Deriva

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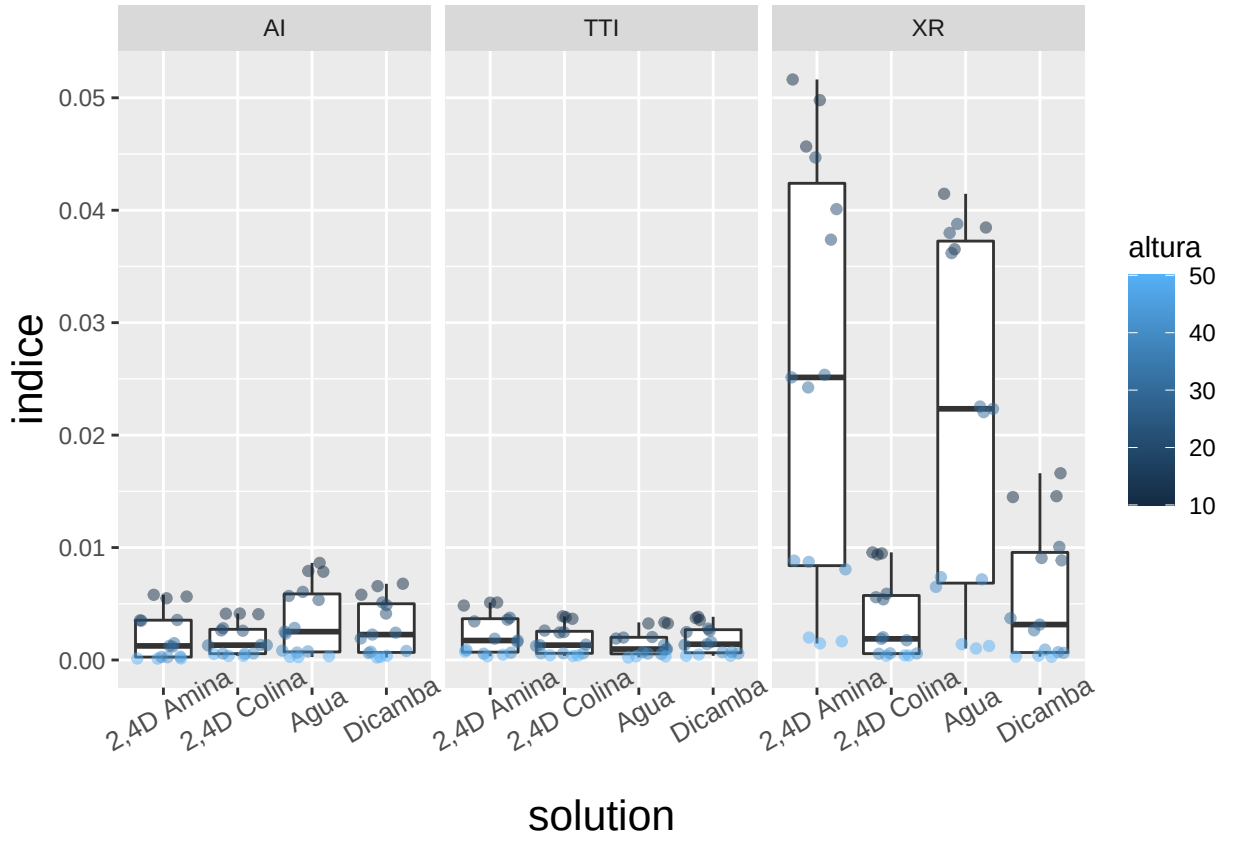
```
library(tidyverse)
library(ggridges)
library(betareg)
library(emmeans)
library(lmerTest)
library(lme4)
library(stats)
library(car)
library(kableExtra)
```

Inserindo os dados

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

Observando os dados com box-plots

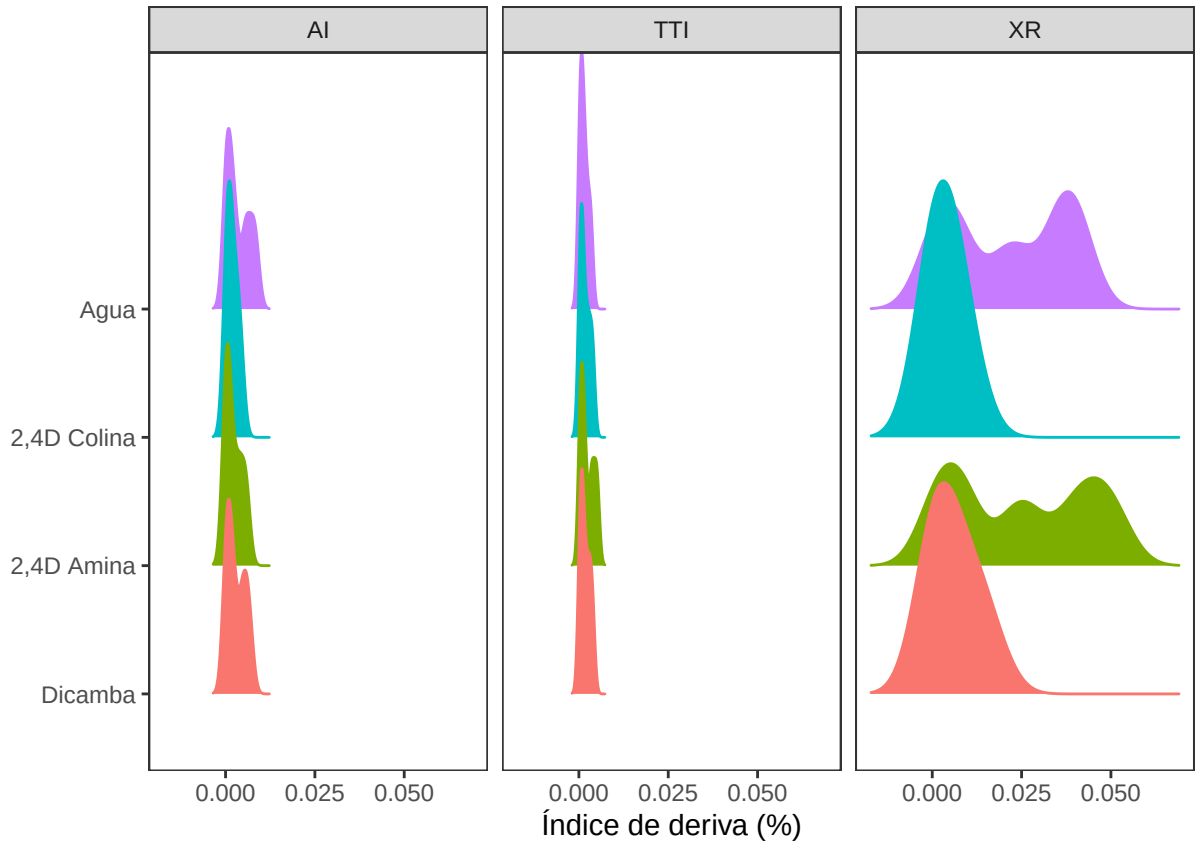
```
deriva %>%
  ggplot(aes(x=solution, y=indice, color=altura)) + geom_boxplot() +
  facet_grid(~nozzle) + geom_jitter(alpha=0.5)  +
  theme(axis.title = element_text(size=16),
axis.text.x = element_text(size=10, angle = 30))
```



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 indice de deriva da tabela que você enviou. Mas se o indice 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)
```

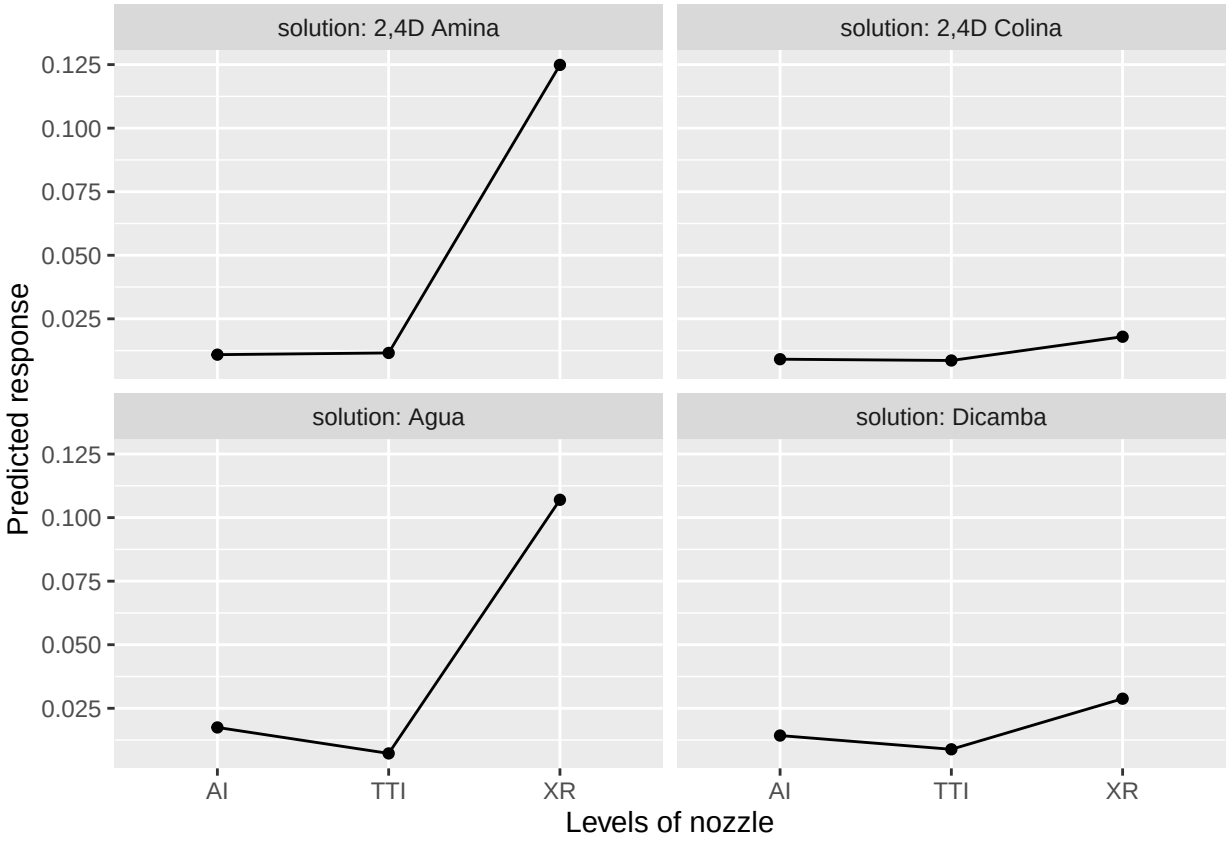
```
model <- betareg(indice ~ nozzle * solution, data=new_dt, link = "logit")
```

```
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")
```



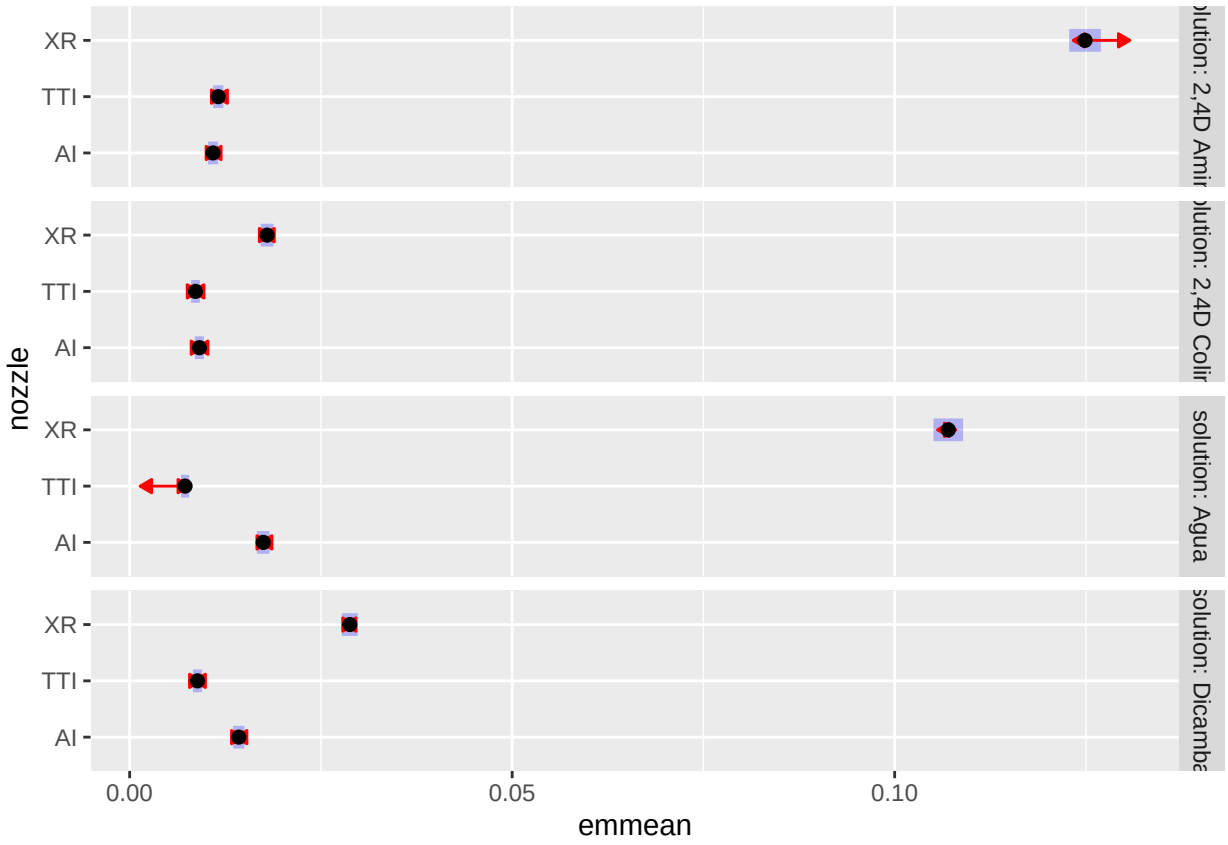

```
lsmeans <- emmeans(model, ~ nozzle | solution, cont="pairwise", adjust="none", type="response", alpha=0

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
```

```r
plot(lsmeans, ~ nozzle | solution, comparisons=TRUE, type="response", alpha=0.05, adjust="none")
```



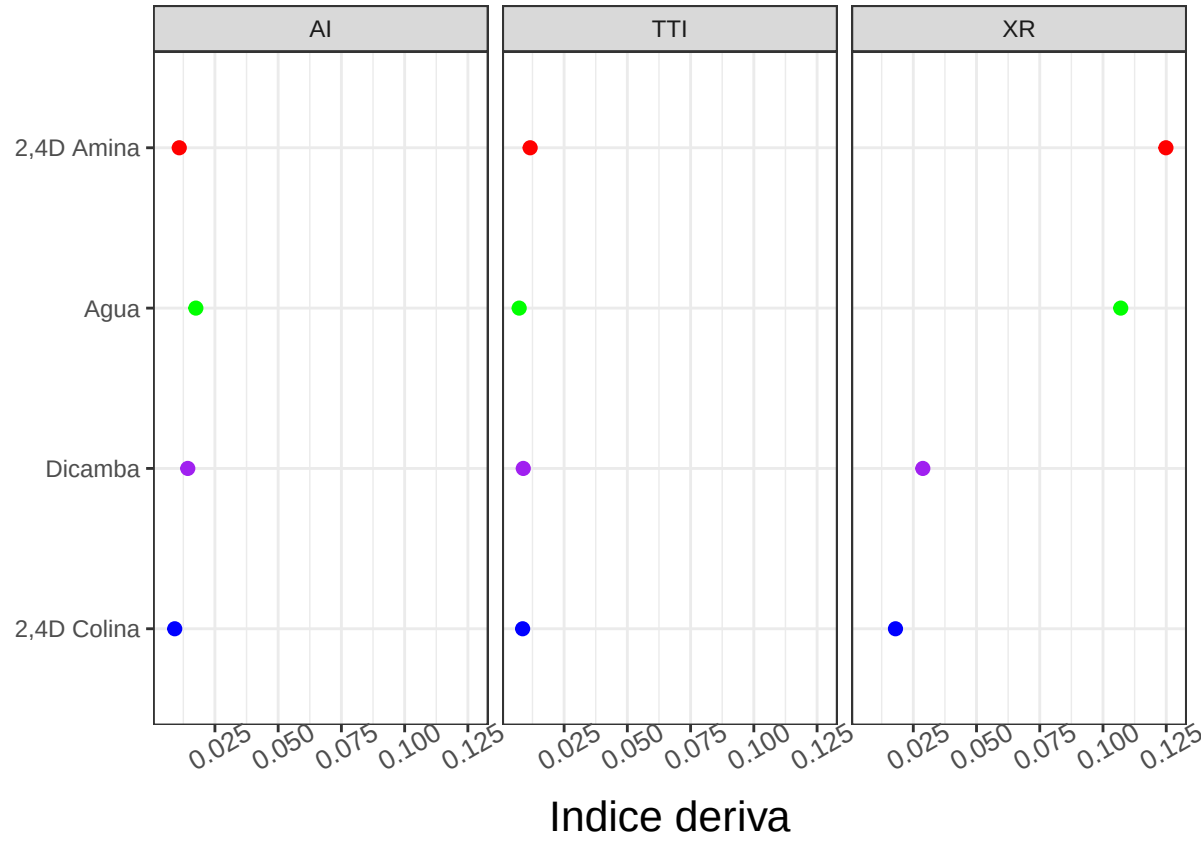

```
cld <-CLD(lsmeans, alpha=0.05, Letters=letters, adjust="none", reversed = TRUE)

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(lsmeans$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.

```
new_dt %>%
  group_by(solution, nozzle) %>%
  summarise(indice_deriva = mean(indice), sd=sd(indice), var=var(indice))  %>%
  kable()
```

solution	nozzle	indice_deriva	sd	var
2,4D Amina	AI	0.0108833	0.0000764	0.00e+00
2,4D Amina	TTI	0.0115600	0.0000700	0.00e+00
2,4D Amina	XR	0.1249100	0.0042784	1.83e-05
2,4D Colina	AI	0.0090967	0.0001457	0.00e+00
2,4D Colina	TTI	0.0085933	0.0001550	0.00e+00
2,4D Colina	XR	0.0179500	0.0004276	2.00e-07
Agua	AI	0.0174500	0.0003637	1.00e-07
Agua	TTI	0.0072300	0.0001473	0.00e+00
Agua	XR	0.1070133	0.0024263	5.90e-06
Dicamba	AI	0.0142967	0.0013687	1.90e-06
Dicamba	TTI	0.0088533	0.0005244	3.00e-07
Dicamba	XR	0.0287967	0.0018943	3.60e-06