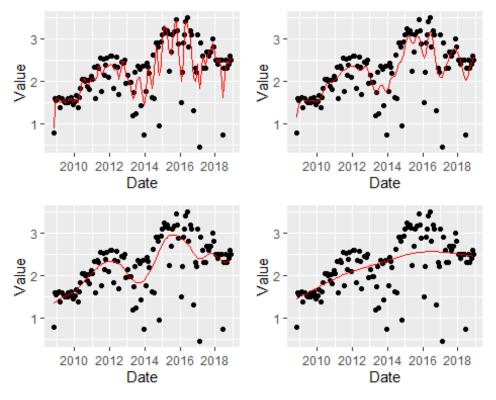
Assignment6

2023-05-29

```
library(gam)
## Loading required package: splines
## Loading required package: foreach
## Loaded gam 1.22-2
library(ggplot2)
library(gridExtra)
ccc <- read.csv("CCC05.csv")</pre>
ecan <- read.csv("ECAN93.csv")</pre>
ccc$Date <- as.Date(ccc$Date, format="%d/%m/%Y")</pre>
mod1 <- gam(Value ~ s(Date, spar = 0.2), data=ccc)</pre>
mod2 <- gam(Value ~ s(Date, spar = 0.4), data=ccc)</pre>
mod3 <- gam(Value ~ s(Date, spar = 0.63), data=ccc)</pre>
mod4 <- gam(Value ~ s(Date, spar = 1), data=ccc)</pre>
ccc$predict1 <- predict(mod1)</pre>
ccc$predict2 <- predict(mod2)</pre>
ccc$predict3 <- predict(mod3)</pre>
ccc$predict4 <- predict(mod4)</pre>
plot1 <- ggplot(ccc, aes(x=Date, y=Value)) + geom_point() +</pre>
geom_line(aes(x=Date, y=predict1),
                                                            col='red')
plot2 <- ggplot(ccc, aes(x=Date, y=Value)) + geom_point() +</pre>
geom_line(aes(x=Date, y=predict2),
                                                            col='red')
plot3 <- ggplot(ccc, aes(x=Date, y=Value)) + geom_point() +</pre>
geom line(aes(x=Date, y=predict3),
                                                           col='red')
plot4 <- ggplot(ccc, aes(x=Date, y=Value)) + geom_point() +</pre>
geom_line(aes(x=Date, y=predict4),
                                                            col='red')
grid.arrange(plot1, plot2, plot3, plot4, nrow=2)
```



```
summary(mod3)
##
## Call: gam(formula = Value ~ s(Date, spar = 0.63), data = ccc)
## Deviance Residuals:
       Min
                 1Q
                      Median
                                   3Q
                                           Max
## -1.94583 -0.12562 0.09761 0.25403 0.74684
##
## (Dispersion Parameter for gaussian family taken to be 0.2292)
##
       Null Deviance: 49.5862 on 122 degrees of freedom
## Residual Deviance: 25.3442 on 110.5726 degrees of freedom
## AIC: 181.6184
##
## Number of Local Scoring Iterations: NA
## Anova for Parametric Effects
                           Df Sum Sq Mean Sq F value
## s(Date, spar = 0.63) 1.00 12.219 12.2190 53.309 4.654e-11 ***
## Residuals
                       110.57 25.344 0.2292
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.05 '.' 0.1 ' ' 1
## Anova for Nonparametric Effects
##
                       Npar Df Npar F
                                         Pr(F)
## (Intercept)
## s(Date, spar = 0.63) 10.4 5.0305 3.79e-06 ***
```

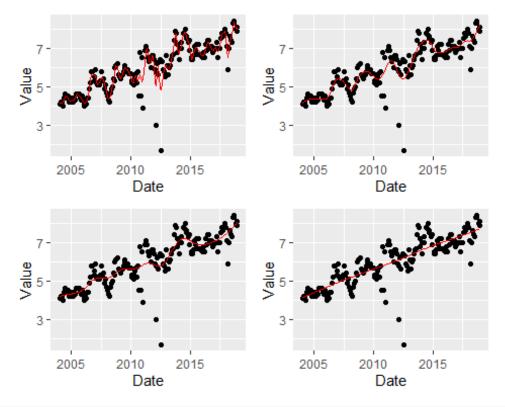
```
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.05 '.' 0.1 ' ' 1
```

I will not be using AIC or p-values to determine the best models. AIC values are not relevant because an overfitted model with have low AIC. P-values are not relevant because an insignificant p-value means a model may be over smoothed while a significant p value does not tell us if the model is over fitted or a good fit.

Mod1 and Mod2 over fit the data as the model captures features that may not actually be present, this causes a lot of noise in the data. Mod4 over smooths the data as the model does not capture the important features. Mod3 has a spar of 0.63. This looks a good fit as it only captures the significant features in the model without capturing trends they may not actually be present in the data.

Mod3 shows the Nitrate levels in th Christchurch City river steadily increases over time. There appears to be a seasonal trend as there are clear peaks in 2012 and mid 2015. There are clear troughs in mid 2013 and mid 2018.

```
ecan$Date <- as.Date(ecan$Date, format="%d/%m/%Y")</pre>
mod5 <- gam(Value ~ s(Date, spar = 0.2), data=ecan)</pre>
mod6 <- gam(Value ~ s(Date, spar = 0.55), data=ecan)</pre>
mod7 <- gam(Value ~ s(Date, spar = 0.7), data=ecan)</pre>
mod8 <- gam(Value ~ s(Date, spar = 1), data=ecan)</pre>
ecan$predict5 <- predict(mod5)</pre>
ecan$predict6 <- predict(mod6)</pre>
ecan$predict7 <- predict(mod7)</pre>
ecan$predict8 <- predict(mod8)</pre>
plot5 <- ggplot(ecan, aes(x=Date, y=Value)) + geom_point() +</pre>
geom_line(aes(x=Date, y=predict5),
                                                           col='red')
plot6 <- ggplot(ecan, aes(x=Date, y=Value)) + geom point() +</pre>
geom line(aes(x=Date, y=predict6),
                                                           col='red')
plot7 <- ggplot(ecan, aes(x=Date, y=Value)) + geom_point() +</pre>
geom line(aes(x=Date, y=predict7),
                                                           col='red')
plot8 <- ggplot(ecan, aes(x=Date, y=Value)) + geom point() +</pre>
geom_line(aes(x=Date, y=predict8),
                                                           col='red')
grid.arrange(plot5, plot6, plot7, plot8, nrow=2)
```



```
summary(mod2)
##
## Call: gam(formula = Value ~ s(Date, spar = 0.4), data = ccc)
## Deviance Residuals:
       Min
                  1Q
                      Median
                                    3Q
                                            Max
## -1.65041 -0.09580 0.07344 0.23888 0.99659
##
## (Dispersion Parameter for gaussian family taken to be 0.2128)
##
       Null Deviance: 49.5862 on 122 degrees of freedom
## Residual Deviance: 19.8108 on 93.1011 degrees of freedom
## AIC: 186.2642
##
## Number of Local Scoring Iterations: NA
## Anova for Parametric Effects
                           Df Sum Sq Mean Sq F value
## s(Date, spar = 0.4) 1.000 12.219 12.2190 57.423 2.544e-11 ***
                      93.101 19.811 0.2128
## Residuals
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
## Anova for Nonparametric Effects
##
                      Npar Df Npar F
                                         Pr(F)
## (Intercept)
## s(Date, spar = 0.4) 27.9 2.9573 5.109e-05 ***
```

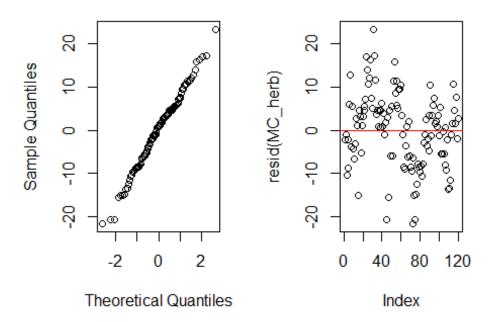
```
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.05 '.' 0.1 ' ' 1
```

Mod5 overfits the data, it captures the main feautes in the data but it also captures features that may not actually exist. Mod7 and Mod8 both over smooth the data as the main features are not captured. Mod6 has a spar of 0.55. This appears to be the best model as it captures the main features of the data without creating noise by capturing features that may not exist.

Mod6 shows the Nitrate levels in the Canterbury Region river are increasing over time on average. There appears to be a seasonal effect as the Nirtate levels in the river have a clear peak followed by a trough. This may be due to changing conditions in the environment such as temperature.

```
library(readxl)
library(agricolae)
library(multcomp)
## Loading required package: mvtnorm
## Loading required package: survival
## Loading required package: TH.data
## Loading required package: MASS
## Attaching package: 'TH.data'
## The following object is masked from 'package:MASS':
##
##
       geyser
herb <- read excel("Herbicides.xlsx")</pre>
MC herb <- aov(Grass percent ~ Herbicide, herb)</pre>
summary(MC herb)
                Df Sum Sq Mean Sq F value
##
                                             Pr(>F)
                             343.5
                                   4.412 6.09e-05 ***
## Herbicide
                 9
                     3092
## Residuals
                     8564
                              77.9
               110
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
par(mfrow=(c(1,2)))
qqnorm(MC herb$residuals)
plot(resid(MC herb))
abline(0,0, col='red')
```

Normal Q-Q Plot



The residuals are fitted to a relatively straight line on the normal Q-Q plot and the residual plot shows constant variance. This means we can assume our data is normally distributed.

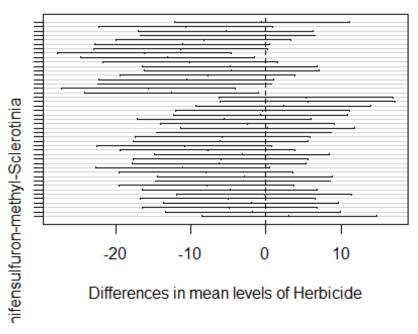
```
mse <-sum(MC herb$residuals*MC herb$residuals)/MC herb$df.residual</pre>
LSD.test(herb$Grass percent, herb$Herbicide, MC herb$df.residual, mse,
console = TRUE)
##
## Study: herb$Grass_percent ~ herb$Herbicide
## LSD t Test for herb$Grass percent
##
## Mean Square Error:
                       77.8534
##
## herb$Herbicide, means and individual ( 95 %) CI
##
##
                          herb.Grass percent
                                                    std r
                                                                LCL
                                                                         UCL
Min
                                               9.913055 12 58.39597 68.49153
## Aminopyralid
                                    63.44375
49.875
## Aminopyralid+triclopyr
                                    62.89583 8.645617 12 57.84805 67.94361
52.500
## Chlorsulfuron
                                    52.77083 5.158244 12 47.72305 57.81861
44.500
## Flumetsulam
                                     58.09375 6.201202 12 53.04597 63.14153
49.500
## MCPA
                                     58.31875 8.093657 12 53.27097 63.36653
45.750
                                    55.11458 10.260590 12 50.06680 60.16236
## MCPB
```

```
33.500
                                     52.29167 8.893201 12 47.24389 57.33945
## MCPB+bentazone
36.750
                                     52.04167 7.303551 12 46.99389 57.08945
## Nil
40.375
## Sclerotinia
                                     47.19792 12.355696 12 42.15014 52.24570
26,500
## Thifensulfuron-methyl
                                     50.30208 9.196476 12 45.25430 55.34986
29.500
##
                             Max
## Aminopyralid
                          86.75
## Aminopyralid+triclopyr 80.00
## Chlorsulfuron
                          60.25
## Flumetsulam
                          70.75
## MCPA
                          69.75
## MCPB
                          72.00
## MCPB+bentazone
                          64.25
## Nil
                          63.50
## Sclerotinia
                          63.50
## Thifensulfuron-methyl 64.25
##
## Alpha: 0.05 ; DF Error: 110
## Critical Value of t: 1.981765
## least Significant Difference: 7.138638
## Treatments with the same letter are not significantly different.
##
##
                          herb$Grass_percent groups
## Aminopyralid
                                     63.44375
                                                   а
## Aminopyralid+triclopyr
                                     62.89583
                                                   а
## MCPA
                                     58.31875
                                                  ab
## Flumetsulam
                                     58.09375
                                                  ab
## MCPB
                                     55.11458
                                                  bc
## Chlorsulfuron
                                     52.77083
                                                 bcd
## MCPB+bentazone
                                     52.29167
                                                 bcd
## Nil
                                     52.04167
                                                 bcd
## Thifensulfuron-methyl
                                     50.30208
                                                  cd
## Sclerotinia
                                     47,19792
                                                   d
```

The pairs with significant differences according to the LSD test are the pairs which do not have any of the letters. This means that the pairs of herbicedes have a difference in grass_percent of atleast 7.14. In this data there are 17 pairs of herbicides that have significant differences in grass_percent according to the LSD test.

```
pairwise.t.test(herb$Grass percent, herb$Herbicide, p.adj =
"bonferroni", console=TRUE)
##
##
  Pairwise comparisons using t tests with pooled SD
## data: herb$Grass percent and herb$Herbicide
##
##
                          Aminopyralid Aminopyralid+triclopyr Chlorsulfuron
## Aminopyralid+triclopyr 1.00000
## Chlorsulfuron
                          0.16810
                                       0.26332
## Flumetsulam
                          1.00000
                                                              1.00000
                                       1.00000
## MCPA
                          1.00000
                                       1.00000
                                                              1.00000
## MCPB
                          1.00000
                                       1.00000
                                                              1.00000
## MCPB+bentazone
                          0.11201
                                                              1.00000
                                       0.17800
## Nil
                          0.09018
                                       0.14438
                                                              1.00000
## Sclerotinia
                          0.00073
                                       0.00133
                                                              1.00000
## Thifensulfuron-methyl 0.01824
                                       0.03068
                                                              1.00000
                          Flumetsulam MCPA
                                              MCPB
                                                      MCPB+bentazone Nil
## Aminopyralid+triclopyr -
## Chlorsulfuron
## Flumetsulam
## MCPA
                          1.00000
## MCPB
                          1.00000
                                      1.00000 -
## MCPB+bentazone
                                      1.00000 1.00000 -
                          1.00000
## Nil
                          1.00000
                                      1.00000 1.00000 1.00000
## Sclerotinia
                          0.13938
                                      0.11505 1.00000 1.00000
                                                                     1.00000
## Thifensulfuron-methyl 1.00000
                                      1.00000 1.00000 1.00000
                                                                     1.00000
                          Sclerotinia
## Aminopyralid+triclopyr -
## Chlorsulfuron
## Flumetsulam
## MCPA
## MCPB
## MCPB+bentazone
## Nil
## Sclerotinia
## Thifensulfuron-methyl 1.00000
## P value adjustment method: bonferroni
herbHSD <- TukeyHSD(aov(Grass_percent ~ Herbicide, herb))</pre>
plot(herbHSD)
```

95% family-wise confidence level



```
print(herbHSD)
##
     Tukey multiple comparisons of means
       95% family-wise confidence level
##
##
## Fit: aov(formula = Grass_percent ~ Herbicide, data = herb)
##
## $Herbicide
                                                        diff
                                                                     lwr
##
upr
## Aminopyralid+triclopyr-Aminopyralid
                                                  -0.5479167 -12.181524
11.0856909
## Chlorsulfuron-Aminopyralid
                                                 -10.6729167 -22.306524
0.9606909
                                                  -5.3500000 -16.983608
## Flumetsulam-Aminopyralid
6.2836076
## MCPA-Aminopyralid
                                                  -5.1250000 -16.758608
6.5086076
## MCPB-Aminopyralid
                                                  -8.3291667 -19.962774
3.3044409
## MCPB+bentazone-Aminopyralid
                                                 -11.1520833 -22.785691
0.4815243
## Nil-Aminopyralid
                                                 -11.4020833 -23.035691
0.2315243
## Sclerotinia-Aminopyralid
                                                 -16.2458333 -27.879441 -
4.6122257
## Thifensulfuron-methyl-Aminopyralid
                                                 -13.1416667 -24.775274 -
```

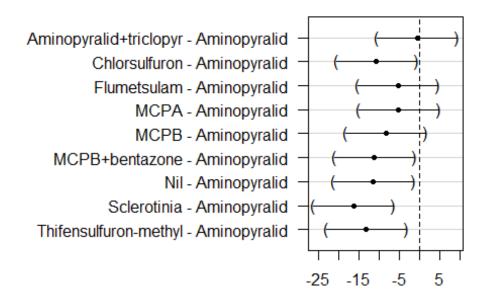
1.5080591 ## Chlorsulfuron-Aminopyralid+triclopyr	-10.1250000	_21 758608
1.5086076	-10.1230000	-21.75000
## Flumetsulam-Aminopyralid+triclopyr	-4.8020833	-16.435691
6.8315243		
## MCPA-Aminopyralid+triclopyr	-4.5770833	-16.210691
7.0565243	7 7013500	10 414050
## MCPB-Aminopyralid+triclopyr 3.8523576	-7.7812500	-19.414000
## MCPB+bentazone-Aminopyralid+triclopyr	-10.6041667	-22.237774
1.0294409		
## Nil-Aminopyralid+triclopyr	-10.8541667	-22.487774
0.7794409		
## Sclerotinia-Aminopyralid+triclopyr	-15.6979167	-27.331524 -
4.0643091	12 5027500	24 227250
<pre>## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.9601424</pre>	-12.593/500	-24.22/358 -
## Flumetsulam-Chlorsulfuron	5.3229167	-6.310691
16.9565243	3.3223107	0.310031
## MCPA-Chlorsulfuron	5.5479167	-6.085691
17.1815243		
## MCPB-Chlorsulfuron	2.3437500	-9.289858
13.9773576		
## MCPB+bentazone-Chlorsulfuron	-0.4791667	-12.112774
11.1544409 ## Nil-Chlorsulfuron	0 7201667	-12.362774
10.9044409	-0.7291007	-12.302//4
## Sclerotinia-Chlorsulfuron	-5.5729167	-17.206524
6.0606909		
## Thifensulfuron-methyl-Chlorsulfuron	-2.4687500	-14.102358
9.1648576		
## MCPA-Flumetsulam	0.2250000	-11.408608
11.8586076	2 0704667	14 612774
## MCPB-Flumetsulam 8.6544409	-2.9/9166/	-14.612774
## MCPB+bentazone-Flumetsulam	-5 8020833	-17.435691
5.8315243	3.0020033	17.455051
## Nil-Flumetsulam	-6.0520833	-17.685691
5.5815243		
## Sclerotinia-Flumetsulam	-10.8958333	-22.529441
0.7377743		
## Thifensulfuron-methyl-Flumetsulam	-7.7916667	-19.425274
3.8419409 ## MCPB-MCPA	2 20/1667	-14.837774
8.4294409	-3.204100/	17.03///4
## MCPB+bentazone-MCPA	-6.0270833	-17.660691
5.6065243		_
## Nil-MCPA	-6.2770833	-17.910691
5.3565243		
## Sclerotinia-MCPA	-11.1208333	-22.754441

8.5127743 ## Thifensulfuron-methyl-MCPA 3.6169409 ## MCPB-bentazone-MCPB 8.8106909 ## NII-MCPB 8.5606909 ## Sclerotinia-MCPB 3.709409 ## Sclerotinia-MCPB 3.7169409 ## NII-MCPB 8.510670 8.8211076 ## NII-MCPB+bentazone 6.8211076 ## NII-MCPB+bentazone 1.3836076 ## Sclerotinia-MCPB+bentazone 6.5398576 ## Thifensulfuron-methyl-MCPB+bentazone 9.640243 ## Thifensulfuron-methyl-NII 9.8940243 ## Thifensulfuron-methyl-Sclerotinia 14.7377743 ## ## Aminopyralid+triclopyr-Aminopyralid ## MCPB-Aminopyralid 9.895655 ## MCPB-Aminopyralid 9.895655 ## MCPB-Aminopyralid 9.895655 ## MCPB-Aminopyralid 9.895655 ## Sclerotinia-Aminopyralid 9.895655 ## MCPB-Aminopyralid 9.895655 ## MCPB-Aminopyralid 9.895655 ## Sclerotinia-Aminopyralid 9.895655 ## Sclerotinia-Aminopyralid 9.895655 ## MCPB-Aminopyralid 9.895655 ## Sclerotinia-Aminopyralid 9.895667 ## MCPB-Aminopyralid 9.895667 ## MCPB-Aminopyralid 9.895667 ## Sclerotinia-Aminopyralid 9.895667 ## Sclerotinia-Aminopyralid+triclopyr 9.9586631 ## MCPB-Aminopyralid+triclopyr 9.9586631 ## MCPB-Chlorsulfuron 9.999763 ## Sclerotinia-Aminopyralid+triclopyr 9.9586631 ## MCPB-Chlorsulfuron 9.9997663 ## MCPB-Chlorsulfuron 9.9997663 ## MCPB-Chlorsulfuron 9.9997663 ## MCPB-Chlorsulfuron 9.9997663 ## MCPB-Chlorsulfuron 9.99986023			
3.6169409 ## MCPB+bentazone-MCPB	0.5127743		
## MCPB-bentazone-MCPB	•	-8.0166667	-19.650274
8.8169090 ## Nil-MCPB 8.5606909 ## Sclerotinia-MCPB 3.7169409 ## Thifensulfuron-methyl-MCPB 6.8211076 ## Sclerotinia-MCPB+bentazone 11.3836076 ## Sclerotinia-MCPB+bentazone 6.5398576 ## Thifensulfuron-methyl-MCPB+bentazone 6.5398576 ## Thifensulfuron-methyl-MCPB+bentazone 7.0937500 8.5398576 ## Thifensulfuron-methyl-MCPB+bentazone 7.0937500 8.5398576 ## Thifensulfuron-methyl-MCPB+bentazone 8.5398576 ## Thifensulfuron-methyl-Nil 8.640243 ## Thifensulfuron-methyl-Nil 8.8940243 ## Thifensulfuron-methyl-Sclerotinia 8.8940243 ## Thifensulfuron-methyl-Sclerotinia 8.8040243 ## Adinopyralid+triclopyr-Aminopyralid 8.61053043 ## Flumetsulam-Aminopyralid 9.8952159 ## MCPB-Aminopyralid 9.8952159 ## MCPB-Aminopyralid 9.8952159 ## MCPB-Aminopyralid 9.8956955 ## MCPB-Aminopyralid 9.8956955 ## Sclerotinia-Aminopyralid 9.0006647 ## MCPB-Aminopyralid+triclopyr 9.9436704 ## MCPB-Aminopyralid+triclopyr 9.983631 ## MCPB-Aminopyralid+triclopyr 9.983631 ## MCPB-Aminopyralid+triclopyr 9.983631 ## MCPB-Aminopyralid+triclopyr 9.983631 ## MCPB-Aminopyralid+triclopyr 9.083631 ## MCPB-Chlorsulfuron 9.093763 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 9.083785 ## Flumetsulam-Chlorsulfuron 9.093763 ## MCPB-Chlorsulfuron 9.093763 ## MCPB-Chlorsulfuron 9.0939763 ## MCPB-Chlorsulfuron		0.00044=	4.4.5554
## Nil-MCPB 8.566969 8.566969 ## Sclerotinia-MCPB 3.7169409 ## Thifensulfuron-methyl-MCPB 6.8211076 ## Nil-MCPB+bentazone 11.3836076 ## Sclerotinia-MCPB+bentazone 6.53938576 ## Thifensulfuron-methyl-MCPB+bentazone 6.5398576 ## Thifensulfuron-methyl-MCPB+bentazone 6.5398576 ## Thifensulfuron-methyl-MCPB+bentazone 6.7898576 ## Thifensulfuron-methyl-Nil 9.8940243 ## Sclerotinia-Nil 6.7898576 ## Thifensulfuron-methyl-Nil 9.8940243 ## Thifensulfuron-methyl-Sclerotinia 1.7377743 ## Thifensulfuron-methyl-Sclerotinia 1.0000000 ## Chlorsulfuron-Aminopyralid 1.00000000 ## Chlorsulfuron-Aminopyralid 0.8952159 ## MCPB-Aminopyralid ## MCPB-Aminopyralid 0.9175099 ## MCPB-Aminopyralid 0.0006647 ## Thifensulfuron-methyl-Aminopyralid ## Chlorsulfuron-methyl-Aminopyralid 0.0006647 ## Thifensulfuron-methyl-Aminopyralid 0.0006647 ## MCPB-Aminopyralid+triclopyr 0.0006647 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.0006647 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.0006647 ## MCPB-Chlorsulfuron 0.0000600 ## CPB-Chlorsulfuron 0.0000600 ## CPB-Chlorsulfuron 0.0000600 ## Thifensulfuron-methyl-Chlorsulfuron 0.00006000 ## MCPB-Chlorsulfuron 0.00006000 ## CPB-Chlorsulfuron 0.00006000 ## MCPB-Chlorsulfuron 0.00006000 ## Thifensulfuron-methyl-Chlorsulfuron 0.00006000 ## MCPB-Chlorsulfuron 0.00006000 ## CPB-Chlorsulfuron 0.00006000 ## CPB-Chlorsulfuron 0.00006000 ## MCPB-Chlorsulfuron 0.00006000 ## MCPB-Chlorsulfuron		-2.822916/	-14.456524
8.5606909 ## Sclerotinia-MCPB		2 0700467	4.4 70.550.4
## Sclerotinia-MCPB 3.7169409 ## Thifensulfuron-methyl-MCPB 6.8211076 ## Nil-MCPB+bentazone 1.3836076 ## Sclerotinia-MCPB+bentazone 6.5398576 ## Thifensulfuron-methyl-MCPB+bentazone 6.7898576 ## Thifensulfuron-methyl-MCPB+bentazone 6.7898576 ## Thifensulfuron-methyl-Nil 9.8940243 ## Thifensulfuron-methyl-Sclerotinia 1.4.8437500 9.8940243 ## Thifensulfuron-methyl-Sclerotinia 1.4.7377743 ## Thifensulfuron-methyl-Sclerotinia 1.4.7377743 ## Aminopyralid+triclopyr-Aminopyralid 1.00000000 ## Chlorsulfuron-Aminopyralid 9.8952159 ## MCPB-Aminopyralid 9.9175099 ## MCPB-Aminopyralid 9.012182 ## Flumetsulam-Aminopyralid 9.012182 ## Flumetsulam-Aminopyralid 9.0175099 ## MCPB-Aminopyralid 9.0175099 ## MCPB-Aminopyralid 9.0175099 ## MCPB-Aminopyralid 9.0386947 ## Thifensulfuron-methyl-Aminopyralid 9.0496647 ## Thifensulfuron-methyl-Aminopyralid 9.0496655 ## Sclerotinia-Aminopyralid+triclopyr 9.1457962 ## Flumetsulam-Aminopyralid+triclopyr 9.9436704 ## MCPB-Aminopyralid+triclopyr 9.9436704 ## MCPB-Aminopyralid+triclopyr 9.9580631 ## MCPB-Aminopyralid+triclopyr 9.9580631 ## MCPB-Aminopyralid+triclopyr 9.9580631 ## MCPB-Aminopyralid+triclopyr 9.0891505 ## MCPB-Chlorsulfuron 9.8927875 ## MCPB-Chlorsulfuron 9.8927875 ## MCPB-Chlorsulfuron 9.8927875 ## MCPB-Chlorsulfuron 9.999763 ## MCPB-Chlorsulfuron 9.999763 ## MCPB-Chlorsulfuron 9.9995511 ## MCPB-Flumetsulam		-3.0/2916/	-14./06524
3.7169409 ## Thifensulfuron-methyl-MCPB		7 046667	40 550074
## Thifensulfuron-methyl-MCPB 6.8211076 ## Nil-MCPB+bentazone 1.3836076 ## Sclerotinia-MCPB+bentazone 6.5398576 ## Thifensulfuron-methyl-MCPB+bentazone 9.648048243 ## Thifensulfuron-methyl-Nil 9.8840243 ## Thifensulfuron-methyl-Sclerotinia 14.7377743 ## Aminopyralid+triclopyr-Aminopyralid ## Flumetsulam-Aminopyralid ## MCPB-Aminopyralid ## MCPB-Aminopyralid ## MCPB-Aminopyralid ## Nil-Aminopyralid ## Thifensulfuron-methyl-Mil 9.959635 ## Thifensulfuron-methyl-Sclerotinia 1.0000000 ## Chlorsulfuron-Minopyralid 9.9175099 ## MCPA-Aminopyralid 9.9175099 ## MCPB-Aminopyralid 9.0596955 ## Tollorsulfuron-Aminopyralid 9.0596955 ## Sclerottinia-Aminopyralid 9.0596955 ## Chlorsulfuron-Aminopyralid 9.04936704 ## Thifensulfuron-methyl-Aminopyralid 9.04936704 ## Thifensulfuron-Aminopyralid+triclopyr ## Thifensulfuron-Aminopyralid+triclopyr 9.04936704 ## Flumetsulam-Aminopyralid+triclopyr 9.04936704 ## MCPB-Aminopyralid+triclopyr 9.04936704 ## MCPB-Aminopyralid+triclopyr 9.04936704 ## MCPB-Aminopyralid+triclopyr 9.0580631 ## MCPB-Aminopyralid+triclopyr 9.0891595 ## Sclerotinia-Aminopyralid+triclopyr 9.0891630 ## MCPB-Chlorsulfuron 9.0890000 ## Sclerotinia-Chlorsulfuron 9.0890000 ## MCPB-Chlorsulfuron 9.0999763 ## MCPB-Chlorsulfuron 9.0999551 ## MCPB-Flumetsulam 9.0995511 ## MCPB-Flumetsulam 9.0905511 ## MCPB-Flumetsulam 9.0905511		-/.916666/	-19.5502/4
6.8211076 ## Nil-MCPB+bentazone 1.3836076 ## Sclerotinia-MCPB+bentazone 6.5398576 ## Thifensulfuron-methyl-MCPB+bentazone 9.6440243 ## Sclerotinia-Nil 9.6840243 ## Thifensulfuron-methyl-Nil 9.898576 ## Thifensulfuron-methyl-Nil 9.8940243 ## Thifensulfuron-methyl-Sclerotinia 1.7395833 -13.623191 9.8940243 ## Thifensulfuron-methyl-Sclerotinia 1.7395833 -13.373191 9.8940243 ## Thifensulfuron-methyl-Sclerotinia 1.0000000 ## Aninopyralid+triclopyr-Aminopyralid 1.0000000 ## Chlorsulfuron-Aminopyralid 9.8952159 ## MCPA-Aminopyralid 9.9175099 ## MCPA-Aminopyralid 9.9175099 ## MCPB-Aminopyralid 9.0719191 ## Mil-Aminopyralid 9.095955 ## Sclerotinia-Aminopyralid 9.0142167 ## Thifensulfuron-methyl-Aminopyralid 9.0142167 ## Chlorsulfuron-methyl-Aminopyralid 9.0142167 ## Chlorsulfuron-methyl-Aminopyralid 9.0142167 ## Chlorsulfuron-methyl-Aminopyralid 9.0142167 ## Chlorsulfuron-methyl-Aminopyralid ## MCPB-Aminopyralid+triclopyr 9.9436704 ## MCPB-Aminopyralid+triclopyr 9.9436704 ## MCPB-Aminopyralid+triclopyr 9.04901410 ## MCPB-Aminopyralid+triclopyr 9.0891595 ## Sclerotinia-Aminopyralid+triclopyr 9.0891595 ## Sclerotinia-Aminopyralid+triclopyr 9.022898 ## MCPB-Chlorsulfuron 9.8992787 ## MCPB-Chlorsulfuron 9.8938078 ## MCPB-Chlorsulfuron 9.9997063 ## MCPB-Chlorsulfuron 9.9997063 ## MCPB-Chlorsulfuron 9.9997063 ## MCPB-Chlorsulfuron 9.9995511 ## MCPB-Flumetsulam-Chlorsulfuron 9.9995511 ## MCPB-Flumetsulam ## Thifensulfuron-methyl-Chlorsulfuron 9.9995511 ## MCPB-Flumetsulam ## MC		4 0425000	16 116100
## Nil-MCPB+bentazone	•	-4.8125000	-16.446108
11.3836076 ## Sclerotinia-MCPB+bentazone		0 050000	44 003600
## Sclerotinia-MCPB+bentazone		-0.2500000	-11.883608
6.5398576 ## Thifensulfuron-methyl-MCPB+bentazone		F 0037F00	46 727250
## Thifensulfuron-methyl-MCPB+bentazone 9.6440243		-5.093/500	-16./2/358
9.6440243 ## Sclerotinia-Ni1		1 0005033	12 (22101
## Sclerotinia-Nil	•	-1.9895833	-13.623191
6.7898576 ## Thifensulfuron-methyl-Nil		4 0427500	16 477250
## Thifensulfuron-methyl-Nil		-4.843/500	-16.4//358
9.8940243 ## Thifensulfuron-methyl-Sclerotinia		1 7205022	12 272101
## Thifensulfuron-methyl-Sclerotinia 14.7377743 ## p adj ## Aminopyralid+triclopyr-Aminopyralid ## Chlorsulfuron-Aminopyralid ## Chlorsulfuron-Aminopyralid ## Chlorsulfuron-Aminopyralid ## Sclerotinia-Aminopyralid ## MCPB-Aminopyralid ## N1-Aminopyralid ## Sclerotinia-Aminopyralid ## Sclerotinia-Aminopyralid ## Chlorsulfuron-methyl-Aminopyralid ## Chlorsulfuron-methyl-Aminopyralid ## Thifensulfuron-Aminopyralid ## Chlorsulfuron-Aminopyralid ## Chlorsulfuron-Aminopyralid ## Chlorsulfuron-Aminopyralid+triclopyr ## Chlorsulfuron-Aminopyralid+triclopyr ## MCPB-Aminopyralid+triclopyr ## MCPB-Aminopyralid+triclopyr ## MCPB-Aminopyralid+triclopyr ## MCPB-Aminopyralid+triclopyr ## MCPB-bentazone-Aminopyralid+triclopyr ## Aminopyralid+triclopyr ## Sclerotinia-Aminopyralid+triclopyr ## Sclerotinia-Aminopyralid+triclopyr ## Thifensulfuron-methyl-Aminopyralid+triclopyr ## Thifensulfuron-methyl-Aminopyralid+triclopyr ## Thifensulfuron-methyl-Aminopyralid+triclopyr ## MCPB-Chlorsulfuron ## MCPB-Flumetsulam ## Thifensulfuron-methyl-Chlorsulfuron ## MCPB-Flumetsulam ## MCPA-Flumetsulam ### MCPA-Flumetsulam ### MCPA-Flumetsulam ### MCPA-Flumetsulam		-1./395833	-13.3/3191
## Aminopyralid+triclopyr-Aminopyralid		2 1041667	0 530441
## Aminopyralid+triclopyr-Aminopyralid 1.0000000 ## Chlorsulfuron-Aminopyralid 0.1012182 ## Flumetsulam-Aminopyralid 0.8952159 ## MCPA-Aminopyralid 0.9175099 ## MCPB-Aminopyralid 0.3896947 ## MCPB-bentazone-Aminopyralid 0.0719191 ## Nil-Aminopyralid 0.0596955 ## Sclerotinia-Aminopyralid 0.0906647 ## Thifensulfuron-methyl-Aminopyralid 0.0142167 ## Chlorsulfuron-Aminopyralid+triclopyr 0.1457962 ## Flumetsulam-Aminopyralid+triclopyr 0.9436704 ## MCPB-Aminopyralid+triclopyr 0.9580631 ## MCPB-Aminopyralid+triclopyr 0.9580631 ## MCPB-Aminopyralid+triclopyr 0.0891595 ## Sclerotinia-Aminopyralid+triclopyr 0.0891595 ## Sclerotinia-Aminopyralid+triclopyr 0.0811879 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.0228998 ## Flumetsulam-Chlorsulfuron 0.8727875 ## MCPB-Chlorsulfuron 0.8727875 ## MCPB-Chlorsulfuron 0.9997063 ## MCPB-Chlorsulfuron 0.9997063 ## MCPB-bentazone-Chlorsulfuron 1.0000000 ## Nil-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000	•	3.1041667	-8.529441
## Aminopyralid+triclopyr-Aminopyralid			
## Chlorsulfuron-Aminopyralid ## Flumetsulam-Aminopyralid ## MCPA-Aminopyralid ## MCPB-Aminopyralid ## MCPB-Aminopyralid ## MCPB-Aminopyralid ## MCPB-Aminopyralid ## MCPB-bentazone-Aminopyralid ## MCPB-bentazone-Aminopyralid ## Nil-Aminopyralid ## O.0006647 ## Thifensulfuron-methyl-Aminopyralid ## Chlorsulfuron-Aminopyralid ## Chlorsulfuron-Aminopyralid+triclopyr ## Flumetsulam-Aminopyralid+triclopyr ## MCPB-Aminopyralid+triclopyr ## MCPB-Aminopyralid+triclopyr ## MCPB-Aminopyralid+triclopyr ## MCPB-Aminopyralid+triclopyr ## MCPB-Aminopyralid+triclopyr ## MCPB-Indersulfuron ## Sclerotinia-Aminopyralid+triclopyr ## Sclerotinia-Aminopyralid+triclopyr ## Sclerotinia-Aminopyralid+triclopyr ## Flumetsulam-Chlorsulfuron ## MCPB-Chlorsulfuron ## MCPB-Chlorsulfuron ## MCPB-Chlorsulfuron ## MCPB-Chlorsulfuron ## MCPB-Chlorsulfuron ## MCPB-bentazone-Chlorsulfuron ## MCPB-bentazone-Chlorsulfuron ## Sclerotinia-Chlorsulfuron ## MCPA-Flumetsulam ## MCPA-Flumetsu			
## Flumetsulam-Aminopyralid 0.8952159 ## MCPA-Aminopyralid 0.9175099 ## MCPB-Aminopyralid 0.3896947 ## MCPB-bentazone-Aminopyralid 0.0719191 ## Nil-Aminopyralid 0.0596955 ## Sclerotinia-Aminopyralid 0.0006647 ## Thifensulfuron-methyl-Aminopyralid 0.0142167 ## Chlorsulfuron-Aminopyralid+triclopyr 0.1457962 ## Flumetsulam-Aminopyralid+triclopyr 0.9436704 ## MCPA-Aminopyralid+triclopyr 0.9580631 ## MCPB-Aminopyralid+triclopyr 0.4901410 ## MCPB-bentazone-Aminopyralid+triclopyr 0.0891595 ## Sclerotinia-Aminopyralid+triclopyr 0.0011879 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.0228998 ## Flumetsulam-Chlorsulfuron 0.8727875 ## MCPB-Chlorsulfuron 0.8727875 ## MCPB-Chlorsulfuron 1.0000000 ## Nil-Chlorsulfuron 1.0000000 ## Sclerotinia-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000			
## MCPA-Aminopyralid 0.9175099 ## MCPB-Aminopyralid 0.3896947 ## MCPB+bentazone-Aminopyralid 0.0719191 ## Nil-Aminopyralid 0.0596955 ## Sclerotinia-Aminopyralid 0.0006647 ## Thifensulfuron-methyl-Aminopyralid 0.0142167 ## Chlorsulfuron-Aminopyralid+triclopyr 0.1457962 ## Flumetsulam-Aminopyralid+triclopyr 0.9436704 ## MCPA-Aminopyralid+triclopyr 0.9580631 ## MCPB-Aminopyralid+triclopyr 0.4901410 ## MCPB-Bentazone-Aminopyralid+triclopyr 0.1061242 ## Nil-Aminopyralid+triclopyr 0.0091879 ## Sclerotinia-Aminopyralid+triclopyr 0.0011879 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.88980798 ## Flumetsulam-Chlorsulfuron 0.8727875 ## MCPB-Chlorsulfuron 1.0000000 ## MCPB-bentazone-Chlorsulfuron 1.0000000 ## Nil-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000	·		
## MCPB-Aminopyralid 0.3896947 ## MCPB+bentazone-Aminopyralid 0.0719191 ## Nil-Aminopyralid 0.0596955 ## Sclerotinia-Aminopyralid 0.0006647 ## Thifensulfuron-methyl-Aminopyralid 0.0142167 ## Chlorsulfuron-Aminopyralid+triclopyr 0.1457962 ## Flumetsulam-Aminopyralid+triclopyr 0.9436704 ## MCPA-Aminopyralid+triclopyr 0.9580631 ## MCPB-Aminopyralid+triclopyr 0.4901410 ## MCPB+bentazone-Aminopyralid+triclopyr 0.1061242 ## Nil-Aminopyralid+triclopyr 0.0891595 ## Sclerotinia-Aminopyralid+triclopyr 0.0011879 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.0228998 ## Flumetsulam-Chlorsulfuron 0.8727875 ## MCPA-Chlorsulfuron 0.9997063 ## MCPB-bentazone-Chlorsulfuron 1.0000000 ## Nil-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000			
## MCPB+bentazone-Aminopyralid 0.0719191 ## Nil-Aminopyralid 0.0596955 ## Sclerotinia-Aminopyralid 0.0006647 ## Thifensulfuron-methyl-Aminopyralid 0.0142167 ## Chlorsulfuron-Aminopyralid+triclopyr 0.1457962 ## Flumetsulam-Aminopyralid+triclopyr 0.9436704 ## MCPA-Aminopyralid+triclopyr 0.9580631 ## MCPB-Aminopyralid+triclopyr 0.4901410 ## MCPB+bentazone-Aminopyralid+triclopyr 0.1061242 ## Nil-Aminopyralid+triclopyr 0.0891595 ## Sclerotinia-Aminopyralid+triclopyr 0.0011879 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.0228998 ## Flumetsulam-Chlorsulfuron 0.8727875 ## MCPA-Chlorsulfuron 0.9997063 ## MCPB-bentazone-Chlorsulfuron 1.0000000 ## MIl-Chlorsulfuron 1.0000000 ## Sclerotinia-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000			
## Nil-Aminopyralid 0.0596955 ## Sclerotinia-Aminopyralid 0.0006647 ## Thifensulfuron-methyl-Aminopyralid 0.0142167 ## Chlorsulfuron-Aminopyralid+triclopyr 0.1457962 ## Flumetsulam-Aminopyralid+triclopyr 0.9436704 ## MCPA-Aminopyralid+triclopyr 0.9580631 ## MCPB-Aminopyralid+triclopyr 0.4901410 ## MCPB+bentazone-Aminopyralid+triclopyr 0.1061242 ## Nil-Aminopyralid+triclopyr 0.0891595 ## Sclerotinia-Aminopyralid+triclopyr 0.0011879 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.228998 ## Flumetsulam-Chlorsulfuron 0.8980798 ## MCPA-Chlorsulfuron 0.8727875 ## MCPB-Chlorsulfuron 1.0000000 ## MCPB+bentazone-Chlorsulfuron 1.0000000 ## Nil-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000			
## Sclerotinia-Aminopyralid 0.0006647 ## Thifensulfuron-methyl-Aminopyralid 0.0142167 ## Chlorsulfuron-Aminopyralid+triclopyr 0.1457962 ## Flumetsulam-Aminopyralid+triclopyr 0.9436704 ## MCPA-Aminopyralid+triclopyr 0.9580631 ## MCPB-Aminopyralid+triclopyr 0.4901410 ## MCPB-bentazone-Aminopyralid+triclopyr 0.1061242 ## Nil-Aminopyralid+triclopyr 0.0891595 ## Sclerotinia-Aminopyralid+triclopyr 0.0011879 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.0228998 ## Flumetsulam-Chlorsulfuron 0.8727875 ## MCPA-Chlorsulfuron 0.9997063 ## MCPB-bentazone-Chlorsulfuron 1.0000000 ## Nil-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000			
## Thifensulfuron-methyl-Aminopyralid 0.0142167 ## Chlorsulfuron-Aminopyralid+triclopyr 0.1457962 ## Flumetsulam-Aminopyralid+triclopyr 0.9436704 ## MCPA-Aminopyralid+triclopyr 0.9580631 ## MCPB-Aminopyralid+triclopyr 0.4901410 ## MCPB+bentazone-Aminopyralid+triclopyr 0.1061242 ## Nil-Aminopyralid+triclopyr 0.0891595 ## Sclerotinia-Aminopyralid+triclopyr 0.0011879 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.0228998 ## Flumetsulam-Chlorsulfuron 0.8980798 ## MCPA-Chlorsulfuron 0.8727875 ## MCPB-Chlorsulfuron 1.0000000 ## MCPB-bentazone-Chlorsulfuron 1.0000000 ## Nil-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000			
## Chlorsulfuron-Aminopyralid+triclopyr 0.1457962 ## Flumetsulam-Aminopyralid+triclopyr 0.9436704 ## MCPA-Aminopyralid+triclopyr 0.9580631 ## MCPB-Aminopyralid+triclopyr 0.4901410 ## MCPB-bentazone-Aminopyralid+triclopyr 0.1061242 ## Nil-Aminopyralid+triclopyr 0.0891595 ## Sclerotinia-Aminopyralid+triclopyr 0.0011879 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.0228998 ## Flumetsulam-Chlorsulfuron 0.8980798 ## MCPA-Chlorsulfuron 0.8727875 ## MCPB-Chlorsulfuron 1.0000000 ## MCPB-bentazone-Chlorsulfuron 1.0000000 ## Nil-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000			
## Flumetsulam-Aminopyralid+triclopyr 0.9436704 ## MCPA-Aminopyralid+triclopyr 0.9580631 ## MCPB-Aminopyralid+triclopyr 0.4901410 ## MCPB+bentazone-Aminopyralid+triclopyr 0.1061242 ## Nil-Aminopyralid+triclopyr 0.0891595 ## Sclerotinia-Aminopyralid+triclopyr 0.0011879 ## Thifensulfuron-methyl-Aminopyralid+triclopyr 0.0228998 ## Flumetsulam-Chlorsulfuron 0.8980798 ## MCPA-Chlorsulfuron 0.8727875 ## MCPB-Chlorsulfuron 0.9997063 ## MCPB-bentazone-Chlorsulfuron 1.0000000 ## Nil-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000			
<pre>## MCPA-Aminopyralid+triclopyr ## MCPB-Aminopyralid+triclopyr ## MCPB+bentazone-Aminopyralid+triclopyr ## Nil-Aminopyralid+triclopyr ## Nil-Aminopyralid+triclopyr ## Sclerotinia-Aminopyralid+triclopyr ## Thifensulfuron-methyl-Aminopyralid+triclopyr ## Flumetsulam-Chlorsulfuron ## MCPA-Chlorsulfuron ## MCPB-Chlorsulfuron ## MCPB-bentazone-Chlorsulfuron ## Nil-Chlorsulfuron ## MCPA-Flumetsulam ## MCPA-Flumetsulam</pre>			
<pre>## MCPB-Aminopyralid+triclopyr ## MCPB+bentazone-Aminopyralid+triclopyr ## Nil-Aminopyralid+triclopyr ## Sclerotinia-Aminopyralid+triclopyr ## Thifensulfuron-methyl-Aminopyralid+triclopyr ## Flumetsulam-Chlorsulfuron ## MCPA-Chlorsulfuron ## MCPB-Chlorsulfuron ## MCPB-bentazone-Chlorsulfuron ## MCPB+bentazone-Chlorsulfuron ## Nil-Chlorsulfuron ## Sclerotinia-Chlorsulfuron ## Sclerotinia-Chlorsulfuron ## Thifensulfuron-methyl-Chlorsulfuron ## MCPA-Flumetsulam ## MCPA-Flumetsulam ## MCPA-Flumetsulam ## MCPA-Flumetsulam ## MCPA-Flumetsulam ## 0.4901410 ## 0.1061242 ## 0.0001879 ## 0.0011879 ## 0.0011879 ## 0.0028998 ## Flumetsulam-Chlorsulfuron ## 0.8980798</pre>			
<pre>## MCPB+bentazone-Aminopyralid+triclopyr ## Nil-Aminopyralid+triclopyr ## Sclerotinia-Aminopyralid+triclopyr ## Thifensulfuron-methyl-Aminopyralid+triclopyr ## Flumetsulam-Chlorsulfuron ## MCPA-Chlorsulfuron ## MCPB-Chlorsulfuron ## MCPB-bentazone-Chlorsulfuron ## MCPB-bentazone-Chlorsulfuron ## Nil-Chlorsulfuron ## Sclerotinia-Chlorsulfuron ## Sclerotinia-Chlorsulfuron ## Thifensulfuron-methyl-Chlorsulfuron ## MCPA-Flumetsulam ## MCPA-Flumetsulam</pre> ## 0.1061242 0.0891595 0.0011879 0.0228998 0.8980798 0.8727875 0.9997063 0.9997063 0.9997063 0.9997063 0.9997063 0.9997063 0.9997063 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.90000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.90000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.90000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.8697678 0.9000000 0.9000000 0.9000000000000000	· · · · · · · · · · · · · · · · · · ·		
<pre>## Nil-Aminopyralid+triclopyr ## Sclerotinia-Aminopyralid+triclopyr ## Thifensulfuron-methyl-Aminopyralid+triclopyr ## Flumetsulam-Chlorsulfuron ## MCPA-Chlorsulfuron ## MCPB-Chlorsulfuron ## MCPB+bentazone-Chlorsulfuron ## Nil-Chlorsulfuron ## Sclerotinia-Chlorsulfuron ## Sclerotinia-Chlorsulfuron ## Thifensulfuron-methyl-Chlorsulfuron ## MCPA-Flumetsulam ## MCPA-Flumetsulam ## MCPA-Flumetsulam</pre> ## 0.0891595 ## 0.0011879 ## 0.0228998 ## 0.08289798 ## 0.8997063 ## 0.9997063 ## 0.000000 ## 3.0000000 ## 1.0000000 ## 1.0000000 ## 1.0000000 ## 1.0000000 ## 1.0000000 ## 1.0000000			
<pre>## Sclerotinia-Aminopyralid+triclopyr ## Thifensulfuron-methyl-Aminopyralid+triclopyr ## Thifensulfuron-methyl-Aminopyralid+triclopyr ## Flumetsulam-Chlorsulfuron ## MCPA-Chlorsulfuron ## MCPB-Chlorsulfuron ## MCPB+bentazone-Chlorsulfuron ## Nil-Chlorsulfuron ## Sclerotinia-Chlorsulfuron ## Sclerotinia-Chlorsulfuron ## Thifensulfuron-methyl-Chlorsulfuron ## MCPA-Flumetsulam ## MCPA-Flumetsulam ## 0.0011879 0.0011879 0.00228998 0.8980798 0.9997063 1.0000000 0.9997063 1.0000000 ## Sclerotinia-Chlorsulfuron 0.8697678 1.0000000</pre>			
<pre>## Thifensulfuron-methyl-Aminopyralid+triclopyr ## Flumetsulam-Chlorsulfuron</pre>			
## Flumetsulam-Chlorsulfuron 0.8980798 ## MCPA-Chlorsulfuron 0.8727875 ## MCPB-Chlorsulfuron 0.9997063 ## MCPB+bentazone-Chlorsulfuron 1.0000000 ## Nil-Chlorsulfuron 1.0000000 ## Sclerotinia-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000	· ·		
## MCPA-Chlorsulfuron 0.8727875 ## MCPB-Chlorsulfuron 0.9997063 ## MCPB+bentazone-Chlorsulfuron 1.0000000 ## Nil-Chlorsulfuron 1.0000000 ## Sclerotinia-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000			
<pre>## MCPB-Chlorsulfuron 0.9997063 ## MCPB+bentazone-Chlorsulfuron 1.0000000 ## Nil-Chlorsulfuron 1.0000000 ## Sclerotinia-Chlorsulfuron 0.8697678 ## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000</pre>			
<pre>## MCPB+bentazone-Chlorsulfuron</pre>			
<pre>## Nil-Chlorsulfuron</pre>			
<pre>## Sclerotinia-Chlorsulfuron</pre>			
## Thifensulfuron-methyl-Chlorsulfuron 0.9995511 ## MCPA-Flumetsulam 1.0000000			
## MCPA-Flumetsulam 1.0000000			
	•		
## MCPB-Flumetsulam 0.9980023			
	## MCPB-Flumetsulam	0.9980023	

```
## MCPB+bentazone-Flumetsulam
                                                 0.8401778
## Nil-Flumetsulam
                                                 0.8041383
## Sclerotinia-Flumetsulam
                                                 0.0865607
## Thifensulfuron-methyl-Flumetsulam
                                                 0.4881667
## MCPB-MCPA
                                                 0.9965119
## MCPB+bentazone-MCPA
                                                 0.8079096
## Nil-MCPA
                                                 0.7686463
## Sclerotinia-MCPA
                                                 0.0735856
## Thifensulfuron-methyl-MCPA
                                                 0.4460368
## MCPB+bentazone-MCPB
                                                 0.9986881
## Nil-MCPB
                                                 0.9974634
## Sclerotinia-MCPB
                                                 0.4646294
## Thifensulfuron-methyl-MCPB
                                                 0.9429303
## Nil-MCPB+bentazone
                                                 1.0000000
## Sclerotinia-MCPB+bentazone
                                                 0.9203383
## Thifensulfuron-methyl-MCPB+bentazone
                                                 0.9999248
## Sclerotinia-Nil
                                                 0.9406693
## Thifensulfuron-methyl-Nil
                                                 0.9999760
## Thifensulfuron-methyl-Sclerotinia
                                                 0.9972591
  Tukeyaov <- aov(Grass_percent ~ Herbicide, herb)</pre>
  summary(Tukeyaov)
##
                Df Sum Sq Mean Sq F value
                                             Pr(>F)
                                     4.412 6.09e-05 ***
## Herbicide
                 9
                     3092
                            343.5
## Residuals
               110
                     8564
                             77.9
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.05 '.' 0.1 ' ' 1
   herbHSD <- TukeyHSD(Tukeyaov)</pre>
 herb$Trta <- as.factor(herb$Herbicide)</pre>
 Dunnetaov <- aov(Grass percent ~ Trta, herb)</pre>
 test.dunnett=glht(Dunnetaov,linfct=mcp(Trta="Dunnett"))
 confint(test.dunnett)
##
##
     Simultaneous Confidence Intervals
## Multiple Comparisons of Means: Dunnett Contrasts
##
##
## Fit: aov(formula = Grass_percent ~ Trta, data = herb)
##
## Quantile = 2.7315
## 95% family-wise confidence level
##
##
## Linear Hypotheses:
##
                                               Estimate lwr
## Aminopyralid+triclopyr - Aminopyralid == 0 -0.5479 -10.3873 9.2914
```

```
## Chlorsulfuron - Aminopyralid == 0
                                              -10.6729 -20.5123
                                                                 -0.8336
## Flumetsulam - Aminopyralid == 0
                                               -5.3500 -15.1894
                                                                  4.4894
## MCPA - Aminopyralid == 0
                                                                  4.7144
                                               -5.1250 -14.9644
## MCPB - Aminopyralid == 0
                                               -8.3292 -18.1685
                                                                  1.5102
## MCPB+bentazone - Aminopyralid == 0
                                              -11.1521 -20.9914 -1.3127
## Nil - Aminopyralid == 0
                                              -11.4021 -21.2414
                                                                 -1.5627
## Sclerotinia - Aminopyralid == 0
                                              -16.2458 -26.0852
                                                                 -6.4065
## Thifensulfuron-methyl - Aminopyralid == 0 -13.1417 -22.9810
                                                                 -3.3023
op <- par()
par(mar=c(4,15,4,2))
plot(test.dunnett)
```

95% family-wise confidence le



Linear Function

```
par(op)
## Warning in par(op): graphical parameter "cin" cannot be set
## Warning in par(op): graphical parameter "cra" cannot be set
## Warning in par(op): graphical parameter "csi" cannot be set
## Warning in par(op): graphical parameter "cxy" cannot be set
## Warning in par(op): graphical parameter "din" cannot be set
## Warning in par(op): graphical parameter "page" cannot be set
```

The Bonferroni and Tukey adjustments show there are 4 pairs with significant p-values meaning there are 4 pairs of herbicides that have significant differences in grass_percent. These pairs are (Aminopyralid, Sclerotinia), (Aminopyralid, Thifensulfuron-methyl), (Aminopyralid+triclopyr, Sclerotini) and (Aminopyralid+triclopyr, Thifensulfuron-methyl). This means we can be confident there is a significant difference between these herbicides.

The Dunnett method shows that Aminipyralid alone has a significantly different impact on grass_percent when compared to the 5 herbicides Thifensulfuron-methyl, Sclerotinia, Nil, MCPB+bentazone and Chlorsulfuron. This means there could possibly be a significant difference between these herbicides.

The LSD tests claims 17 significant differences while Bonferroni and Tukey only claim 4 and the Dunnett claims 5 for Aminopyralid herbicide. I would use the Bonferroni, Tukey and Dunnett adjustments over the LSD test because the LSD test claims many significant differences between herbicides which the other methods do not.