Correlation Analysis of Phenols and N availability

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Contents

Necessary libraries

```
library(knitr)
library(ggplot2)
theme_set(theme_bw())
library(emmeans)
library(multcomp)
library(PLS205)
library(lme4)
library(lmerTest)
library(multcompView)
library(car)
library(Rmisc)
library(dplyr) #https://r4ds.had.co.nz/ (Chapter 3, Chapter 5, look at filter and select)
# https://bookdown.org/ansellbr/WEHI_tidyR_course_book/
library(stringr)
library(data.table)
library(GGally)
library(formatR)
library(readxl)
library(mgcv)
library(writexl)
```

Data Organisation

```
preplant <- read_excel("Cor_Base.xlsx", sheet = 1)
str(preplant)
```

```
## tibble [12 x 13] (S3: tbl_df/tbl/data.frame)
##  $ Field                      : chr [1:12] "RF" "RF" "RF" "CR" ...
##  $ Blk_Site                   : chr [1:12] "RES 1" "RES 2" "RES 3" "RES 1" ...
##  $ Blk                        : chr [1:12] "1" "2" "3" "1" ...
##  $ Year                       : chr [1:12] "2021" "2021" "2021" "2021" ...
##  $ p-hydroxybenzoic phenols   : num [1:12] 0.212 0.2 0.21 0.233 0.22 ...
##  $ Vanillyl phenols           : num [1:12] 0.5 0.472 0.521 0.64 0.593 ...
##  $ Cinnamic phenols           : num [1:12] 0.464 0.413 0.579 0.739 0.659 ...
##  $ Syringyl phenols           : num [1:12] 0.667 0.587 0.668 0.774 0.727 ...
##  $ Total phenols              : num [1:12] 1.84 1.67 1.98 2.39 2.2 ...
##  $ Crop N uptake (fertilizer): num [1:12] 58.2 52.5 49.1 60.2 44.1 ...
##  $ Crop N uptake (soil)       : num [1:12] 120.7 107.2 109.3 98.8 90 ...
##  $ Soil FertilizerN Recovery : num [1:12] 32.8 37.6 38 30.1 22.6 ...
##  $ yield_Mgha                 : num [1:12] 15.3 15.1 14.2 13.3 12.7 ...
```

```
topdress <- read_excel("Cor_Base.xlsx", sheet = 2)
str(topdress)
```

```
## tibble [12 x 13] (S3: tbl_df/tbl/data.frame)
##  $ Field                      : chr [1:12] "RF" "RF" "RF" "CR" ...
##  $ Blk_Site                   : chr [1:12] "RES 1" "RES 2" "RES 3" "RES 1" ...
##  $ Blk                        : chr [1:12] "1" "2" "3" "1" ...
##  $ Year                       : chr [1:12] "2021" "2021" "2021" "2021" ...
##  $ p-hydroxybenzoic phenols   : num [1:12] 0.212 0.2 0.21 0.233 0.22 ...
##  $ Vanillyl phenols           : num [1:12] 0.5 0.472 0.521 0.64 0.593 ...
##  $ Cinnamic phenols           : num [1:12] 0.464 0.413 0.579 0.739 0.659 ...
##  $ Syringyl phenols           : num [1:12] 0.667 0.587 0.668 0.774 0.727 ...
##  $ Total phenols              : num [1:12] 1.84 1.67 1.98 2.39 2.2 ...
##  $ Crop N uptake (fertilizer): num [1:12] 11.96 11.77 7.9 10.61 9.19 ...
##  $ Crop N uptake (soil)       : num [1:12] 102.1 96.6 94.2 80.8 93.4 ...
##  $ Soil FertilizerN Recovery : num [1:12] 6.02 6.3 2.89 4.79 4.76 ...
##  $ yield_Mgha                 : num [1:12] 11 10.74 10.57 8.96 10.18 ...
```

```
#cor_data_preplant <- preplant%>%select(-Field,-Blk_Site,-Blk,-Year)
#cor_data_topdress <- topdress%>%select(-Field,-Blk_Site,-Blk,-Year)

cor_data_preplant <- preplant%>%select(-Blk_Site,-Blk,-Year)
cor_data_topdress <- topdress%>%select(-Blk_Site,-Blk,-Year)
```

Correlation matrix

```
all_preplant_cor_matrix <-ggpairs(cor_data_preplant %>% select(-Field, -yield_Mgha),
                                  upper = list(continuous = wrap("cor", size = 5.5))
                                  )+
                          ggtitle("(a) Preplant") +
                          theme(plot.title = element_text(size = 30, face = "bold"))


all_topdress_cor_matrix <-ggpairs(cor_data_topdress %>% select(-Field, -yield_Mgha),
                                  upper = list(continuous = wrap("cor", size = 5.5))
```

```
                                    )+
                          ggtitle("(b) Topdress") +
                          theme(plot.title = element_text(size = 30, face = "bold"))


ggsave(all_preplant_cor_matrix, filename = "all_preplant.png", height = 34, width = 33, units = "cm", dp
```

```
## Warning in geom_point(): All aesthetics have length 1, but the data has 64 rows.
## i Please consider using `annotate()` or provide this layer with data containing
##   a single row.
```

```
ggsave(all_topdress_cor_matrix, filename = "all_topdress.png", height = 34, width = 33, units = "cm", dp
```

```
## Warning in geom_point(): All aesthetics have length 1, but the data has 64 rows.
## i Please consider using `annotate()` or provide this layer with data containing
##   a single row.
```

```
citation("GGally")
```

```
## To cite package 'GGally' in publications use:
##
##   Schloerke B, Cook D, Larmarange J, Briatte F, Marbach M, Thoen E,
##   Elberg A, Crowley J (2021). _GGally: Extension to 'ggplot2'_. R
##   package version 2.1.2, <https://CRAN.R-project.org/package=GGally>.
##
## A BibTeX entry for LaTeX users is
##
##   @Manual{,
##     title = {GGally: Extension to 'ggplot2'},
##     author = {Barret Schloerke and Di Cook and Joseph Larmarange and Francois Briatte and Moritz Marb
##     year = {2021},
##     note = {R package version 2.1.2},
##     url = {https://CRAN.R-project.org/package=GGally},
##   }
```