

Deriva

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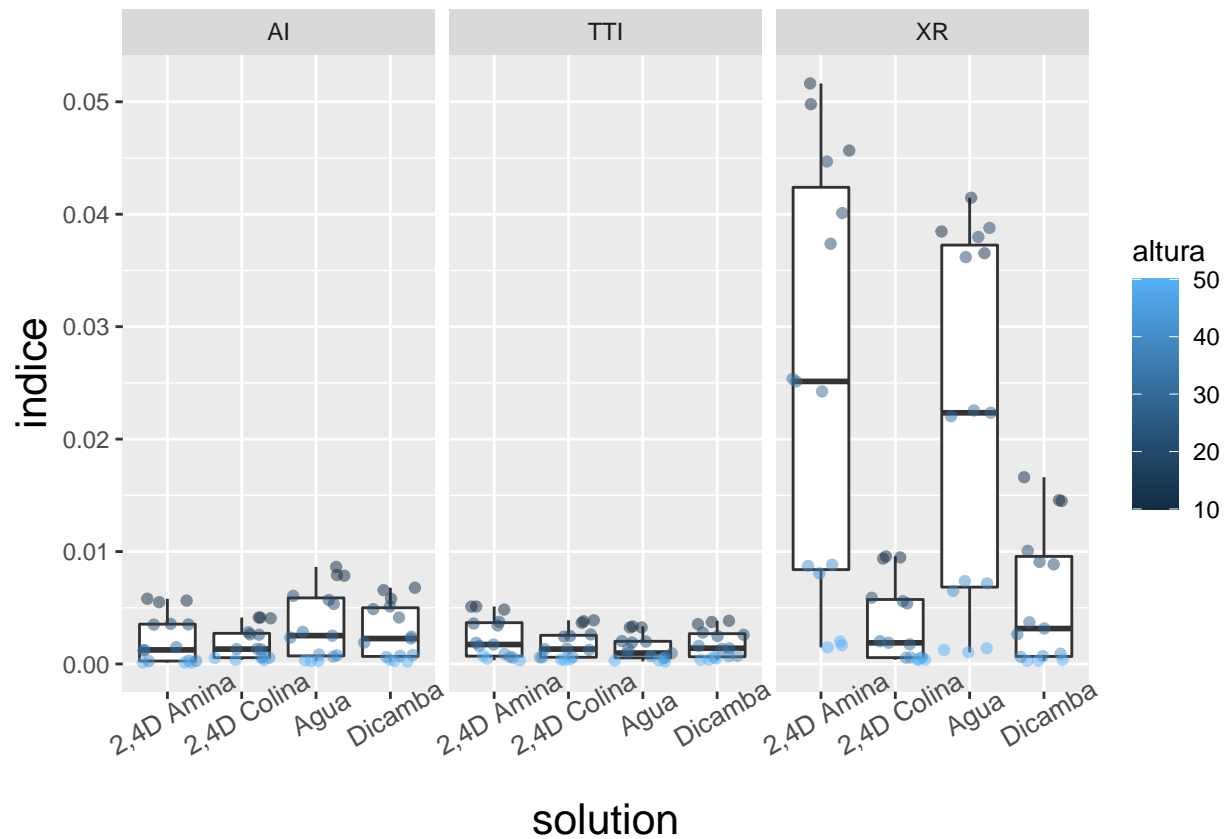
```
library(tidyverse)
library(ggthemes)
library(betareg)
library(emmeans)
library(lmerTest)
library(lme4)
library(stats)
library(car)
library(kableExtra)
```

Inserindo os dados

```
deriva <- read_csv("Dados_Indice_Deriva.csv")
```

Observando os dados com box-plots

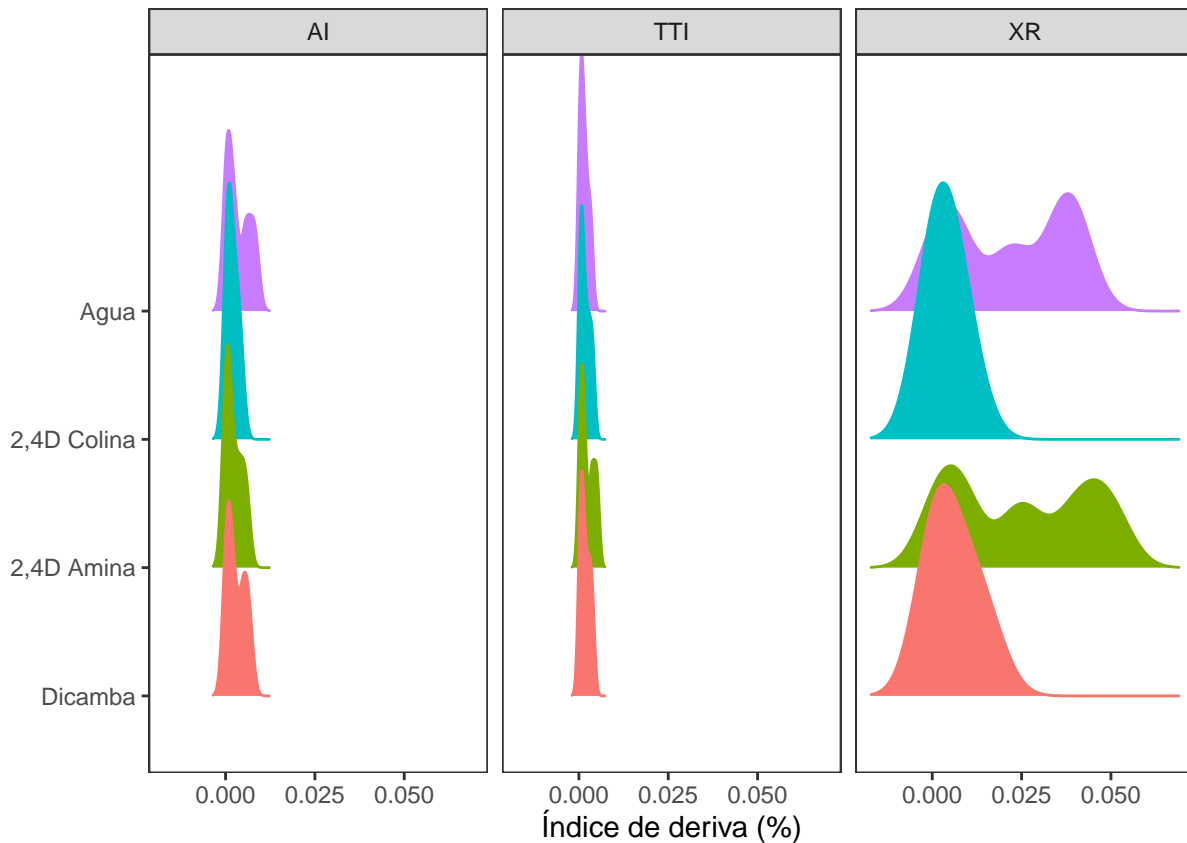
```
deriva %>%
  ggplot(aes(x=solution, y=indice, color=altura)) + geom_boxplot() +
  facet_grid(~nozzle) + geom_jitter(alpha=0.5) +
  theme(axis.title = element_text(size=16),
        axis.text.x = element_text(size=10, angle = 30))
```



Observando a distribuição dados

Essa figura mostra claramente o que aconteceu no experimento.

```
deriva %>%
  mutate(solution = factor(solution, levels = c("Dicamba", "2,4D Amina", "2,4D Colina", "Agua"))) %>%
  ggplot(aes(x=indice, y=solution, fill=solution, color=solution)) +
  geom_density_ridges(scale=2) + facet_grid(~nozzle) +
  labs(x="Índice de deriva (%)", y="") +
  theme_bw() + theme(legend.position = "none", panel.grid = element_blank()) +
  ggsave("deriva.png", height=6, width=9)
```



ANOVA

Usei os dados do índice de deriva da tabela que você enviou. Mas se o índice de deriva estiver em %, a ANOVA abaixo está errada pois devemos usar % em proporção (entre 0 e 1). Tipo, 50% deve ser usado como 0.5. Quando eu rodei os dados abaixo em proporção, o modelo não convergiu devido aos valores muito baixos, tipo 0.00000124. Então, se os valores de deriva for em %, desconsidere essa análise.

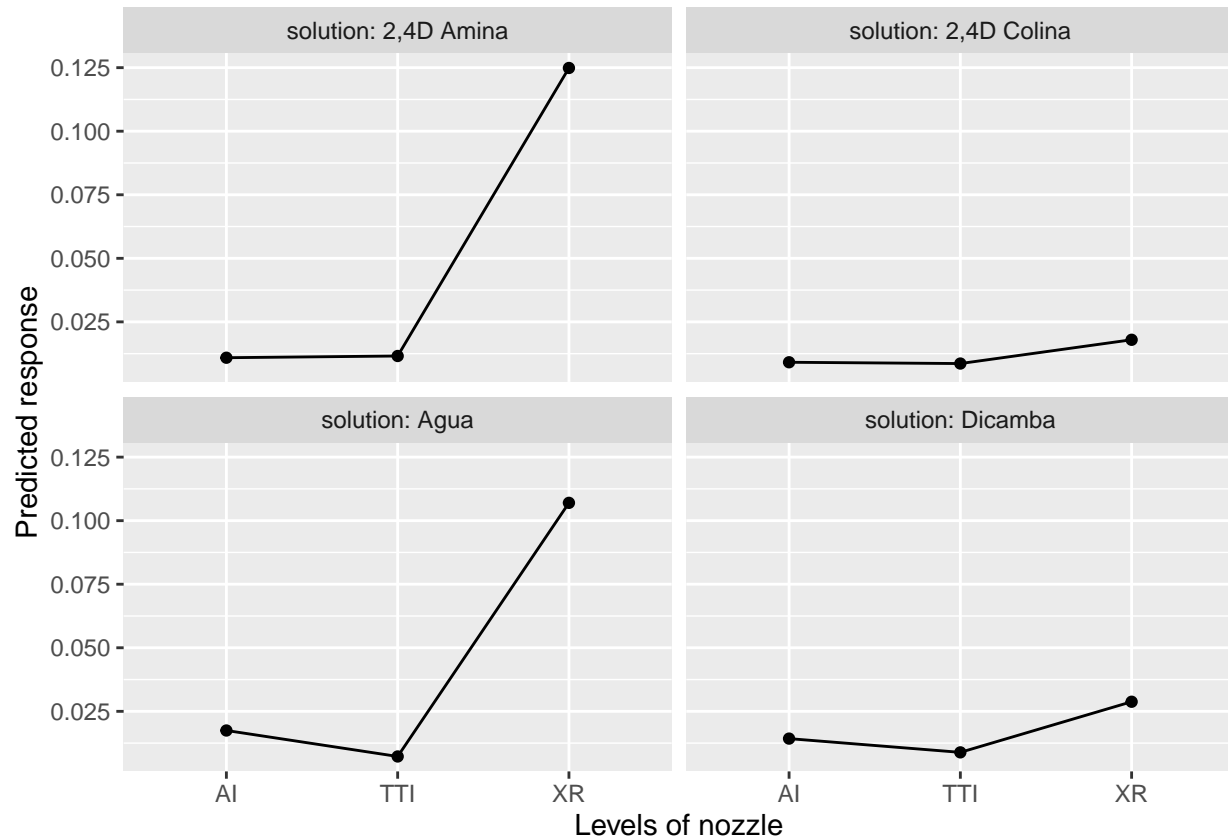
```
new_dt <- deriva %>%
  group_by(solution, nozzle, rep) %>%
  mutate(indice = sum(indice)) %>%
  select(-altura) %>%
  distinct(solution, nozzle, rep, indice)
```

```
model <- betareg(indice ~ nozzle * solution, data=new_dt, link = "logit")
```

```
Anova(model)
```

```
## Analysis of Deviance Table (Type II tests)
##
## Response: indice
##           Df    Chisq Pr(>Chisq)
## nozzle      2 18978.4 < 2.2e-16 ***
## solution    3  7568.6 < 2.2e-16 ***
## nozzle:solution 6  3511.1 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
emmip(model, ~ nozzle | solution, type="response")
```



```
lsmeans <- emmeans(model, ~ nozzle | solution, cont="pairwise", adjust="none", type="response", alpha=0
```

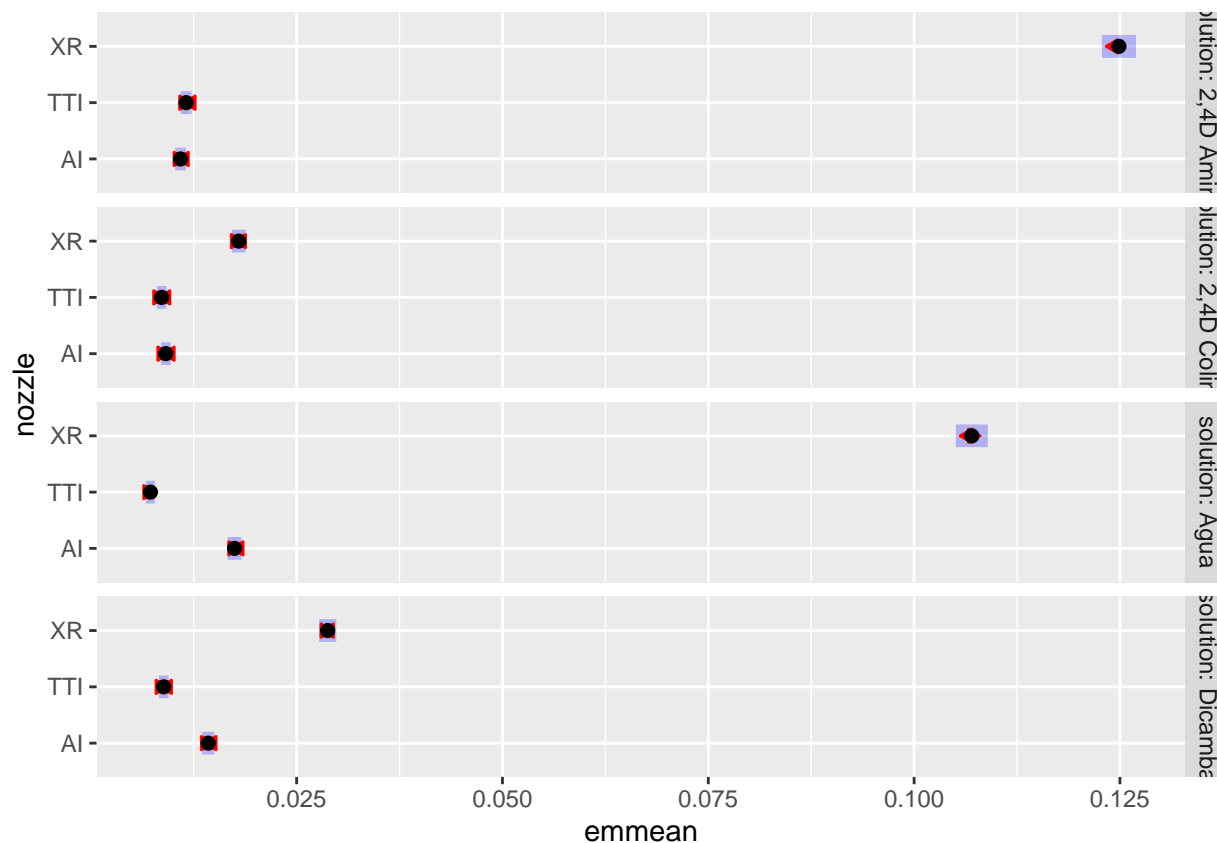
```
lsmeans
```

```
## $emmeans
## solution = 2,4D Amina:
## nozzle emmean      SE df asymp.LCL asymp.UCL
## AI      0.01090 0.000332 Inf  0.01025  0.01155
## TTI      0.01157 0.000342 Inf  0.01090  0.01224
## XR      0.12488 0.001057 Inf  0.12281  0.12695
##
## solution = 2,4D Colina:
## nozzle emmean      SE df asymp.LCL asymp.UCL
## AI      0.00911 0.000304 Inf  0.00852  0.00971
## TTI      0.00861 0.000295 Inf  0.00803  0.00919
## XR      0.01796 0.000424 Inf  0.01713  0.01879
##
## solution = Agua:
## nozzle emmean      SE df asymp.LCL asymp.UCL
## AI      0.01746 0.000419 Inf  0.01664  0.01828
## TTI      0.00724 0.000271 Inf  0.00671  0.00777
## XR      0.10701 0.000988 Inf  0.10507  0.10895
##
## solution = Dicamba:
```

```

## nozzle emmean      SE df asymp.LCL asymp.UCL
## AI      0.01427 0.000379 Inf  0.01352  0.01501
## TTI     0.00886 0.000299 Inf  0.00827  0.00944
## XR      0.02877 0.000534 Inf  0.02772  0.02982
##
## Confidence level used: 0.95
##
## $contrasts
## solution = 2,4D Amina:
## contrast estimate      SE df z.ratio p.value
## AI - TTI -0.000677 0.000476 Inf  -1.421 0.1554
## AI - XR  -0.113982 0.001108 Inf -102.899 <.0001
## TTI - XR -0.113305 0.001111 Inf -102.008 <.0001
##
## solution = 2,4D Colina:
## contrast estimate      SE df z.ratio p.value
## AI - TTI  0.000503 0.000423 Inf   1.189 0.2343
## AI - XR  -0.008851 0.000522 Inf -16.961 <.0001
## TTI - XR -0.009354 0.000517 Inf -18.095 <.0001
##
## solution = Agua:
## contrast estimate      SE df z.ratio p.value
## AI - TTI  0.010218 0.000499 Inf  20.494 <.0001
## AI - XR  -0.089547 0.001073 Inf -83.435 <.0001
## TTI - XR -0.099765 0.001025 Inf -97.360 <.0001
##
## solution = Dicamba:
## contrast estimate      SE df z.ratio p.value
## AI - TTI  0.005409 0.000483 Inf  11.200 <.0001
## AI - XR  -0.014504 0.000655 Inf -22.142 <.0001
## TTI - XR -0.019913 0.000612 Inf -32.514 <.0001
plot(lsmeans, ~ nozzle | solution, comparisons=TRUE, type="response", alpha=0.05, adjust="none")

```



```
cld <-CLD(lsmmeans$emmeans, alpha=0.05, Letters=letters, adjust="none", reversed = TRUE)
```

```
cld
```

```
## solution = 2,4D Amina:
```

```
## nozzle emmean      SE df asymp.LCL asymp.UCL .group
## XR      0.12488 0.001057 Inf  0.12281  0.12695  a
## TTI      0.01157 0.000342 Inf  0.01090  0.01224  b
## AI       0.01090 0.000332 Inf  0.01025  0.01155  b
##
```

```
## solution = 2,4D Colina:
```

```
## nozzle emmean      SE df asymp.LCL asymp.UCL .group
## XR      0.01796 0.000424 Inf  0.01713  0.01879  a
## AI       0.00911 0.000304 Inf  0.00852  0.00971  b
## TTI      0.00861 0.000295 Inf  0.00803  0.00919  b
##
```

```
## solution = Agua:
```

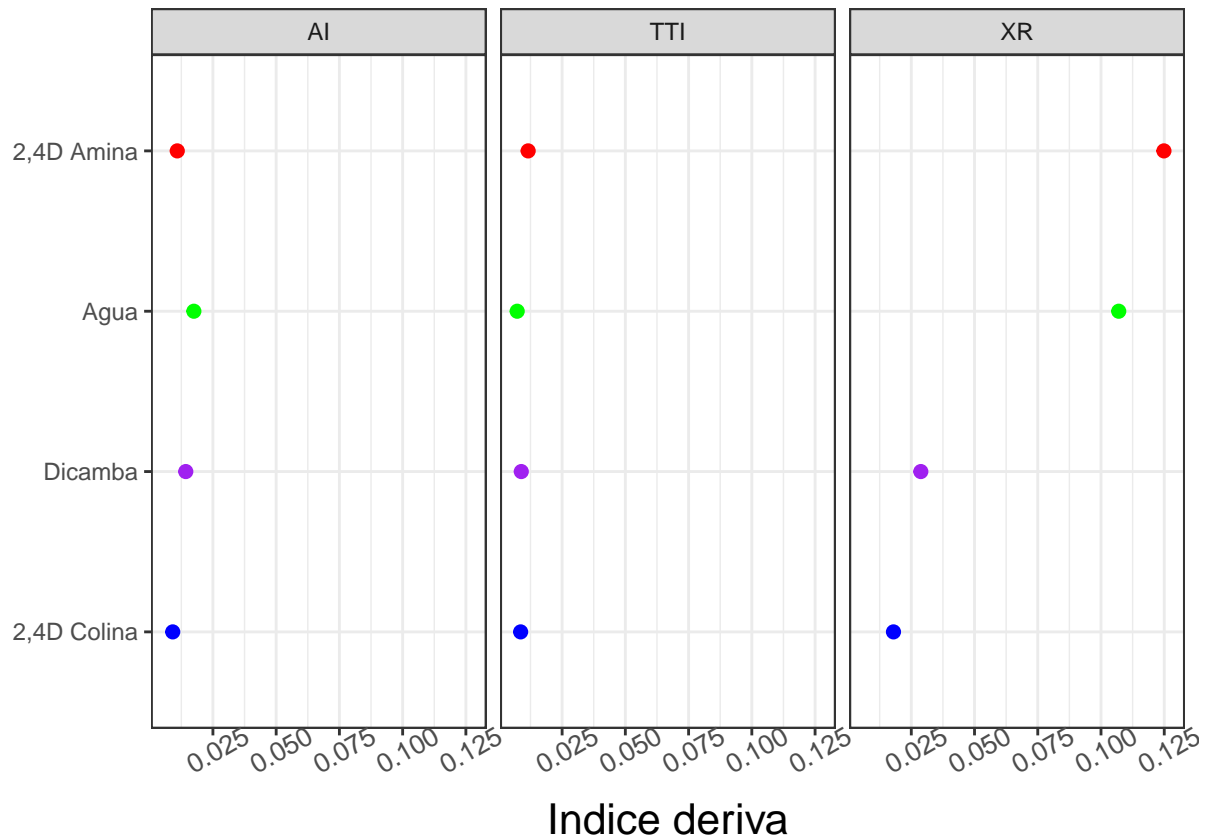
```
## nozzle emmean      SE df asymp.LCL asymp.UCL .group
## XR      0.10701 0.000988 Inf  0.10507  0.10895  a
## AI       0.01746 0.000419 Inf  0.01664  0.01828  b
## TTI      0.00724 0.000271 Inf  0.00671  0.00777  c
##
```

```
## solution = Dicamba:
```

```
## nozzle emmean      SE df asymp.LCL asymp.UCL .group
## XR      0.02877 0.000534 Inf  0.02772  0.02982  a
## AI       0.01427 0.000379 Inf  0.01352  0.01501  b
## TTI      0.00886 0.000299 Inf  0.00827  0.00944  c
```

```
##
## Confidence level used: 0.95
## significance level used: alpha = 0.05

nd <- as.data.frame(lsmmeans$emmeans)
ggplot(nd, aes(x=reorder(solution,emmean), y=emmean, color=solution)) + facet_grid(~nozzle) +
  geom_point(size=2) +
  scale_color_manual(values=c("red", "blue", "green", "purple")) +
  theme_bw() + labs(y="Indice deriva", x="") +
  geom_linerange(aes(ymin = asymp.LCL, ymax = asymp.UCL), size=1.5) +
  theme(axis.title = element_text(size=16),
        axis.text.x = element_text(size=10, angle = 30),
        legend.position = "none") + coord_flip()
```



Tabela

Essa tabela é como os estudantes da Unesp reportam, apenas a média do índice de deriva, juntamente com o desvio padrao e variancia.