Waterhemp Adaptation Trial

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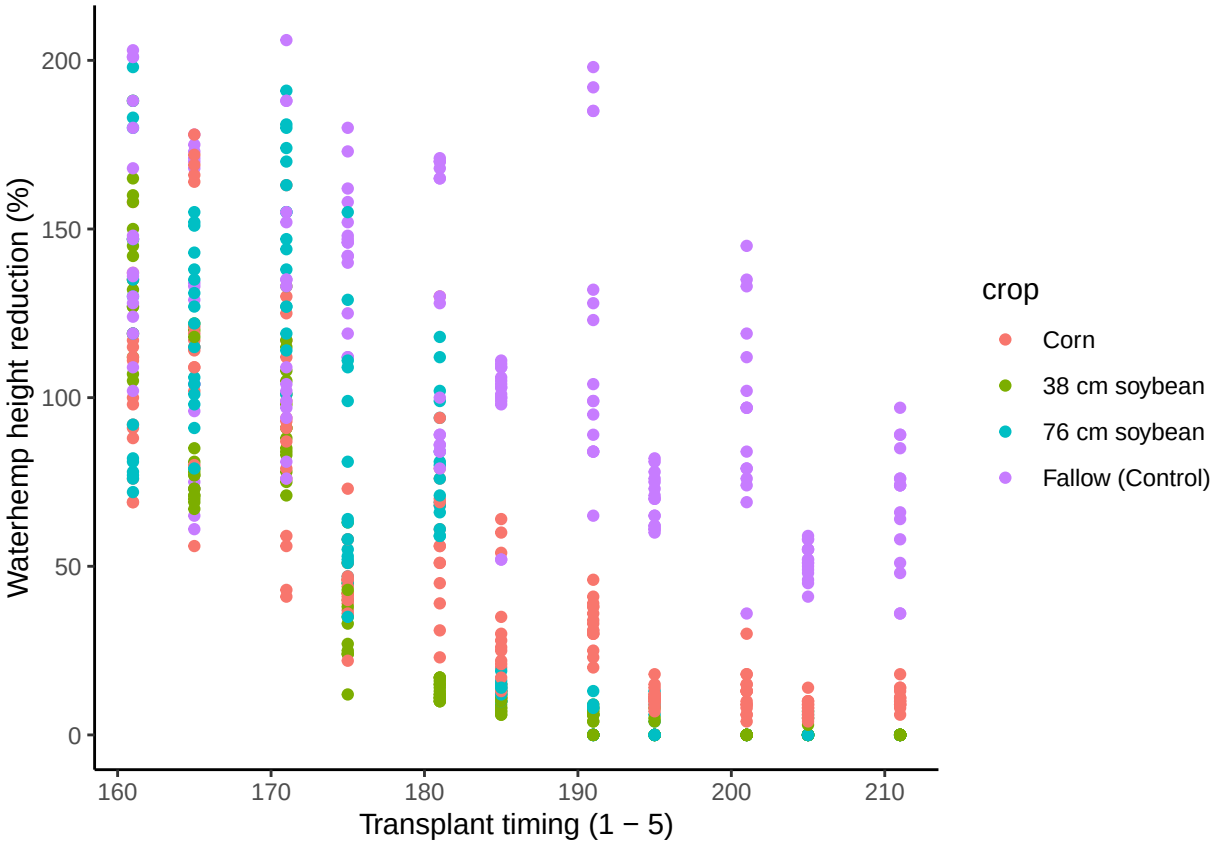
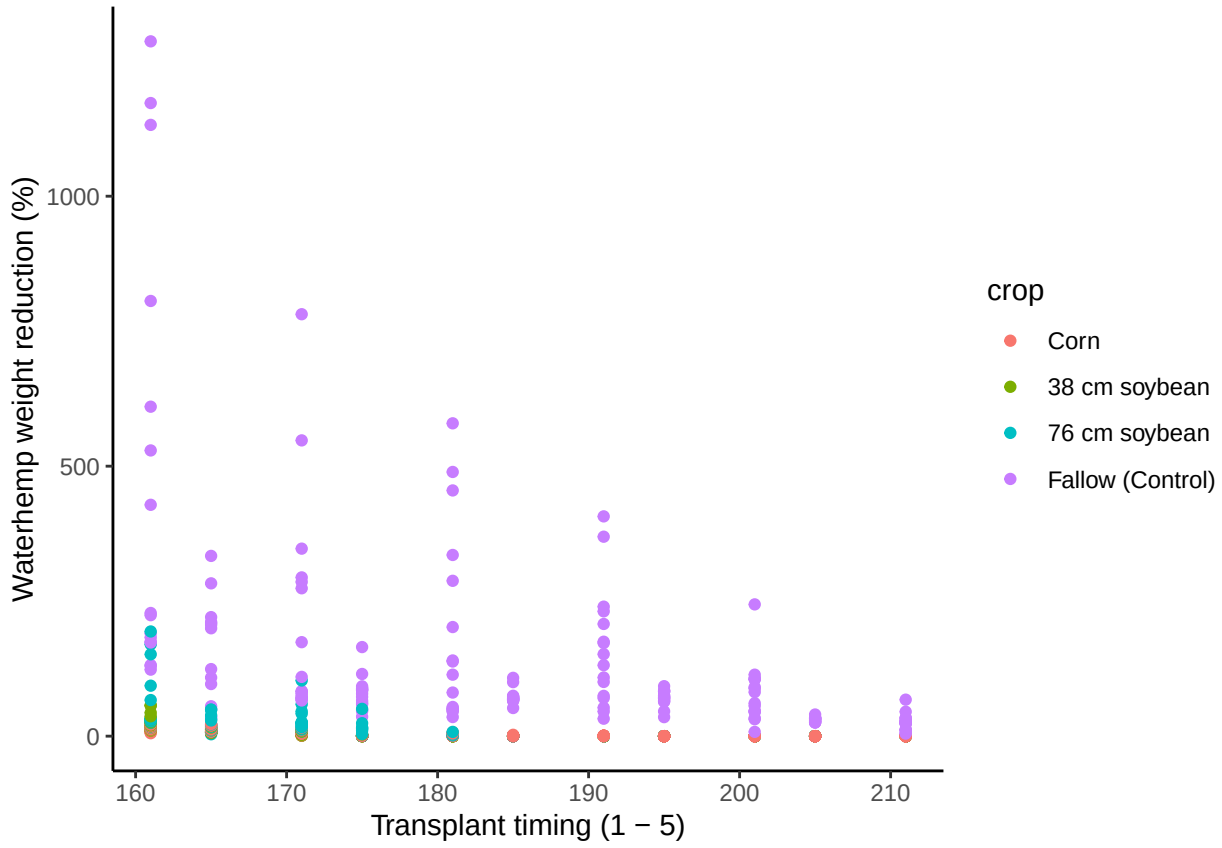
Roughly plotting the data, to view the overall look of it (height).





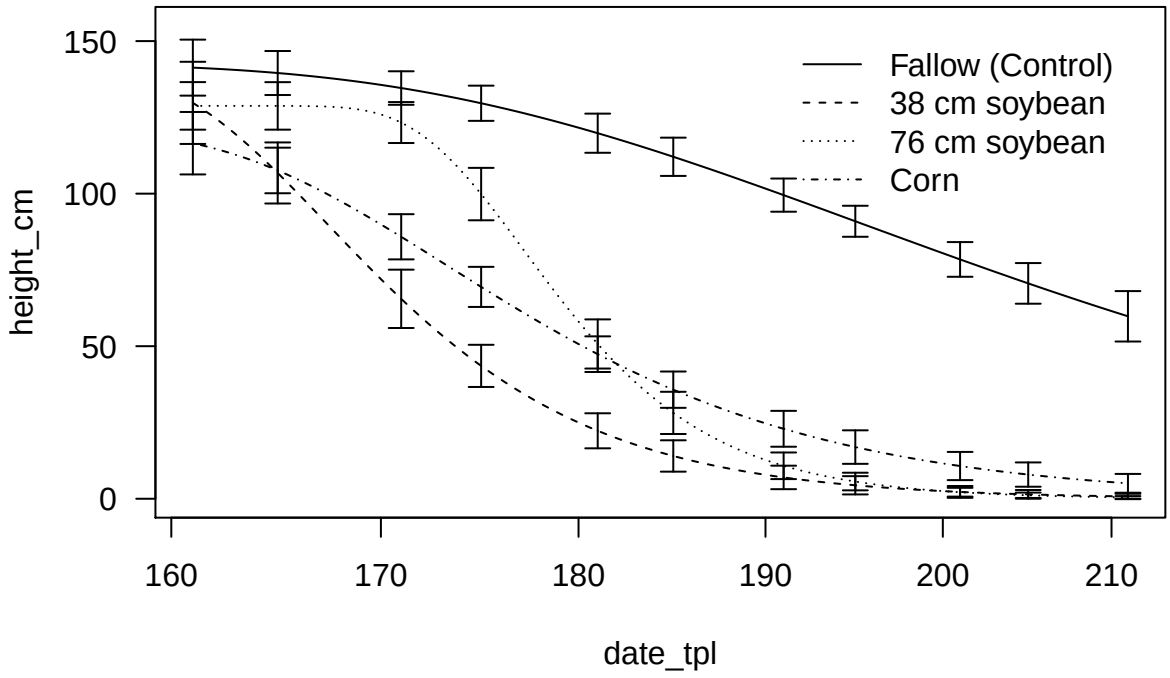
Fitting the 'drm' model for waterhemp height reduction

```
redukcija = drm(data=red, height_cm~date_tpl, crop, fct =W2.3(fixed = c(NA, NA,NA), names = c("slope", "
summary(redukcija)
```

```
##
## Model fitted: Weibull (type 2) with lower limit at 0 (3 parms)
##
## Parameter estimates:
##
##                          Estimate Std. Error  t-value   p-value
## slope:Fallow (Control)  -7.92214    1.21578  -6.5161 1.390e-10 ***
## slope:38 cm soybean    -22.65439    3.28853  -6.8889 1.265e-11 ***
## slope:76 cm soybean    -32.41790    2.74646 -11.8035 < 2.2e-16 ***
## slope:Corn             -16.00212    1.90255  -8.4109 2.272e-16 ***
## upper:Fallow (Control) 142.69971    6.32989  22.5438 < 2.2e-16 ***
## upper:38 cm soybean    142.55624   21.43572   6.6504 5.937e-11 ***
## upper:76 cm soybean    128.76398    3.96944  32.4388 < 2.2e-16 ***
## upper:Corn             121.36699    8.81329  13.7709 < 2.2e-16 ***
## ec50:Fallow (Control)  195.35030    2.49167  78.4013 < 2.2e-16 ***
## ec50:38 cm soybean     167.37579    2.55627  65.4766 < 2.2e-16 ***
## ec50:76 cm soybean     177.18027    0.61361 288.7520 < 2.2e-16 ***
## ec50:Corn              173.21787    1.86641  92.8079 < 2.2e-16 ***
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
##  25.27187 (692 degrees of freedom)
```

```
plot(redukcija, type="b", ylim = c(0,155))
```



Checking if the fitted model is the best for the loaded data

```
mselect(redukcija, list(l3(), l4(), W2.3(), W1.3(), W1.4(), W2.4(), LL.3(), LL.5(), W1.3(), W1.4(), W2.4
nested = F,
sorted = c("IC", "Res var", "Lack of fit", "no"),
linreg = F, icfct = AIC)
```

```
##         logLik       IC  Lack of fit  Res var
## LL.5 -3255.845 6553.689 1.244745e-33 626.7214
## W1.3 -3263.993 6553.987 3.772620e-33 633.9839
## W1.3 -3263.993 6553.987 3.772620e-33 633.9839
## W1.4 -3261.418 6556.837 6.672797e-34 633.0222
## W1.4 -3261.418 6556.837 6.672797e-34 633.0222
## l3   -3265.768 6557.537 8.519047e-34 637.1892
```

```
## LL.3 -3265.768 6557.537 8.519047e-34 637.1892
## W2.3 -3266.584 6559.168 4.295850e-34 638.6672
## W2.3 -3266.584 6559.168 4.295850e-34 638.6672
## W2.4 -3264.141 6562.283 6.597620e-35 637.9382
## W2.4 -3264.141 6562.283 6.597620e-35 637.9382
## l4   -3264.236 6562.472 6.087754e-35 638.1096
```

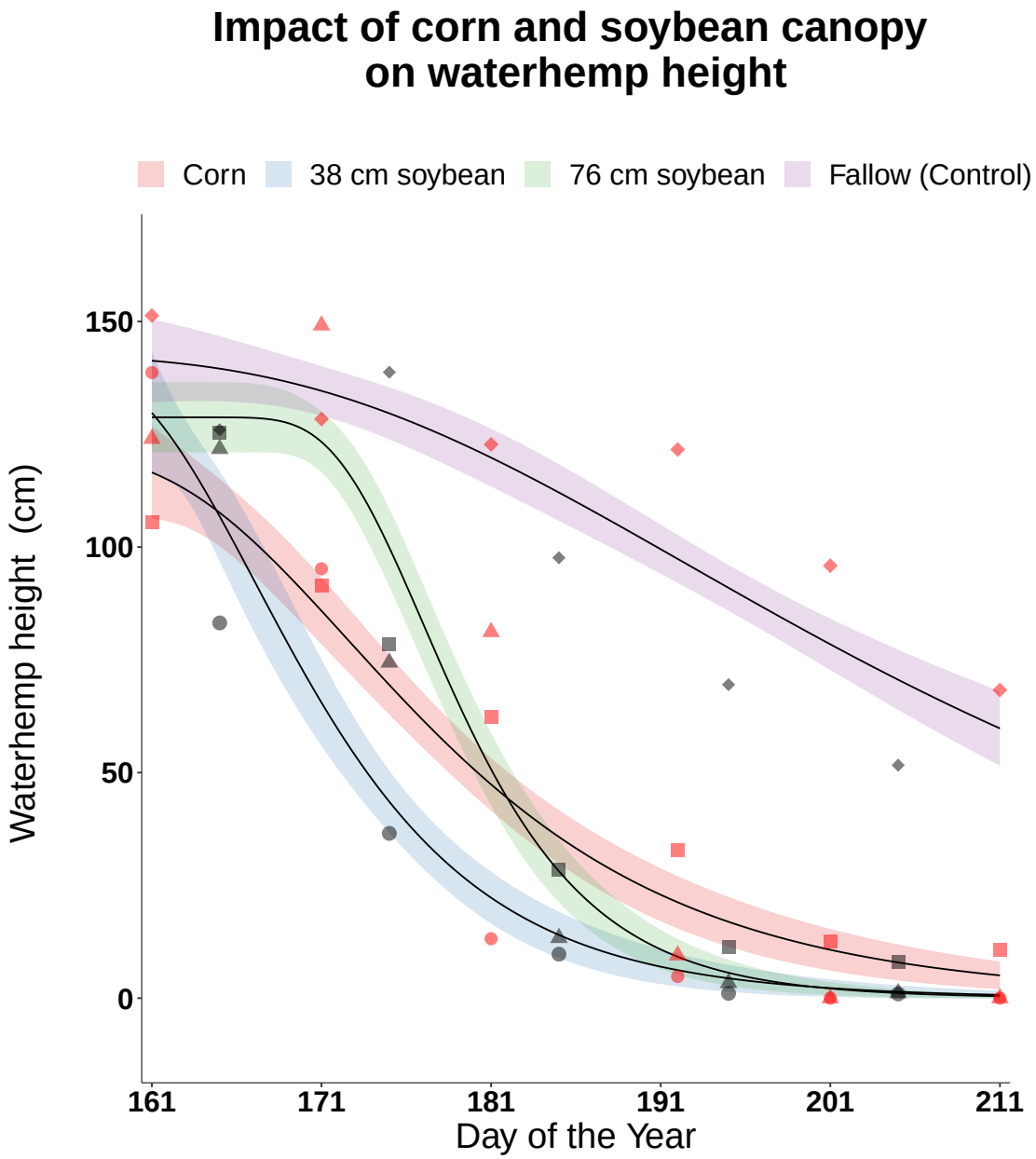
Estimating ED50 and ED90 values for height reduction. Also, comparing the slopes of corn, 15in and 30in soybean.

```
ED(redukcija, c(50,90), type="absolute", interval = "delta")
```

```
##
## Estimated effective doses
##
##                          Estimate Std. Error     Lower     Upper
## e:38 cm soybean:50     173.69467    1.91203 169.94060 177.44874
## e:38 cm soybean:90     167.39167    2.55453 162.37610 172.40724
## e:76 cm soybean:50     181.10494    0.65798 179.81306 182.39681
## e:76 cm soybean:90     176.18437    0.63028 174.94688 177.42186
## e:Corn:50              180.20749    1.50282 177.25685 183.15813
## e:Corn:90              169.97553    2.10900 165.83473 174.11633
## e:Fallow (Control):50 217.22285    2.89268 211.54336 222.90234
## e:Fallow (Control):90 195.44588    2.48407 190.56866 200.32310
```

```
compParm(redukcija, "slope", "-")
```

```
##
## Comparison of parameter 'slope'
##
##                                Estimate Std. Error t-value   p-value
## Fallow (Control)-38 cm soybean  14.7322     3.5061  4.2019 2.993e-05 ***
## Fallow (Control)-76 cm soybean  24.4958     3.0035  8.1557 1.705e-15 ***
## Fallow (Control)-Corn            8.0800     2.2578  3.5786 0.0003695 ***
## 38 cm soybean-76 cm soybean      9.7635     4.2846  2.2788 0.0229848 *
## 38 cm soybean-Corn              -6.6523     3.7992 -1.7510 0.0803969 .
## 76 cm soybean-Corn             -16.4158     3.3411 -4.9133 1.119e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```



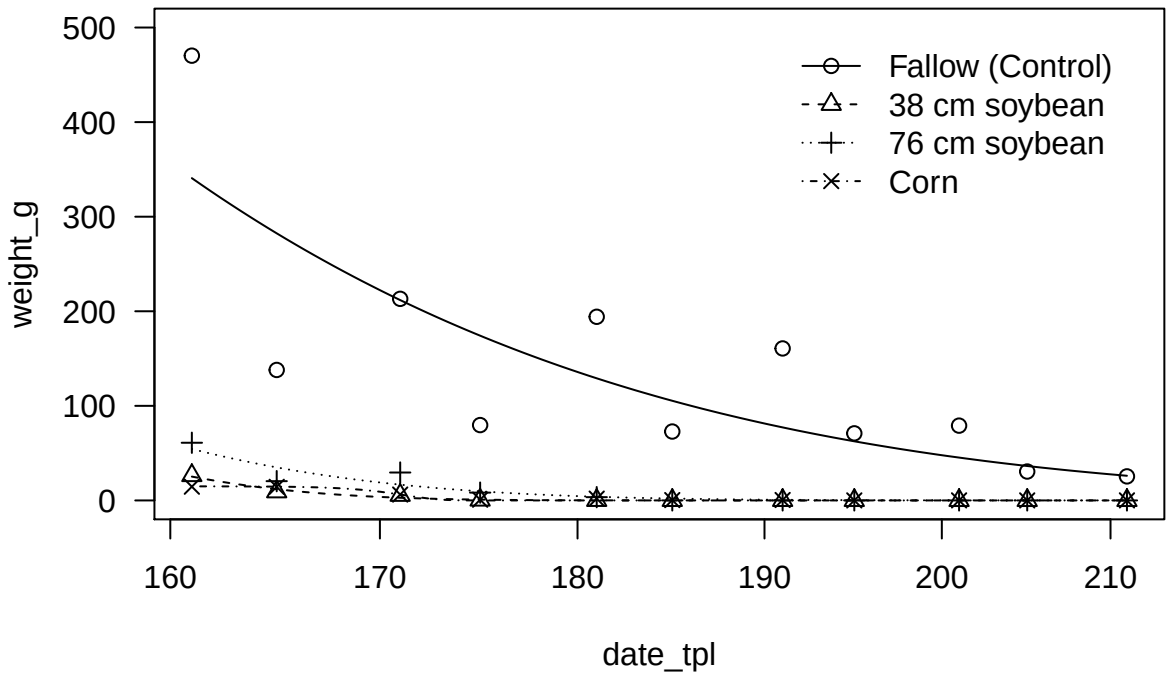
Fitting the 'drm' model for waterhemp weight.

```
reduk = drm(data=red, weight_g~date_tpl, crop, fct =W1.3(fixed = c(NA,NA,NA), names = c("slope", "upper
summary(reduk)
```

```
##
## Model fitted: Weibull (type 1) with lower limit at 0 (3 parms)
##
## Parameter estimates:
##
##                          Estimate Std. Error t-value   p-value
```

```
## slope:Fallow (Control) 1.6921e+00 3.2055e-01  5.2788 1.742e-07 ***
## slope:38 cm soybean    8.8446e+00 2.8591e+01  0.3093 0.7571527
## slope:76 cm soybean    4.5080e+00 9.0973e+00  0.4955 0.6203790
## slope:Corn             1.0065e+02         NA      NA        NA
## upper:Fallow (Control) 2.8558e+04 2.6370e+04  1.0830 0.2791958
## upper:38 cm soybean    5.6469e+02 5.8066e+03  0.0973 0.9225555
## upper:76 cm soybean    2.4074e+03 1.2414e+04  0.1939 0.8462950
## upper:Corn             1.4921e+01 6.7244e+00  2.2189 0.0268178 *
## ec50:Fallow (Control)  6.6820e+01 1.8797e+01  3.5549 0.0004039 ***
## ec50:38 cm soybean     1.4162e+02 1.0578e+02  1.3389 0.1810543
## ec50:76 cm soybean     1.1981e+02 1.0704e+02  1.1192 0.2634224
## ec50:Corn              1.7123e+02 6.5882e+00 25.9903 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
##  85.89645 (692 degrees of freedom)
```

```
plot(reduk, ylim=c(0,500))
```



Checking if the fitted model is the best for the loaded data (looking for the lowest IC value)

```
mselect(reduk, list(l3(), l4(), W2.3(), W1.3(), W1.4(), W2.4(), LL.3(), LL.5(), W1.3(), W1.4(), W2.4(),
nested = F,
sorted = c("IC", "Res var", "Lack of fit", "no"),
linreg = F, icfct = AIC)
```

```
## Error in optim(startVec, opfct, hessian = TRUE, method = optMethod, control = list(maxit = maxIt,  :
##   non-finite finite-difference value [14]
```

```
##          logLik       IC  Lack of fit  Res var
## W2.4  -4102.547 8239.094 6.509293e-09 6905.512
## W2.4  -4102.547 8239.094 6.509293e-09 6905.512
## W1.4  -4104.231 8242.462 2.001472e-09 6938.634
## W1.4  -4104.231 8242.462 2.001472e-09 6938.634
## LL.5  -4102.518 8247.036 5.030326e-10 6945.324
## baro5 -4103.434 8248.868 2.566351e-10 6963.423
## W2.3  -4124.158 8274.317 1.431075e-14 7300.325
## l3    -4124.458 8274.915 1.143682e-14 7306.535
## LL.3  -4124.458 8274.915 1.143682e-14 7306.535
## W1.3  -4127.893 8281.787 8.566884e-16 7378.200
## W1.3  -4127.893 8281.787 8.566884e-16 7378.200
## W1.3  -4127.893 8281.787 8.566884e-16 7378.200
## l4           NA       NA           NA       NA
```

Estimating ED90 values for height reduction. Also, comparing the slopes of corn, 15in and 30in soybean.

```
ED(reduk, c(50,90), type="absolute", interval = "delta", display = T, curveid=CURVE)
```

```
##
## Estimated effective doses
##
##                         Estimate Std. Error    Lower    Upper
## e:38 cm soybean:50    156.5333    70.1294  18.8413 294.2252
## e:38 cm soybean:90    151.6952    81.7132  -8.7403 312.1307
## e:76 cm soybean:50    161.7915    49.1663  65.2584 258.3245
## e:76 cm soybean:90    155.9926    58.1327  41.8549 270.1304
## e:Corn:50                   NA         NA       NA       NA
## e:Corn:90                   NA         NA       NA       NA
## e:Fallow (Control):50 199.1717    17.4841 164.8434 233.5000
## e:Fallow (Control):90 188.0565    18.1640 152.3933 223.7198
```

```
compParm(reduk, "slope", "-")
```

```
##
## Comparison of parameter 'slope'
```

```
##
##                                Estimate Std. Error t-value p-value
## Fallow (Control)-38 cm soybean  -7.1524    28.5975 -0.2501  0.8026
## Fallow (Control)-76 cm soybean  -2.8159     9.0995 -0.3095  0.7571
## Fallow (Control)-Corn          -98.9574         NA      NA      NA
## 38 cm soybean-76 cm soybean      4.3365    29.9440  0.1448  0.8849
## 38 cm soybean-Corn             -91.8050         NA      NA      NA
## 76 cm soybean-Corn             -96.1415         NA      NA      NA
```