. :1433.3   
##

my.anova <- aov(transf\_no ~ Cultivar + Block,   
 data = file.subset)  
  
summary(my.anova)

## Df Sum Sq Mean Sq F value Pr(>F)   
## Cultivar 5 1738767 347753 5.258 0.00019 \*\*\*  
## Block 2 2223180 1111590 16.807 3e-07 \*\*\*  
## Residuals 136 8994637 66137   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#Means separation   
(LSD.test(my.anova, c("Cultivar"), alpha= 0.05, p.adj="none") )

## $statistics  
## Mean CV MSerror LSD  
## 942.5933 27.28337 66137.03 146.812  
##   
## $parameters  
## Df ntr t.value alpha test name.t  
## 136 6 1.977561 0.05 Fisher-LSD Cultivar  
##   
## $means  
## transf\_no std r LCL UCL Min Max  
## Antas 933.3367 127.40441 24 829.5249 1037.1484 766.67 1066.67  
## Denmark 855.5533 489.76774 24 751.7416 959.3651 233.33 1400.00  
## Leura 933.3333 73.55907 24 829.5216 1037.1451 833.33 1000.00  
## Monti 1166.6667 194.61127 24 1062.8549 1270.4784 1000.00 1433.33  
## Narrikup 822.2233 307.50442 24 718.4116 926.0351 433.33 1166.67  
## Woogenellup 944.4467 306.24075 24 840.6349 1048.2584 566.67 1300.00  
##   
## $comparison  
## NULL  
##   
## $groups  
## trt means M  
## 1 Monti 1166.6667 a  
## 2 Woogenellup 944.4467 b  
## 3 Antas 933.3367 b  
## 4 Leura 933.3333 b  
## 5 Denmark 855.5533 b  
## 6 Narrikup 822.2233 b