

Cumulative Weed Emergence

SS

3/9/2020

```
#NLR model Janesville 2018 - giant ragweed emergence
model = drm(AMBTR ~ DOY, Trt, fct = 14(), data=data1)
summary(model)

##
## Model fitted: Log-logistic (ED50 as parameter) (4 parms)
##
## Parameter estimates:
##
##      Estimate Std. Error t-value  p-value
## b:NTC -19.290249    7.036661 -2.7414 0.1112871
## b:PRE -18.475289    5.649877 -3.2700 0.0821578 .
## c:NTC  -0.671510    0.742241 -0.9047 0.4611115
## c:PRE  -0.490950    0.406983 -1.2063 0.3510302
## d:NTC   1.006541    0.041083 24.5005 0.0016618 **
## d:PRE   1.015970    0.046265 21.9597 0.0020673 **
## e:NTC 147.883690    6.977631 21.1940 0.0022189 **
## e:PRE 150.576937    4.517573 33.3314 0.0008989 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.02020191 (2 degrees of freedom)

mselect(model, list(14(), W2.3(), W1.3(), W1.4(), W2.4()), sorted=c("IC",
"Res var", "Lack of fit", "no"), icfct = AIC)

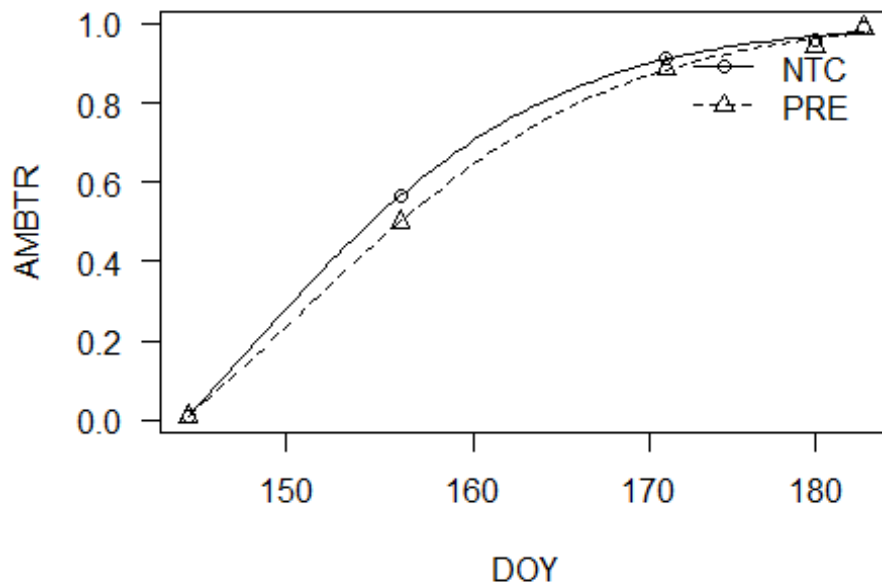
##      logLik      IC Lack of fit      Res var
## 14    32.87758 -47.75517      NA 0.0004081173
## 14    32.87758 -47.75517      NA 0.0004081173
## W1.4 32.63351 -47.26703      NA 0.0004285335
## W1.3 27.93987 -41.87973      NA 0.0005478223
## W2.3 21.39903 -28.79807      NA 0.0020266052
## W2.4 21.39861 -24.79723      NA 0.0040535513

model2 = drm(AMBTR ~ DOY, Trt, fct = 14(fixed=c(NA, NA, NA, NA), names =
c("b", "c", "d", "e")), data=data1)
summary(model2)

##
## Model fitted: Log-logistic (ED50 as parameter) (4 parms)
##
```

```
## Parameter estimates:
##
##      Estimate Std. Error t-value  p-value
## b:NTC -19.290249   7.036661 -2.7414 0.1112871
## b:PRE -18.475289   5.649877 -3.2700 0.0821578 .
## c:NTC  -0.671510   0.742241 -0.9047 0.4611115
## c:PRE  -0.490950   0.406983 -1.2063 0.3510302
## d:NTC   1.006541   0.041083 24.5005 0.0016618 **
## d:PRE   1.015970   0.046265 21.9597 0.0020673 **
## e:NTC 147.883690   6.977631 21.1940 0.0022189 **
## e:PRE 150.576937   4.517573 33.3314 0.0008989 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.02020191 (2 degrees of freedom)

plot(model2)
```



```
ED(model2, c(0.5,0.9), type="absolute", interval = "delta")
##
## Estimated effective doses
##
##      Estimate Std. Error  Lower  Upper
## e:NTC:0.5 154.4531     4.9054 133.3467 175.5596
```

```

## e:NTC:0.9 170.0241      1.7103 162.6652 177.3830
## e:PRE:0.5 155.9909      3.0964 142.6682 169.3137
## e:PRE:0.9 172.2499      2.5569 161.2483 183.2514

EDcomp(model2, c(0.5,0.5), type="absolute")

##
## Estimated ratios of effect doses
##
##           Estimate Std. Error  t-value  p-value
## NTC/PRE:0.5/0.5  0.990142    0.037084 -0.265837  0.815260

EDcomp(model2, c(0.9,0.9), type="absolute")

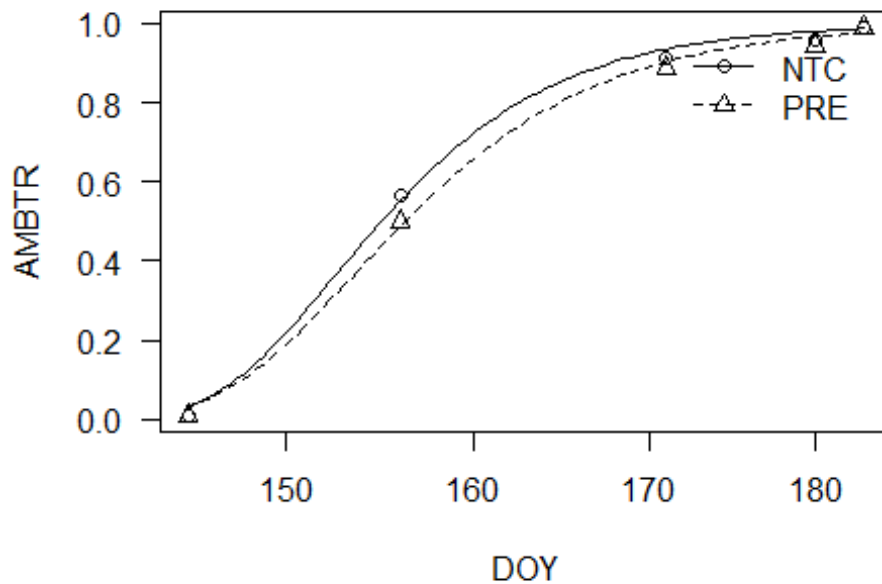
##
## Estimated ratios of effect doses
##
##           Estimate Std. Error  t-value  p-value
## NTC/PRE:0.9/0.9  0.98708     0.01770 -0.73005  0.54129

model2.2 = drm(AMBTR ~ DOY, Trt, fct = W1.3(fixed=c(NA, 1, NA), names =
c("b", "c", "d")), data=data1)
summary(model2.2)

##
## Model fitted: Weibull (type 1) with lower limit at 0 (2 parms)
##
## Parameter estimates:
##
##           Estimate Std. Error t-value  p-value
## b:NTC -23.88558      2.20350 -10.840 3.651e-05 ***
## b:PRE -21.38210      1.74872 -12.227 1.822e-05 ***
## d:NTC 152.64245      0.45847 332.938 4.953e-14 ***
## d:PRE 153.60171      0.46555 329.936 5.236e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
##  0.02377161 (6 degrees of freedom)

plot(model2.2)

```



```
ED(model2.2, c(0.5,0.9), type="absolute", interval = "delta")
```

```
##
```

```
## Estimated effective doses
```

```
##
```

	Estimate	Std. Error	Lower	Upper
e:NTC:0.5	155.00273	0.42730	153.95718	156.04829
e:NTC:0.9	167.72281	1.33684	164.45168	170.99394
e:PRE:0.5	156.25730	0.45243	155.15025	157.36436
e:PRE:0.9	170.64892	1.38927	167.24949	174.04834

```
EDcomp(model2.2, c(0.5,0.5), type="absolute")
```

```
##
```

```
## Estimated ratios of effect doses
```

```
##
```

	Estimate	Std. Error	t-value	p-value
NTC/PRE:0.5/0.5	0.9919711	0.0039658	-2.0245541	0.0893351

```
EDcomp(model2.2, c(0.9,0.9), type="absolute")
```

```
##
```

```
## Estimated ratios of effect doses
```

```
##
```

	Estimate	Std. Error	t-value	p-value
NTC/PRE:0.9/0.9	0.982853	0.011198	-1.531260	0.176586

#NLR model - Janesville 2019 giant ragweed emergence

```
model3 = drm(AMBTR ~ DOY, Trt, fct = 14(), data=data2)
```

```
summary(model3)
```

```
##
```

```
## Model fitted: Log-logistic (ED50 as parameter) (4 parms)
```

```
##
```

```
## Parameter estimates:
```

```
##
```

	Estimate	Std. Error	t-value	p-value	
## b:NTC	-15.993545	4.857884	-3.2923	0.0109845	*
## b:PRE	-18.404207	5.160372	-3.5664	0.0073315	**
## c:NTC	0.199059	0.047771	4.1670	0.0031350	**
## c:PRE	0.223602	0.040130	5.5720	0.0005272	***
## d:NTC	1.147502	0.155358	7.3862	7.721e-05	***
## d:PRE	1.158867	0.143535	8.0738	4.087e-05	***
## e:NTC	164.402112	3.731235	44.0610	7.769e-11	***
## e:PRE	166.656438	3.218147	51.7865	2.142e-11	***

```
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
```

```
## Residual standard error:
```

```
##
```

```
## 0.04161458 (8 degrees of freedom)
```

```
mselect(model3, list(14(), W2.3(), W1.3(), W1.4(), W2.4()), sorted=c("IC",  
"Res var", "Lack of fit", "no"), icfct = AIC)
```

	logLik	IC	Lack of fit	Res var
## W2.4	35.84423	-53.68846	NA	0.001326437
## 14	33.71104	-49.42207	NA	0.001731773
## 14	33.71104	-49.42207	NA	0.001731773
## W1.4	31.60129	-45.20257	NA	0.002254356
## W2.3	27.57019	-41.14039	NA	0.002985023
## W1.3	25.89972	-37.79944	NA	0.003678175

```
model4 = drm(AMBTR ~ DOY, Trt, fct = W2.4(fixed=c(NA, NA, 1, NA), names =  
c("b", "c", "d", "e")), data=data2)
```

```
summary(model4)
```

```
##
```

```
## Model fitted: Weibull (type 2) (3 parms)
```

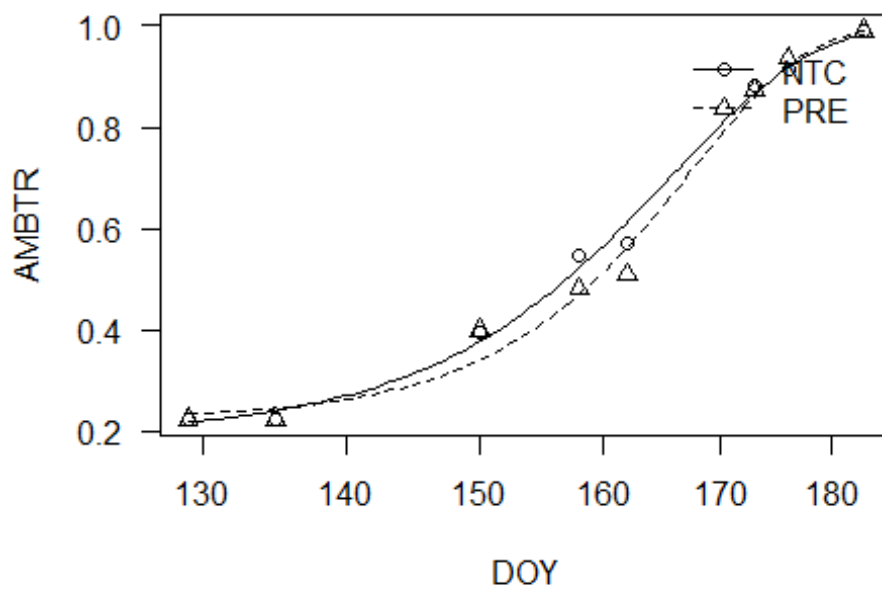
```
##
```

```
## Parameter estimates:
```

```
##
```

	Estimate	Std. Error	t-value	p-value	
## b:NTC	13.549612	1.667122	8.1275	1.025e-05	***
## b:PRE	16.511898	2.045424	8.0726	1.088e-05	***
## c:NTC	0.191288	0.034767	5.5021	0.000261	***
## c:PRE	0.223532	0.029150	7.6683	1.703e-05	***
## e:NTC	165.649634	1.050716	157.6540	< 2.2e-16	***

```
## e:PRE 167.447495    0.908471 184.3179 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.03320156 (10 degrees of freedom)
plot(model4)
```



```
ED(model4, c(0.5,0.9), type="absolute", interval = "delta")

##
## Estimated effective doses
##
##           Estimate Std. Error   Lower   Upper
## e:NTC:0.5 156.9354     1.7072 153.1314 160.7394
## e:NTC:0.9 174.9131     1.2482 172.1320 177.6942
## e:PRE:0.5 159.3287     1.4979 155.9913 162.6662
## e:PRE:0.9 174.8855     1.1063 172.4204 177.3506

EDcomp(model4, c(0.5,0.5), type="absolute")

##
## Estimated ratios of effect doses
##
##           Estimate Std. Error  t-value  p-value
## NTC/PRE:0.5/0.5  0.984979    0.014162 -1.060685 0.313779
```

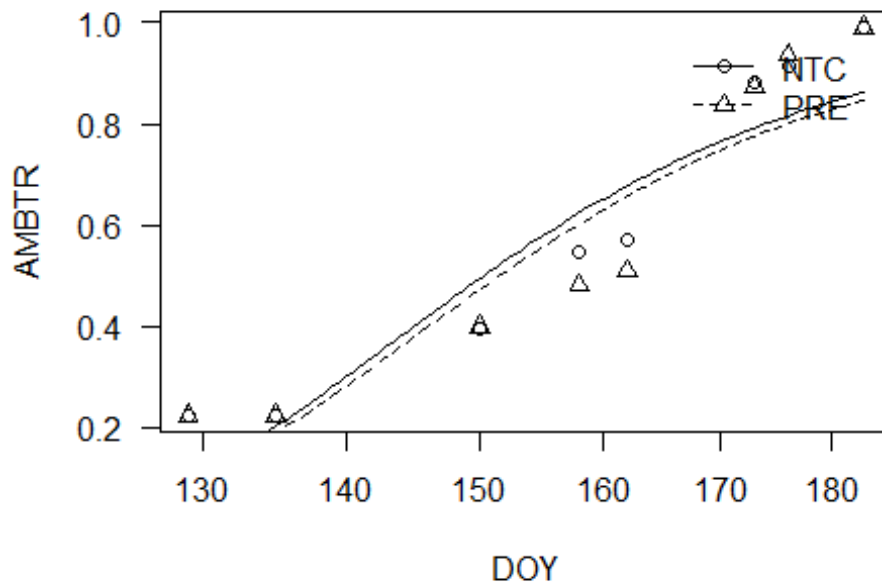
```
EDcomp(model4, c(0.9,0.9), type="absolute")

##
## Estimated ratios of effect doses
##
##           Estimate Std. Error   t-value   p-value
## NTC/PRE:0.9/0.9 1.0001577   0.0095378 0.0165330 0.9871344

model4.2 = drm(AMBTR ~ DOY, Trt, fct = W1.3(fixed=c(NA, 1, NA), names =
c("b", "c", "d")), data=data2)
summary(model4.2)

##
## Model fitted: Weibull (type 1) with lower limit at 0 (2 parms)
##
## Parameter estimates:
##
##           Estimate Std. Error t-value   p-value
## b:NTC    -7.7655      1.7834 -4.3542 0.0009379 ***
## b:PRE    -7.5950      1.7958 -4.2293 0.0011694 **
## d:NTC   143.4262      4.1299 34.7285 2.071e-13 ***
## d:PRE   144.4430      4.3059 33.5456 3.127e-13 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.1242691 (12 degrees of freedom)

plot(model4.2)
```



```
ED(model4.2, c(0.5,0.9), type="absolute", interval = "delta")
```

```
##
```

```
## Estimated effective doses
```

```
##
```

	Estimate	Std. Error	Lower	Upper
e:NTC:0.5	150.3579	3.6123	142.4874	158.2284
e:NTC:0.9	191.6389	10.4794	168.8062	214.4716
e:PRE:0.5	151.5843	3.7071	143.5073	159.6613
e:PRE:0.9	194.2567	11.0115	170.2648	218.2487

```
EDcomp(model4.2, c(0.5,0.5), type="absolute")
```

```
##
```

```
## Estimated ratios of effect doses
```

```
##
```

	Estimate	Std. Error	t-value	p-value
NTC/PRE:0.5/0.5	0.991910	0.034005	-0.237920	0.815957

```
EDcomp(model4.2, c(0.9,0.9), type="absolute")
```

```
##
```

```
## Estimated ratios of effect doses
```

```
##
```

	Estimate	Std. Error	t-value	p-value
NTC/PRE:0.9/0.9	0.986524	0.077701	-0.173439	0.865198

#NLR model - Brooklyn 2019 waterhemp emergence

```
model5 = drm(AMATU ~ DOY, Trt, fct = 14(), data=data3)
```

```
summary(model5)
```

```
##
```

```
## Model fitted: Log-logistic (ED50 as parameter) (4 parms)
```

```
##
```

```
## Parameter estimates:
```

```
##
```

	Estimate	Std. Error	t-value	p-value	
## b:NTC	-19.316531	6.353347	-3.0404	0.0383883	*
## b:PRE	-38.150586	16.241311	-2.3490	0.0786025	.
## c:NTC	-0.022774	0.071132	-0.3202	0.7648734	
## c:PRE	-0.023459	0.068656	-0.3417	0.7497775	
## d:NTC	1.131978	0.227961	4.9657	0.0076751	**
## d:PRE	0.938682	0.080970	11.5930	0.0003163	***
## e:NTC	172.707019	4.690707	36.8190	3.249e-06	***
## e:PRE	163.902521	1.807965	90.6558	8.876e-08	***

```
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
```

```
## Residual standard error:
```

```
##
```

```
## 0.07873407 (4 degrees of freedom)
```

```
mselect(model5, list(14(), W2.3(), W1.3(), W1.4(), W2.4()), sorted=c("IC",  
"Res var", "Lack of fit", "no"), icfct = AIC)
```

	logLik	IC	Lack of fit	Res var
## W1.3	24.19331	-34.38662	NA	0.002076756
## W1.4	24.31815	-30.63631	NA	0.003050986
## 14	20.06456	-22.12913	NA	0.006199054
## 14	20.06456	-22.12913	NA	0.006199054
## W2.3	17.75750	-21.51501	NA	0.006070502
## W2.4	17.91197	-17.82394	NA	0.008874323

```
model6 = drm(AMATU ~ DOY, Trt, fct = W1.3(fixed=c(NA, 1, NA), names = c("b",  
"c", "d")), data=data3)
```

```
summary(model6)
```

```
##
```

```
## Model fitted: Weibull (type 1) with lower limit at 0 (2 parms)
```

```
##
```

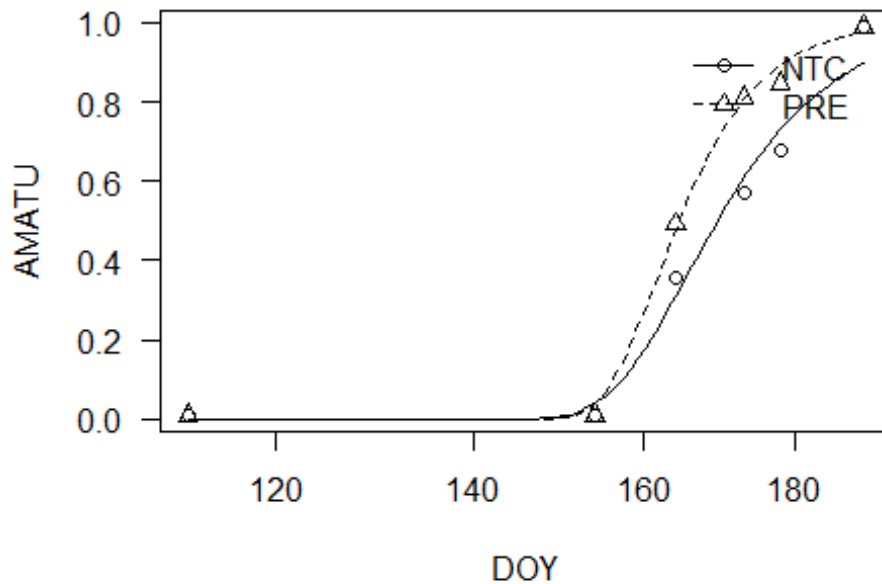
```
## Parameter estimates:
```

```
##
```

	Estimate	Std. Error	t-value	p-value	
## b:NTC	-16.07886	1.85275	-8.6784	2.420e-05	***
## b:PRE	-23.09099	3.18004	-7.2612	8.710e-05	***
## d:NTC	165.68115	1.02775	161.2072	2.448e-15	***
## d:PRE	161.95390	0.88565	182.8647	8.916e-16	***

```
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.05046729 (8 degrees of freedom)
plot(model6)
```



```
ED(model6, c(0.5,0.9), type="absolute", interval = "delta")

##
## Estimated effective doses
##
##           Estimate Std. Error   Lower   Upper
## e:NTC:0.5 169.50118    0.96947 167.26559 171.73677
## e:NTC:0.9 190.57071    2.83176 184.04067 197.10075
## e:PRE:0.5 164.54503    0.82122 162.65128 166.43877
## e:PRE:0.9 178.53206    2.18677 173.48937 183.57476

EDcomp(model6, c(0.5,0.5), type="absolute")

##
## Estimated ratios of effect doses
##
##           Estimate Std. Error  t-value  p-value
## NTC/PRE:0.5/0.5 1.0301203   0.0078195 3.8519301 0.0048642

EDcomp(model6, c(0.9,0.9), type="absolute")
```

```
##
## Estimated ratios of effect doses
##
##           Estimate Std. Error  t-value  p-value
## NTC/PRE:0.9/0.9 1.067431    0.020555 3.280463 0.011180

#NLR model - Arlington 2018 common ragweed emergence
model7 = drm(AMBEL ~ DOY, fct = 14(), data=data4)
summary(model7)

##
## Model fitted: Log-logistic (ED50 as parameter) (4 parms)
##
## Parameter estimates:
##
##           Estimate Std. Error  t-value  p-value
## b:(Intercept) -6.7563e+01  3.0634e+00  -22.0550 5.679e-07 ***
## c:(Intercept)  4.2633e-03  1.7243e-03   2.4725  0.0483 *
## d:(Intercept)  9.9074e-01  4.6577e-04 2127.0837 < 2.2e-16 ***
## e:(Intercept)  1.5535e+02  7.9104e-02 1963.8227 < 2.2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.001032567 (6 degrees of freedom)

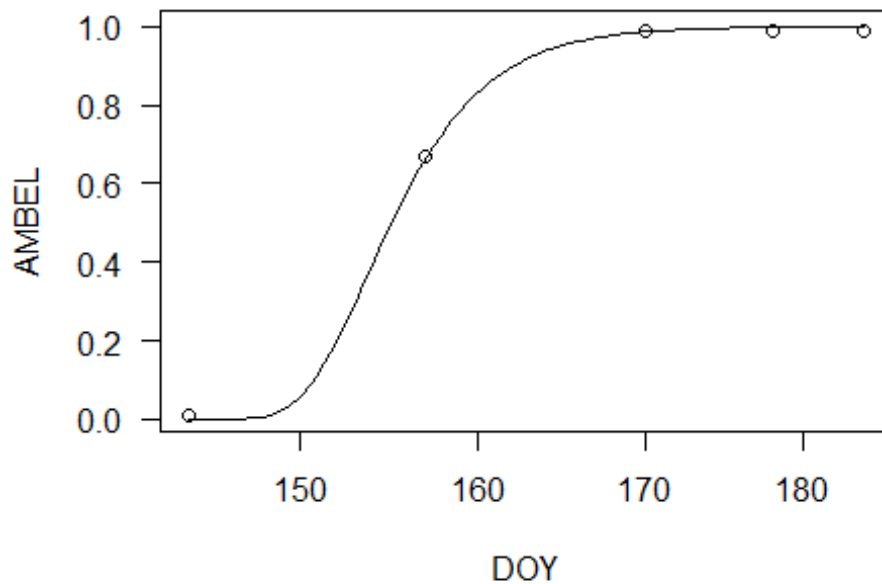
mselect(model7, list(14(), W2.3(), W1.3(), W1.4(), W2.4()), sorted=c("IC",
"Res var", "Lack of fit", "no"), icfct = AIC)

##           logLik           IC Lack of fit           Res var
## W2.3 89.04501 -170.09001 4.687315e-58 1.541973e-09
## W2.4 84.12944 -158.25888 1.362702e-59 4.808219e-09
## 14 57.12182 -104.24364 1.861104e-65 1.066194e-06
## 14 57.12182 -104.24364 1.861104e-65 1.066194e-06
## W1.4 50.01406 -90.02812 5.325258e-67 4.417823e-06
## W1.3 39.19857 -70.39714 7.029229e-69 3.293694e-05

model8 = drm(AMBEL ~ DOY, fct = W1.3(fixed=c(NA, 1, NA), names = c("b", "c",
"d")), data=data4)
summary(model8)

##
## Model fitted: Weibull (type 1) with lower limit at 0 (2 parms)
##
## Parameter estimates:
##
##           Estimate Std. Error  t-value  p-value
## b:(Intercept) -42.68744    5.36501  -7.9566 4.541e-05 ***
## d:(Intercept) 153.71335    0.41978 366.1731 < 2.2e-16 ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.00819572 (8 degrees of freedom)
plot(model8)
```



```
ED(model8, c(0.5,0.9), type="absolute", interval = "delta")

##
## Estimated effective doses
##
##           Estimate Std. Error   Lower   Upper
## e:1:0.5 155.03881    0.26077 154.43748 155.64014
## e:1:0.9 162.03410    0.64375 160.54962 163.51859

#NLR model - Arlington 2019 common ragweed emergence
model9 = drm(AMBEL ~ DOY, Trt, fct = 14(), data=data5)
summary(model9)

##
## Model fitted: Log-logistic (ED50 as parameter) (4 parms)
##
## Parameter estimates:
##
##           Estimate Std. Error t-value p-value
## b:NTC -6.5591e+01  9.8290e+00 -6.6732 0.000157 ***
```

```

## b:PRE -1.3773e+02  2.5906e+02  -0.5316  0.609410
## c:NTC  1.0481e-01  9.0983e-03  11.5199  2.925e-06 ***
## c:PRE  1.0499e-01  1.0929e-02   9.6066  1.144e-05 ***
## d:NTC  9.7997e-01  6.5669e-03 149.2275  4.495e-15 ***
## d:PRE  9.9007e-01  5.4800e-03 180.6689  9.370e-16 ***
## e:NTC  1.4762e+02  1.5720e-01 939.0402 < 2.2e-16 ***
## e:PRE  1.4013e+02  1.3863e+01 10.1084  7.831e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.012814 (8 degrees of freedom)

mselect(model9, list(l4(), W2.3(), W1.3(), W1.4(), W2.4()), sorted=c("IC",
"Res var", "Lack of fit", "no"), icfct = AIC)

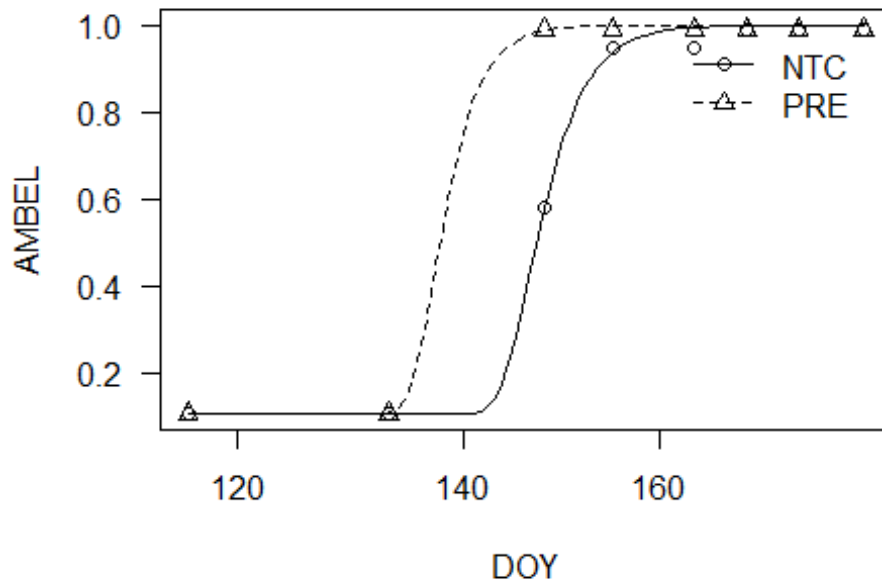
##          logLik          IC Lack of fit      Res var
## W1.4 52.67501 -87.35003          NA 0.0001618070
## l4 52.55764 -87.11527          NA 0.0001641985
## l4 52.55764 -87.11527          NA 0.0001641985
## W2.4 50.80963 -83.61926          NA 0.0002042975
## W2.3 29.07087 -44.14175          NA 0.0024744608
## W1.3 26.39999 -38.79997          NA 0.0034552110

model10 = drm(AMBEL ~ DOY, Trt, fct = W1.4(fixed=c(NA, NA, 1, NA), names =
c("b", "c", "d", "e")), data=data5)
summary(model10)

##
## Model fitted: Weibull (type 1) (3 parms)
##
## Parameter estimates:
##
##          Estimate Std. Error  t-value  p-value
## b:NTC -47.469847   7.292808  -6.5091 6.816e-05 ***
## b:PRE -58.292282  24.208073  -2.4080  0.03681 *
## c:NTC  0.105174   0.012597   8.3493 8.083e-06 ***
## c:PRE  0.104523   0.015579   6.7095 5.302e-05 ***
## e:NTC 146.585344   0.318086 460.8358 < 2.2e-16 ***
## e:PRE 137.311931   3.363746  40.8211 1.863e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.01781497 (10 degrees of freedom)

plot(model10)

```



```
ED(model10, c(0.5,0.9), type="absolute", interval = "delta")
```

```
##
## Estimated effective doses
##
##           Estimate Std. Error   Lower   Upper
## e:NTC:0.5 147.20631    0.24912 146.65123 147.76140
## e:NTC:0.9 153.32153    0.81512 151.50533 155.13773
## e:PRE:0.5 137.78809    3.27332 130.49468 145.08151
## e:PRE:0.9 142.43081    2.95796 135.84006 149.02155
```

```
EDcomp(model10, c(0.5,0.5), type="absolute")
```

```
##
## Estimated ratios of effect doses
##
##           Estimate Std. Error t-value p-value
## NTC/PRE:0.5/0.5 1.068353    0.025444 2.686372 0.022842
```

```
EDcomp(model10, c(0.9,0.9), type="absolute")
```

```
##
## Estimated ratios of effect doses
##
##           Estimate Std. Error t-value p-value
## NTC/PRE:0.9/0.9 1.0764632    0.0230766 3.3134587 0.0078335
```

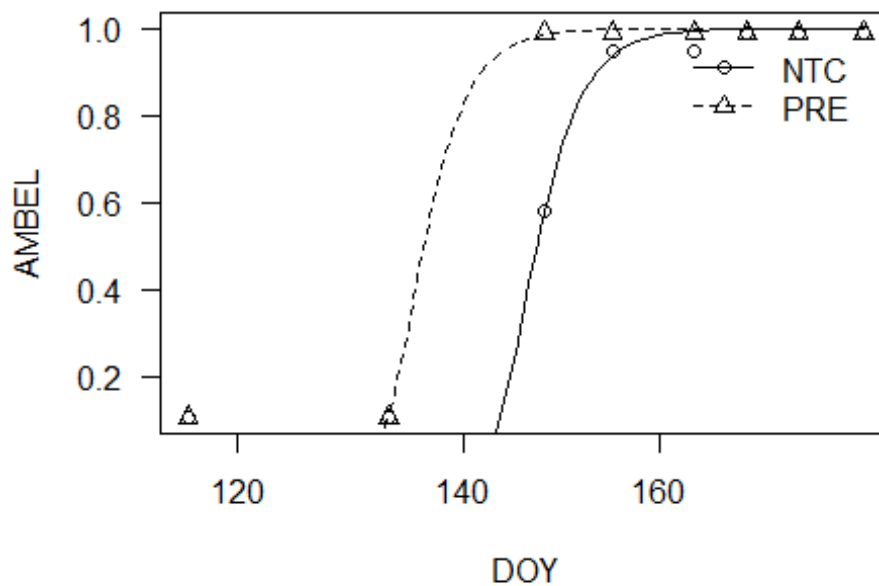
```

model10.2 = drm(AMBEL ~ DOY, Trt, fct = W1.3(fixed=c(NA, 1, NA), names =
c("b", "c", "d")), data=data5)
summary(model10.2)

##
## Model fitted: Weibull (type 1) with lower limit at 0 (2 parms)
##
## Parameter estimates:
##
##      Estimate Std. Error  t-value p-value
## b:NTC -46.3012    21.9924  -2.1053   0.057 .
## b:PRE -48.0955    37.7702  -1.2734   0.227
## d:NTC 146.0700     1.1576 126.1857 <2e-16 ***
## d:PRE 135.2649     1.8701  72.3315 <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.05506811 (12 degrees of freedom)

plot(model10.2)

```



```

ED(model10.2, c(0.5,0.9), type="absolute", interval = "delta")

##
## Estimated effective doses

```

```
##
##           Estimate Std. Error      Lower      Upper
## e:NTC:0.5 147.23086    0.72466 145.65197 148.80976
## e:NTC:0.9 153.34477    2.52942 147.83364 158.85590
## e:PRE:0.5 136.29967    2.66400 130.49532 142.10402
## e:PRE:0.9 141.74433    7.07781 126.32311 157.16554

EDcomp(model10.2, c(0.5,0.5), type="absolute")

##
## Estimated ratios of effect doses
##
##           Estimate Std. Error  t-value  p-value
## NTC/PRE:0.5/0.5 1.0801997  0.0217718 3.6836531 0.0031279

EDcomp(model10.2, c(0.9,0.9), type="absolute")

##
## Estimated ratios of effect doses
##
##           Estimate Std. Error  t-value  p-value
## NTC/PRE:0.9/0.9 1.081841   0.056891 1.438542 0.175847

#NLR model - Lancaster 2018 common LQ emergence
model11 = drm(CHEAL ~ DOY, Trt, fct = 14(), data=data6)
summary(model11)

##
## Model fitted: Log-logistic (ED50 as parameter) (4 parms)
##
## Parameter estimates:
##
##           Estimate Std. Error t-value  p-value
## b:NTC -1.7936e+01  2.8997e+00 -6.1855 0.0251543 *
## b:PRE -3.5270e+02  6.5081e+03 -0.0542 0.9617074
## c:NTC -6.3584e-01  3.0544e-01 -2.0817 0.1728223
## c:PRE  8.3206e-03  2.3870e-02  0.3486 0.7606779
## d:NTC  1.0140e+00  2.7138e-02 37.3634 0.0007156 ***
## d:PRE  9.9000e-01  1.0856e-02 91.1909 0.0001202 ***
## e:NTC  1.4747e+02  3.1256e+00 47.1815 0.0004489 ***
## e:PRE  1.5785e+02  4.3958e+01  3.5909 0.0695570 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.01880371 (2 degrees of freedom)

mselect(model11, list(14(), W2.3(), W1.3(), W1.4(), W2.4()), sorted=c("IC",
"Res var", "Lack of fit", "no"), icfct = AIC)

## Warning in sqrt(diag(varMat)): NaNs produced
```



```

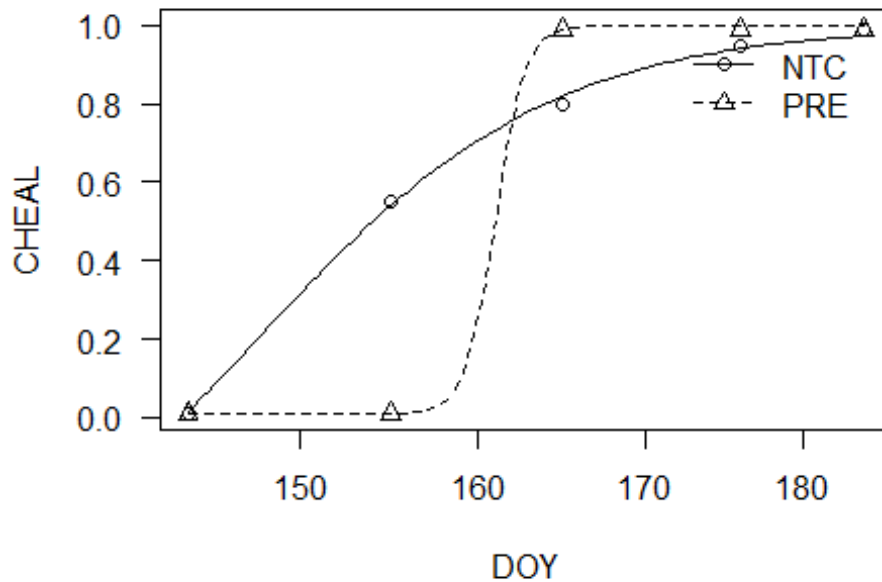
##          logLik          IC Lack of fit          Res var
## 14      33.59482 -49.18963              NA 0.0003535795
## 14      33.59482 -49.18963              NA 0.0003535795
## W1.4  29.34242 -40.68485              NA 0.0008276471
## W1.3  25.32555 -36.65109              NA 0.0009240952
## W2.3  16.83994 -19.67987              NA 0.0050439109
## W2.4  16.86654 -15.73308              NA 0.0100342922

model12 = drm(CHEAL ~ DOY, Trt, fct = 14(fixed=c(NA, NA, 1, NA), names =
c("b", "c", "d", "e")), data=data6)
summary(model12)

##
## Model fitted: Log-logistic (ED50 as parameter) (3 parms)
##
## Parameter estimates:
##
##          Estimate Std. Error t-value p-value
## b:NTC -1.8478e+01  1.6822e+00 -10.9844 0.0003903 ***
## b:PRE -1.8651e+02  3.0073e+02  -0.6202 0.5687113
## c:NTC -6.3550e-01  2.2816e-01  -2.7853 0.0495506 *
## c:PRE  9.3992e-03  1.3959e-02   0.6734 0.5376261
## e:NTC  1.4732e+02  2.4329e+00  60.5557 4.454e-07 ***
## e:PRE  1.6100e+02  6.2453e+00  25.7787 1.345e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
##  0.01642074 (4 degrees of freedom)

plot(model12)

```



```
ED(model12, c(0.5,0.9), type="absolute", interval = "delta")
```

```
##
## Estimated effective doses
##
##           Estimate Std. Error   Lower   Upper
## e:NTC:0.5 154.0106     1.9694 148.5427 159.4786
## e:NTC:0.9 170.7930     1.0222 167.9549 173.6312
## e:PRE:0.5 160.9788     6.2704 143.5694 178.3882
## e:PRE:0.9 162.8938     3.3862 153.4923 172.2954
```

```
EDcomp(model12, c(0.5,0.5), type="absolute")
```

```
##
## Estimated ratios of effect doses
##
##           Estimate Std. Error  t-value  p-value
## NTC/PRE:0.5/0.5  0.956714   0.039222 -1.103606 0.331689
```

```
EDcomp(model12, c(0.9,0.9), type="absolute")
```

```
##
## Estimated ratios of effect doses
##
##           Estimate Std. Error  t-value  p-value
## NTC/PRE:0.9/0.9  1.048493   0.022681  2.138032 0.099307
```

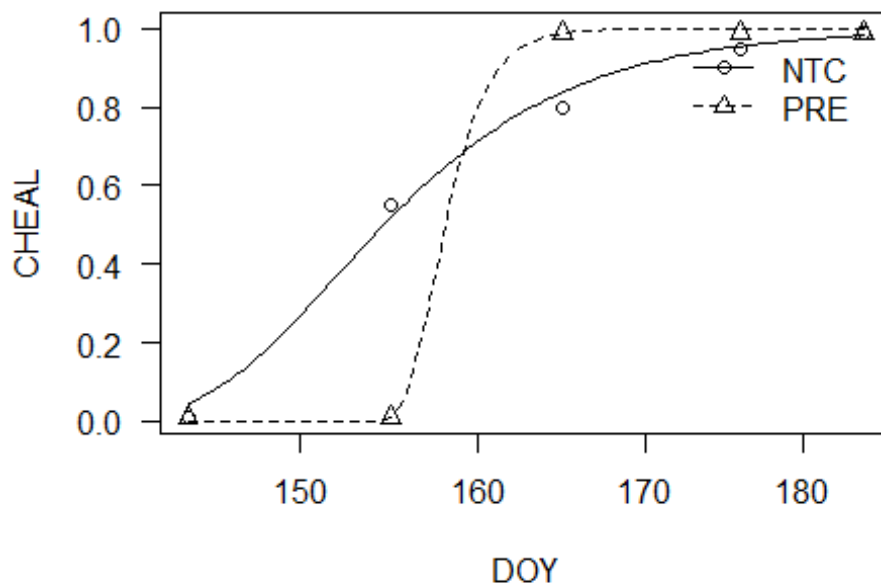
```

model12.2 = drm(CHEAL ~ DOY, Trt, fct = W1.3(fixed=c(NA, 1, NA), names =
c("b", "c", "d")), data=data6)
summary(model12.2)

##
## Model fitted: Weibull (type 1) with lower limit at 0 (2 parms)
##
## Parameter estimates:
##
##      Estimate Std. Error  t-value   p-value
## b:NTC -21.05624    1.61138 -13.0672 1.238e-05 ***
## b:PRE -95.69861   35.75745  -2.6763  0.03672  *
## d:NTC 151.93863    0.49141 309.1869 7.726e-14 ***
## d:PRE 157.48216    1.07782 146.1111 6.932e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.0261935 (6 degrees of freedom)

plot(model12.2)

```



```

ED(model12.2, c(0.5,0.9), type="absolute", interval = "delta")

##
## Estimated effective doses

```

```
##
##           Estimate Std. Error      Lower      Upper
## e:NTC:0.5 154.60648    0.46896 153.45898 155.75399
## e:NTC:0.9 169.07643    1.29565 165.90610 172.24676
## e:PRE:0.5 158.08645    1.23716 155.05923 161.11366
## e:PRE:0.9 161.22926    2.27952 155.65146 166.80705

EDcomp(model12.2, c(0.5,0.5), type="absolute")

##
## Estimated ratios of effect doses
##
##           Estimate Std. Error    t-value    p-value
## NTC/PRE:0.5/0.5  0.9779869  0.0082083 -2.6817882  0.0364492

EDcomp(model12.2, c(0.9,0.9), type="absolute")

##
## Estimated ratios of effect doses
##
##           Estimate Std. Error    t-value    p-value
## NTC/PRE:0.9/0.9  1.048671   0.016864  2.886034  0.027837

#NLR model - Lancaster 2019 common LQ emergence
model13 = drm(CHEAL ~ DOY, fct = 14(), data=data7)
summary(model13)

##
## Model fitted: Log-logistic (ED50 as parameter) (4 parms)
##
## Parameter estimates:
##
##           Estimate Std. Error    t-value    p-value
## b:(Intercept) -31.1798704    3.3225145  -9.3844  0.0111651 *
## c:(Intercept)   0.0077613    0.0179327   0.4328  0.7073588
## d:(Intercept)   1.0212029    0.0221653  46.0722  0.0004708 ***
## e:(Intercept) 166.0388978    0.6275858 264.5676 1.429e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
##  0.02329576 (2 degrees of freedom)

mselect(model13, list(14(), W2.3(), W1.3(), W1.4(), W2.4()), sorted=c("IC",
"Res var", "Lack of fit", "no"), icfct = AIC)

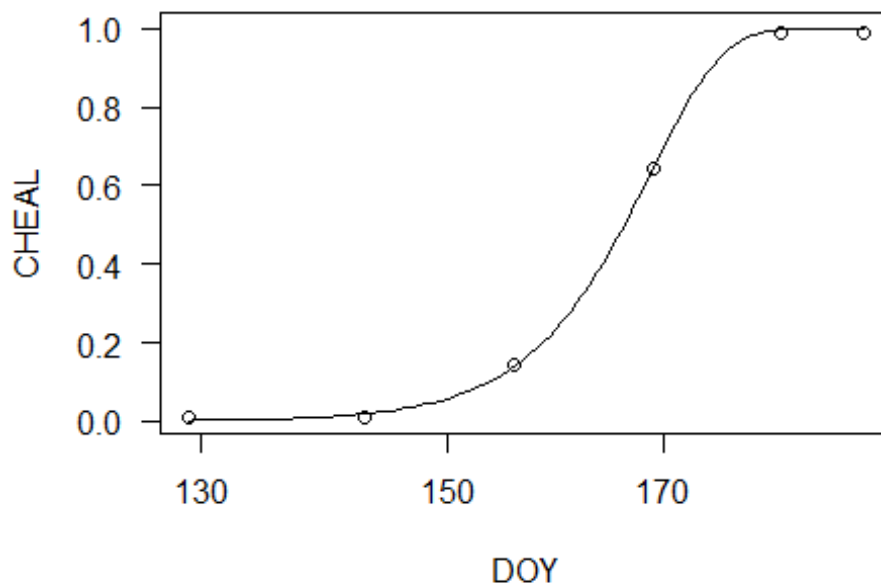
##           logLik      IC Lack of fit      Res var
## W2.3 23.24639 -38.49278      NA 5.050057e-05
## W2.4 23.23651 -36.47302      NA 7.600073e-05
## 14    17.33911 -24.67822      NA 5.426923e-04
## 14    17.33911 -24.67822      NA 5.426923e-04
```

```
## W1.3 13.97931 -19.95862      NA 1.108774e-03
## W1.4 14.25161 -18.50321      NA 1.518852e-03

model14 = drm(CHEAL ~ DOY, fct = W2.3(fixed=c(NA, 1, NA), names = c("b", "c",
"d")), data=data7)
summary(model14)

##
## Model fitted: Weibull (type 2) with lower limit at 0 (2 parms)
##
## Parameter estimates:
##
##              Estimate Std. Error  t-value  p-value
## b:(Intercept)  23.86483    0.85410   27.942 9.760e-06 ***
## d:(Intercept) 168.79695    0.16741 1008.279 5.805e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.008799998 (4 degrees of freedom)

plot(model14)
```



```
ED(model14, c(0.5,0.9), type="absolute", interval = "delta")

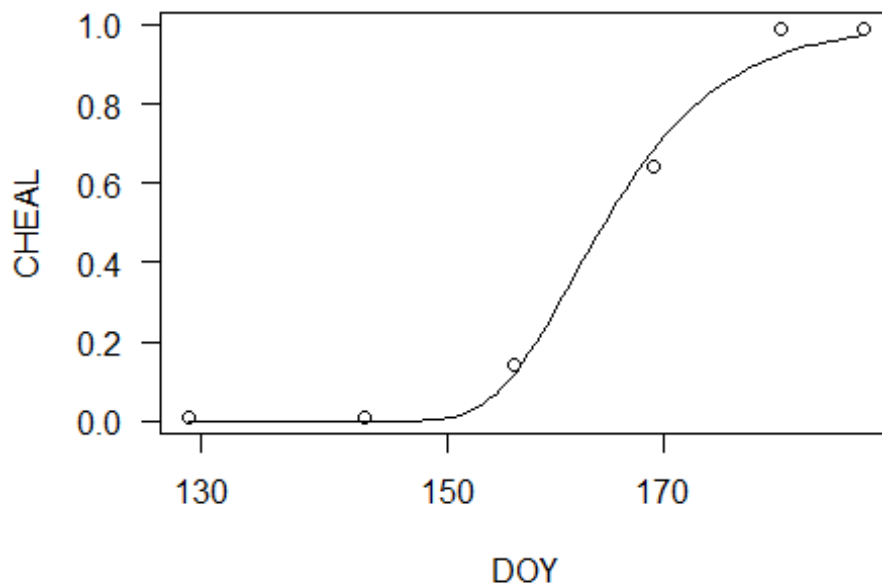
##
## Estimated effective doses
```

```
##
##           Estimate Std. Error      Lower      Upper
## e:1:0.5 166.22439    0.16240 165.77349 166.67530
## e:1:0.9 174.80039    0.31762 173.91852 175.68226

model14.2 = drm(CHEAL ~ DOY, fct = W1.3(fixed=c(NA, 1, NA), names = c("b",
"b", "d")), data=data7)
summary(model14.2)

##
## Model fitted: Weibull (type 1) with lower limit at 0 (2 parms)
##
## Parameter estimates:
##
##           Estimate Std. Error  t-value  p-value
## b:(Intercept) -21.29583    2.24047  -9.5051 0.0006838 ***
## d:(Intercept) 161.52116    0.89833 179.8018 5.74e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error:
##
## 0.04134213 (4 degrees of freedom)

plot(model14.2)
```



```
ED(model14.2, c(0.5,0.9), type="absolute", interval = "delta")
```

```
##
## Estimated effective doses
##
##      Estimate Std. Error   Lower   Upper
## e:1:0.5 164.32508    0.87552 161.89424 166.75592
## e:1:0.9 179.52381    1.95651 174.09167 184.95595
```