visualization-uhuru-day2

Davinder Singh

2023-02-28

```
getwd()
```

```
## [1] "/Users/davindersingh/Downloads/datasceince2023/documents"
```

```
read.csv(file = "../data-raw/ACACIA_DREPANOLOBIUM_SURVEY.txt", sep = "\t")
```

```
##     SURVEY YEAR  SITE BLOCK TREATMENT    PLOT   ID HEIGHT AXIS1 AXIS2 CIRC
## 1        1 2012 SOUTH     1     TOTAL S1TOTAL  581   2.25  2.75  2.15 20.0
## 2        1 2012 SOUTH     1     TOTAL S1TOTAL  582   2.65  4.10  3.90 28.0
## 3        1 2012 SOUTH     1     TOTAL S1TOTAL 3111    1.5  1.70  0.85 17.0
## 4        1 2012 SOUTH     1     TOTAL S1TOTAL 3112   2.01  1.80  1.60 12.0
## 5        1 2012 SOUTH     1     TOTAL S1TOTAL 3113   1.75  1.84  1.42 13.0
## 6        1 2012 SOUTH     1     TOTAL S1TOTAL 3114   1.65  1.62  0.85 15.0
## 7        1 2012 SOUTH     1     TOTAL S1TOTAL 3115    1.2  1.95  0.90  9.0
## 8        1 2012 SOUTH     1     TOTAL S1TOTAL 3199   1.45  2.00  1.75 12.2
## 9        1 2012 SOUTH     1      MESO  S1MESO  941   1.87  2.15  1.82 13.0
## 10       1 2012 SOUTH     1      MESO  S1MESO  942   2.38  5.55  4.82 35.0
## 11       1 2012 SOUTH     1      MESO  S1MESO  943   2.58  4.90  4.24 24.0
## 12       1 2012 SOUTH     1      MESO  S1MESO  944   2.65  3.75  3.10 27.0
## 13       1 2012 SOUTH     1      MESO  S1MESO  946   2.35  2.34  2.05 20.0
## 14       1 2012 SOUTH     1      MESO  S1MESO  947   1.88  2.10  1.85 28.0
## 15       1 2012 SOUTH     1      MESO  S1MESO 3116   2.32  3.05  2.63 30.0
## 16       1 2012 SOUTH     1      MESO  S1MESO 3117   2.39  2.21  2.10 13.0
## 17       1 2012 SOUTH     1      MESO  S1MESO 3118    2.2  1.80  1.50 10.0
## 18       1 2012 SOUTH     1      MESO  S1MESO 3119   1.05  0.90  0.55  8.0
## 19       1 2012 SOUTH     1      MESO  S1MESO 3120      2  1.25  1.20 10.0
## 20       1 2012 SOUTH     1      MESO  S1MESO 3131   1.28  1.14  1.00 10.0
## 21       1 2012 SOUTH     2      OPEN  S2OPEN  341   dead    NA    NA   NA
## 22       1 2012 SOUTH     2     TOTAL S2TOTAL 3178    1.4  2.50  2.15 18.0
## 23       1 2012 SOUTH     2     TOTAL S2TOTAL  101    1.9  3.31  2.65 15.0
## 24       1 2012 SOUTH     2     TOTAL S2TOTAL  102   1.75  2.70  2.55 16.0
## 25       1 2012 SOUTH     2     TOTAL S2TOTAL  103    1.8  2.75  2.30 16.0
## 26       1 2012 SOUTH     2     TOTAL S2TOTAL  104    2.7  4.05  4.00 35.2
## 27       1 2012 SOUTH     2     TOTAL S2TOTAL  105   2.02  2.85  1.49 17.0
## 28       1 2012 SOUTH     2     TOTAL S2TOTAL  108    1.9  3.10  2.85 19.0
## 29       1 2012 SOUTH     2     TOTAL S2TOTAL  109   1.85  2.45  1.90 19.0
## 30       1 2012 SOUTH     2     TOTAL S2TOTAL  110   1.65  1.90  1.54 17.0
## 31       1 2012 SOUTH     2     TOTAL S2TOTAL  111    1.4  2.35  1.45 14.0
## 32       1 2012 SOUTH     2     TOTAL S2TOTAL  113    2.5  3.25  2.30 22.0
## 33       1 2012 SOUTH     2     TOTAL S2TOTAL  115   2.05  5.40  4.50 33.0
## 34       1 2012 SOUTH     2     TOTAL S2TOTAL  116   2.26  3.50  3.10 33.0
```

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## 35       1 2012 SOUTH     2     TOTAL S2TOTAL  117   2.13  2.40  2.30 20.0
## 36       1 2012 SOUTH     2     TOTAL S2TOTAL  118    1.8  3.15  2.55 22.0
## 37       1 2012 SOUTH     2     TOTAL S2TOTAL 1211   1.85  2.00  2.27 20.0
## 38       1 2012 SOUTH     2     TOTAL S2TOTAL 1212    1.5  2.15  1.80 15.0
## 39       1 2012 SOUTH     2     TOTAL S2TOTAL 1213   1.87  2.34  2.05 13.0
## 40       1 2012 SOUTH     2     TOTAL S2TOTAL 1214   1.58  1.28  0.75 11.0
## 41       1 2012 SOUTH     2     TOTAL S2TOTAL 1215   2.05  2.10  1.75 17.0
## 42       1 2012 SOUTH     2     TOTAL S2TOTAL 1216   1.75  2.45  3.28 16.0
## 43       1 2012 SOUTH     2     TOTAL S2TOTAL 1217   1.49  1.50  1.45 13.0
## 44       1 2012 SOUTH     2     TOTAL S2TOTAL 1218   1.28  2.00  0.90 10.0
## 45       1 2012 SOUTH     2     TOTAL S2TOTAL 1219   1.49  2.35  1.65 13.0
## 46       1 2012 SOUTH     2     TOTAL S2TOTAL 1220   1.07  1.20  0.95 11.0
## 47       1 2012 SOUTH     2     TOTAL S2TOTAL 1231   1.48  1.25  1.20  9.0
## 48       1 2012 SOUTH     2     TOTAL S2TOTAL 1232   1.25  1.25  0.90 10.0
## 49       1 2012 SOUTH     2     TOTAL S2TOTAL 1233   1.41  1.41  1.40 14.0
## 50       1 2012 SOUTH     2     TOTAL S2TOTAL 1234    1.6  1.60  1.30 13.0
## 51       1 2012 SOUTH     2     TOTAL S2TOTAL 1235    1.2  1.20  1.30 14.0
## 52       1 2012 SOUTH     2     TOTAL S2TOTAL 1236   1.49  1.49  1.20  8.0
## 53       1 2012 SOUTH     2     TOTAL S2TOTAL 1237    1.5  1.50  1.50 14.0
## 54       1 2012 SOUTH     2     TOTAL S2TOTAL 1238   1.65  1.65  2.00 20.0
## 55       1 2012 SOUTH     2     TOTAL S2TOTAL 1239   1.13  1.13  1.20 10.0
## 56       1 2012 SOUTH     2     TOTAL S2TOTAL 1240   1.25  1.25  0.90 10.0
## 57       1 2012 SOUTH     2     TOTAL S2TOTAL 1251    1.1  1.20  1.10 10.0
## 58       1 2012 SOUTH     2     TOTAL S2TOTAL 1252    2.2  2.70  2.40 25.0
## 59       1 2012 SOUTH     2     TOTAL S2TOTAL 1253   1.45  1.65  1.25 10.0
## 60       1 2012 SOUTH     2     TOTAL S2TOTAL 1254    1.6  2.45  2.10 13.0
## 61       1 2012 SOUTH     2     TOTAL S2TOTAL 1255   1.55  2.40  1.80 13.0
## 62       1 2012 SOUTH     2     TOTAL S2TOTAL 1256    1.5  2.40  2.15 13.0
## 63       1 2012 SOUTH     2     TOTAL S2TOTAL 1257   1.03  1.20  1.00 10.0
## 64       1 2012 SOUTH     2     TOTAL S2TOTAL 1258   2.14  1.90  1.70 13.0
## 65       1 2012 SOUTH     2     TOTAL S2TOTAL 1259    1.2  1.90  1.65 12.0
## 66       1 2012 SOUTH     2     TOTAL S2TOTAL 1260   1.05  1.10  1.00  9.0
## 67       1 2012 SOUTH     2     TOTAL S2TOTAL 2131    1.8  2.60  2.40 15.0
## 68       1 2012 SOUTH     2     TOTAL S2TOTAL 2132    1.2  1.00  0.95  7.0
## 69       1 2012 SOUTH     2     TOTAL S2TOTAL 2133   1.75  1.40  1.10 10.0
## 70       1 2012 SOUTH     2     TOTAL S2TOTAL 2134   1.45  3.10  1.80 10.0
## 71       1 2012 SOUTH     2     TOTAL S2TOTAL 2135   1.17  1.20  1.10  5.0
## 72       1 2012 SOUTH     2     TOTAL S2TOTAL 2136   2.15  3.10  2.58 22.0
## 73       1 2012 SOUTH     2     TOTAL S2TOTAL 2137    1.7  1.70  1.40 12.0
## 74       1 2012 SOUTH     2     TOTAL S2TOTAL 3132   1.98  2.85  2.70 12.0
## 75       1 2012 SOUTH     2     TOTAL S2TOTAL 3133   1.26  1.95  1.75 17.0
## 76       1 2012 SOUTH     2     TOTAL S2TOTAL 3134   1.11  1.95  1.50 10.0
## 77       1 2012 SOUTH     2     TOTAL S2TOTAL 3135   1.14  1.32  1.05 10.0
## 78       1 2012 SOUTH     2     TOTAL S2TOTAL 3136   1.26  1.60  1.40 10.0
## 79       1 2012 SOUTH     2     TOTAL S2TOTAL 3137    1.3  1.40  0.80 10.0
## 80       1 2012 SOUTH     2     TOTAL S2TOTAL 3138   1.29  1.44  1.35 13.0
## 81       1 2012 SOUTH     2     TOTAL S2TOTAL 3139   1.31  1.35  1.15  7.0
## 82       1 2012 SOUTH     2     TOTAL S2TOTAL 3140   1.15  1.70  1.28 10.0
## 83       1 2012 SOUTH     2     TOTAL S2TOTAL 3151   1.87  3.40  1.85 15.0
## 84       1 2012 SOUTH     2     TOTAL S2TOTAL 3152   1.47  2.10  1.61  8.0
## 85       1 2012 SOUTH     2     TOTAL S2TOTAL 3153   1.05  1.79  1.50 10.0
## 86       1 2012 SOUTH     2     TOTAL S2TOTAL 3154    2.1  4.90  3.75 25.0
## 87       1 2012 SOUTH     2     TOTAL S2TOTAL 3155   1.99  1.80  1.35 13.0
## 88       1 2012 SOUTH     2     TOTAL S2TOTAL 3156   1.42  1.90  1.80 14.0
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##  89      1 2012 SOUTH     2     TOTAL S2TOTAL 3157    1.5  2.11  1.75 12.0
##  90      1 2012 SOUTH     2     TOTAL S2TOTAL 3158   1.06  1.05  0.85  4.0
##  91      1 2012 SOUTH     2     TOTAL S2TOTAL 3159   1.49  1.50  1.15 13.0
##  92      1 2012 SOUTH     2     TOTAL S2TOTAL 3160    1.8  1.60  1.50 14.0
##  93      1 2012 SOUTH     2     TOTAL S2TOTAL 3171   1.93  1.74  1.20 14.0
##  94      1 2012 SOUTH     2     TOTAL S2TOTAL 3172    1.2  1.60  1.30 10.0
##  95      1 2012 SOUTH     2     TOTAL S2TOTAL 3173   1.65  1.25  1.10 11.0
##  96      1 2012 SOUTH     2     TOTAL S2TOTAL 3174   1.52  1.49  1.10 12.0
##  97      1 2012 SOUTH     2     TOTAL S2TOTAL 3175   1.43  2.05  1.54 13.0
##  98      1 2012 SOUTH     2     TOTAL S2TOTAL 3176   1.25  1.40  1.25 13.0
##  99      1 2012 SOUTH     2     TOTAL S2TOTAL 3177   1.88  2.65  2.64 20.0
## 100      1 2012 SOUTH     2     TOTAL S2TOTAL 3179   1.03  1.40  0.60 13.0
## 101      1 2012 SOUTH     2     TOTAL S2TOTAL 3180    1.1  1.30  1.20 10.0
## 102      1 2012 SOUTH     2     TOTAL S2TOTAL 3191    1.4  1.05  1.00 10.0
## 103      1 2012 SOUTH     2     TOTAL S2TOTAL 3192   1.05  1.55  0.90 10.0
## 104      1 2012 SOUTH     2     TOTAL S2TOTAL 3193   1.18  1.20  1.00  7.0
## 105      1 2012 SOUTH     2     TOTAL S2TOTAL 3194    1.4  1.30  1.85 13.0
## 106      1 2012 SOUTH     2     TOTAL S2TOTAL 3195   1.37  2.67  2.19 19.0
## 107      1 2012 SOUTH     2     TOTAL S2TOTAL 3196   1.32  2.15  1.55 11.0
## 108      1 2012 SOUTH     2      MEGA  S2MEGA  182   1.55  2.20  1.20 20.0
## 109      1 2012 SOUTH     2      MEGA  S2MEGA  183    1.3  1.80  0.90  8.0
## 110      1 2012 SOUTH     2      MEGA  S2MEGA  184   1.24  1.20  1.20 25.0
## 111      1 2012 SOUTH     2      MEGA  S2MEGA  185    1.5  2.10  1.75 16.0
## 112      1 2012 SOUTH     2      MEGA  S2MEGA  186   1.65  2.50  2.20 15.0
## 113      1 2012 SOUTH     2      MEGA  S2MEGA  187   2.17  2.00  1.20 15.0
## 114      1 2012 SOUTH     2      MEGA  S2MEGA  188   1.28  1.60  1.50 10.0
## 115      1 2012 SOUTH     2      MEGA  S2MEGA  189   1.07  1.50  1.50 10.0
## 116      1 2012 SOUTH     2      MEGA  S2MEGA  190   0.67  1.00  0.80  8.0
## 117      1 2012 SOUTH     2      MEGA  S2MEGA  191   0.68  0.70  0.60  4.0
## 118      1 2012 SOUTH     2      MEGA  S2MEGA  192   1.87  1.60  1.40  9.0
## 119      1 2012 SOUTH     2      MEGA  S2MEGA  193   1.35  1.90  1.50 14.0
## 120      1 2012 SOUTH     2      MEGA  S2MEGA  194   1.75  2.10  2.10 15.0
## 121      1 2012 SOUTH     2      MESO  S2MESO  462   1.75  3.30  2.50 23.0
## 122      1 2012 SOUTH     2      MESO  S2MESO  463   1.64  2.30  2.00 14.0
## 123      1 2012 SOUTH     2      MESO  S2MESO 2138   1.42  0.90  0.80 10.0
## 124      1 2012 SOUTH     3      OPEN  S3OPEN 1301   dead    NA    NA   NA
## 125      1 2012 SOUTH     3      OPEN  S3OPEN 1302    0.9  1.30  1.10 11.0
## 126      1 2012 SOUTH     3     TOTAL S3TOTAL 1061   dead    NA    NA   NA
## 127      1 2012 SOUTH     3     TOTAL S3TOTAL 1062    1.8  2.60  2.60 15.0
## 128      1 2012 SOUTH     3     TOTAL S3TOTAL 1063   2.47  3.10  2.20 18.0
## 129      1 2012 SOUTH     3     TOTAL S3TOTAL 1064   2.15  1.60  1.10 17.0
## 130      1 2012 SOUTH     3     TOTAL S3TOTAL 1066    1.7  2.50  2.15 15.0
## 131      1 2012 SOUTH     3     TOTAL S3TOTAL 1066    1.9  1.80  1.50 20.0
## 132      1 2012 SOUTH     3     TOTAL S3TOTAL 1067   1.95  2.10  1.90 13.0
## 133      1 2012 SOUTH     3     TOTAL S3TOTAL 1068    1.8  1.70  1.40 13.0
## 134      1 2012 SOUTH     3     TOTAL S3TOTAL 1069    1.4  2.00  1.60 14.0
## 135      1 2012 SOUTH     3     TOTAL S3TOTAL 1070      1  1.30  1.20  7.0
## 136      1 2012 SOUTH     3     TOTAL S3TOTAL 2139   1.75  1.20  1.10 13.0
## 137      1 2012 SOUTH     3     TOTAL S3TOTAL 2140   1.28  1.50  0.95  4.0
## 138      1 2012 SOUTH     3     TOTAL S3TOTAL 2151      1  1.40  1.20  4.0
## 139      1 2012 SOUTH     3     TOTAL S3TOTAL 2152   1.45  1.50  1.30 10.0
## 140      1 2012 SOUTH     3     TOTAL S3TOTAL 2153      1  1.00  0.75  8.0
## 141      1 2012 SOUTH     3     TOTAL S3TOTAL 2154   1.03  1.00  0.90  6.0
## 142      1 2012 SOUTH     3     TOTAL S3TOTAL 2155   1.51  2.00  1.80 12.0
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## 143      1 2012 SOUTH     3     TOTAL S3TOTAL 2156   1.17  1.10  0.90 10.0
## 144      1 2012 SOUTH     3     TOTAL S3TOTAL 2157   1.33  1.90  1.85 14.0
## 145      1 2012 SOUTH     3     TOTAL S3TOTAL 2158    1.3  1.10  0.85  8.0
## 146      1 2012 SOUTH     3     TOTAL S3TOTAL 2159   1.13  1.10  0.90 10.0
## 147      1 2012 SOUTH     3     TOTAL S3TOTAL 2160   1.58  1.40  1.40 13.0
## 148      1 2012 SOUTH     3     TOTAL S3TOTAL 2171   1.06  1.40  1.00  5.0
## 149      1 2012 SOUTH     3     TOTAL S3TOTAL 2172   1.05  1.40  0.95  7.0
## 150      1 2012 SOUTH     3     TOTAL S3TOTAL 2173   1.45  1.60  1.10  6.0
## 151      1 2012 SOUTH     3     TOTAL S3TOTAL 2174   1.15  1.10  0.90  5.0
## 152      1 2012 SOUTH     3     TOTAL S3TOTAL 2175   1.42  1.45  1.30 13.0
## 153      1 2012 SOUTH     3     TOTAL S3TOTAL 2176   1.02  1.20  1.00  8.0
## 154      1 2012 SOUTH     3     TOTAL S3TOTAL 2177    1.4  1.20  1.00  9.0
## 155      1 2012 SOUTH     3     TOTAL S3TOTAL 2178   1.45  2.10  2.05 15.0
## 156      1 2012 SOUTH     3      MESO  S3MESO 1421   1.95  2.20  1.60 13.0
## 157      1 2012 SOUTH     3      MESO  S3MESO 1422   dead    NA    NA   NA
##     FLOWERS BUDS FRUITS   ANT
## 1         0    0     10    CS
## 2         0    0    150    TP
## 3         2    1     50    TP
## 4         0    0     75    CS
## 5         0    0     20    CS
## 6         0    0      0     E
## 7         0    0      0    CS
## 8         0    0     25    CS
## 9         0    0      0    TP
## 10        0    0     50    TP
## 11        0    0      5    CS
## 12        0    0     60    TP
## 13        0    0     60    TP
## 14        2    0     60    CS
## 15        2    0      0    CS
## 16        0    0      0    TP
## 17        0    0      0    TP
## 18        0    0      0    CS
## 19        0    0      0    CM
## 20        0    0      0    TP
## 21       NA   NA     NA
## 22        0    0      5    CS
## 23        0    0     45    CS
## 24       40   50     35    CS
## 25        8    2     65    CS
## 26        0    0     20    TP
## 27        0    0     70    CS
## 28        0    0    125    CM
## 29        0    0    200    CM
## 30        0    0     10    CS
## 31        0    0      0    CS
## 32        0    0     35    TP
## 33        0    0    300    CM
## 34        2    2    100    CS
## 35        0    0     30    CM
## 36        0    0     50    TP
## 37        0    0     10    CM
## 38        0    0     25    CS
```

```
## 39        0    0     15    TP
## 40        0    0      0    TP
## 41        0    0     15    TP
## 42        0    0      0    TP
## 43        0    0     40    TP
## 44        0    0      0    TP
## 45        0    0     15    CM
## 46        0    0      0    CM
## 47        0    0      0    TP
## 48        0    0      0    TP
## 49        0    0      1    TP
## 50        0    0     20    TP
## 51        0    0      0    TP
## 52        0    0      0    TP
## 53        0    0     20    TP
## 54        0    0      0    TP
## 55        0    0      0    CN
## 56        0    0      0    CN
## 57        0    0      0    TP
## 58        0    0      5    TP
## 59        0    0      0    TP
## 60        0    0     25    TP
## 61        0    0     25    TP
## 62        0    0     20    TP
## 63        0    0      0    TP
## 64        0    0     10    CS
## 65        1    0     25    CS
## 66        0    0      0    TP
## 67        0    0     10    TP
## 68        0    0      0    TP
## 69        0    0      0    TP
## 70        0    0      0    TP
## 71        0    0      0    TP
## 72        0    0      0    CS
## 73        0    0      0    CS
## 74        0    0     25 AB_TP
## 75        0    0      0    TP
## 76        0    0      0    TP
## 77        0    0      0    TP
## 78        0    0      0    CS
## 79        0    0      0    CS
## 80        0    0      0    CS
## 81        0    0      0    CS
## 82        0    0      5    CS
## 83        6    0      0    CS
## 84        0    0      0    CS
## 85        0    0      1    CS
## 86        0    0     25    CS
## 87        0    0      0    CS
## 88        0    0      0    CS
## 89        0    0     10    CS
## 90        0    0      0    CS
## 91        0    0     35    CS
## 92        0    0      0    CS
```

```
## 93        0    0      0    CS
## 94        0    0      0    CS
## 95        0    0      0    CS
## 96        0    0     20    CS
## 97        0    0      0    CS
## 98        0    0      0    CM
## 99        0    0    100    CM
## 100       0    0      0    CS
## 101       0    0      0    CS
## 102       0    0      0    CS
## 103       0    0      0    CM
## 104       0    0      0    TP
## 105       0    0     30    CS
## 106       0    0     50    TP
## 107       0    0     10    CS
## 108       0    0      0    CS
## 109       0    0     15    CS
## 110       0    0     10    CS
## 111       5    0    200    CS
## 112       0    0     80    CS
## 113       0    0    150    TP
## 114       0    0     40    TP
## 115       0    0     60    TP
## 116       0    0      0    CS
## 117       0    0      0    TP
## 118       0    0     40    CS
## 119       0    0     20    CS
## 120       0    0     75    TP
## 121       0    0     20    CM
## 122       0    0      0    TP
## 123       0    0      0     E
## 124      NA   NA     NA
## 125       0    0      0    TP
## 126      NA   NA     NA
## 127       0    0     50    TP
## 128       0    0      0    TP
## 129       0    0      0    TP
## 130       0    0      2    TP
## 131       0    0     25    TP
## 132       0    0      0    TP
## 133       0    0      0    TP
## 134       0    0      0    TP
## 135       0    0      0    TP
## 136       0    0      0    TP
## 137       0    0      0    TP
## 138       0    0      0    TP
## 139       0    0      0    TP
## 140       0    0      0    TP
## 141       0    0      0    TP
## 142       0    0      0    TP
## 143       0    0      0    TP
## 144       0    0      0    TP
## 145       0    0      0    TP
## 146       0    0      0    TP
```

```
## 147       0    0      0    TP
## 148       0    0      8    TP
## 149       0    0      0    TP
## 150       0    0      0    TP
## 151       0    0      0    TP
## 152       0    0      0    TP
## 153       0    0      0    TP
## 154       0    0      0    TP
## 155       0    0     20    TP
## 156       0    0      2    CS
## 157      NA   NA     NA
```

```
acacia <- read.csv(file = "../data-raw/ACACIA_DREPANOLOBIUM_SURVEY.txt", sep = "\t")
```

```
acacia$HEIGHT <- as.numeric(acacia$HEIGHT)
```

```
## Warning: NAs introduced by coercion
```

```
acacia$HEIGHT
```

```
##   [1] 2.25 2.65 1.50 2.01 1.75 1.65 1.20 1.45 1.87 2.38 2.58 2.65 2.35 1.88 2.32
##  [16] 2.39 2.20 1.05 2.00 1.28   NA 1.40 1.90 1.75 1.80 2.70 2.02 1.90 1.85 1.65
##  [31] 1.40 2.50 2.05 2.26 2.13 1.80 1.85 1.50 1.87 1.58 2.05 1.75 1.49 1.28 1.49
##  [46] 1.07 1.48 1.25 1.41 1.60 1.20 1.49 1.50 1.65 1.13 1.25 1.10 2.20 1.45 1.60
##  [61] 1.55 1.50 1.03 2.14 1.20 1.05 1.80 1.20 1.75 1.45 1.17 2.15 1.70 1.98 1.26
##  [76] 1.11 1.14 1.26 1.30 1.29 1.31 1.15 1.87 1.47 1.05 2.10 1.99 1.42 1.50 1.06
##  [91] 1.49 1.80 1.93 1.20 1.65 1.52 1.43 1.25 1.88 1.03 1.10 1.40 1.05 1.18 1.40
## [106] 1.37 1.32 1.55 1.30 1.24 1.50 1.65 2.17 1.28 1.07 0.67 0.68 1.87 1.35 1.75
## [121] 1.75 1.64 1.42   NA 0.90   NA 1.80 2.47 2.15 1.70 1.90 1.95 1.80 1.40 1.00
## [136] 1.75 1.28 1.00 1.45 1.00 1.03 1.51 1.17 1.33 1.30 1.13 1.58 1.06 1.05 1.45
## [151] 1.15 1.42 1.02 1.40 1.45 1.95   NA
```

```
read.csv(file = "../data-raw/ACACIA_DREPANOLOBIUM_SURVEY.txt",
         sep = "\t",
         na.strings = "dead")
```

```
##     SURVEY YEAR  SITE BLOCK TREATMENT    PLOT   ID HEIGHT AXIS1 AXIS2 CIRC
## 1        1 2012 SOUTH     1     TOTAL S1TOTAL  581   2.25  2.75  2.15 20.0
## 2        1 2012 SOUTH     1     TOTAL S1TOTAL  582   2.65  4.10  3.90 28.0
## 3        1 2012 SOUTH     1     TOTAL S1TOTAL 3111   1.50  1.70  0.85 17.0
## 4        1 2012 SOUTH     1     TOTAL S1TOTAL 3112   2.01  1.80  1.60 12.0
## 5        1 2012 SOUTH     1     TOTAL S1TOTAL 3113   1.75  1.84  1.42 13.0
## 6        1 2012 SOUTH     1     TOTAL S1TOTAL 3114   1.65  1.62  0.85 15.0
## 7        1 2012 SOUTH     1     TOTAL S1TOTAL 3115   1.20  1.95  0.90  9.0
## 8        1 2012 SOUTH     1     TOTAL S1TOTAL 3199   1.45  2.00  1.75 12.2
## 9        1 2012 SOUTH     1      MESO  S1MESO  941   1.87  2.15  1.82 13.0
## 10       1 2012 SOUTH     1      MESO  S1MESO  942   2.38  5.55  4.82 35.0
## 11       1 2012 SOUTH     1      MESO  S1MESO  943   2.58  4.90  4.24 24.0
## 12       1 2012 SOUTH     1      MESO  S1MESO  944   2.65  3.75  3.10 27.0
## 13       1 2012 SOUTH     1      MESO  S1MESO  946   2.35  2.34  2.05 20.0
## 14       1 2012 SOUTH     1      MESO  S1MESO  947   1.88  2.10  1.85 28.0
## 15       1 2012 SOUTH     1      MESO  S1MESO 3116   2.32  3.05  2.63 30.0
```

```
## 16       1 2012 SOUTH     1      MESO  S1MESO 3117   2.39  2.21  2.10 13.0
## 17       1 2012 SOUTH     1      MESO  S1MESO 3118   2.20  1.80  1.50 10.0
## 18       1 2012 SOUTH     1      MESO  S1MESO 3119   1.05  0.90  0.55  8.0
## 19       1 2012 SOUTH     1      MESO  S1MESO 3120   2.00  1.25  1.20 10.0
## 20       1 2012 SOUTH     1      MESO  S1MESO 3131   1.28  1.14  1.00 10.0
## 21       1 2012 SOUTH     2      OPEN  S2OPEN  341     NA    NA    NA   NA
## 22       1 2012 SOUTH     2     TOTAL S2TOTAL 3178   1.40  2.50  2.15 18.0
## 23       1 2012 SOUTH     2     TOTAL S2TOTAL  101   1.90  3.31  2.65 15.0
## 24       1 2012 SOUTH     2     TOTAL S2TOTAL  102   1.75  2.70  2.55 16.0
## 25       1 2012 SOUTH     2     TOTAL S2TOTAL  103   1.80  2.75  2.30 16.0
## 26       1 2012 SOUTH     2     TOTAL S2TOTAL  104   2.70  4.05  4.00 35.2
## 27       1 2012 SOUTH     2     TOTAL S2TOTAL  105   2.02  2.85  1.49 17.0
## 28       1 2012 SOUTH     2     TOTAL S2TOTAL  108   1.90  3.10  2.85 19.0
## 29       1 2012 SOUTH     2     TOTAL S2TOTAL  109   1.85  2.45  1.90 19.0
## 30       1 2012 SOUTH     2     TOTAL S2TOTAL  110   1.65  1.90  1.54 17.0
## 31       1 2012 SOUTH     2     TOTAL S2TOTAL  111   1.40  2.35  1.45 14.0
## 32       1 2012 SOUTH     2     TOTAL S2TOTAL  113   2.50  3.25  2.30 22.0
## 33       1 2012 SOUTH     2     TOTAL S2TOTAL  115   2.05  5.40  4.50 33.0
## 34       1 2012 SOUTH     2     TOTAL S2TOTAL  116   2.26  3.50  3.10 33.0
## 35       1 2012 SOUTH     2     TOTAL S2TOTAL  117   2.13  2.40  2.30 20.0
## 36       1 2012 SOUTH     2     TOTAL S2TOTAL  118   1.80  3.15  2.55 22.0
## 37       1 2012 SOUTH     2     TOTAL S2TOTAL 1211   1.85  2.00  2.27 20.0
## 38       1 2012 SOUTH     2     TOTAL S2TOTAL 1212   1.50  2.15  1.80 15.0
## 39       1 2012 SOUTH     2     TOTAL S2TOTAL 1213   1.87  2.34  2.05 13.0
## 40       1 2012 SOUTH     2     TOTAL S2TOTAL 1214   1.58  1.28  0.75 11.0
## 41       1 2012 SOUTH     2     TOTAL S2TOTAL 1215   2.05  2.10  1.75 17.0
## 42       1 2012 SOUTH     2     TOTAL S2TOTAL 1216   1.75  2.45  3.28 16.0
## 43       1 2012 SOUTH     2     TOTAL S2TOTAL 1217   1.49  1.50  1.45 13.0
## 44       1 2012 SOUTH     2     TOTAL S2TOTAL 1218   1.28  2.00  0.90 10.0
## 45       1 2012 SOUTH     2     TOTAL S2TOTAL 1219   1.49  2.35  1.65 13.0
## 46       1 2012 SOUTH     2     TOTAL S2TOTAL 1220   1.07  1.20  0.95 11.0
## 47       1 2012 SOUTH     2     TOTAL S2TOTAL 1231   1.48  1.25  1.20  9.0
## 48       1 2012 SOUTH     2     TOTAL S2TOTAL 1232   1.25  1.25  0.90 10.0
## 49       1 2012 SOUTH     2     TOTAL S2TOTAL 1233   1.41  1.41  1.40 14.0
## 50       1 2012 SOUTH     2     TOTAL S2TOTAL 1234   1.60  1.60  1.30 13.0
## 51       1 2012 SOUTH     2     TOTAL S2TOTAL 1235   1.20  1.20  1.30 14.0
## 52       1 2012 SOUTH     2     TOTAL S2TOTAL 1236   1.49  1.49  1.20  8.0
## 53       1 2012 SOUTH     2     TOTAL S2TOTAL 1237   1.50  1.50  1.50 14.0
## 54       1 2012 SOUTH     2     TOTAL S2TOTAL 1238   1.65  1.65  2.00 20.0
## 55       1 2012 SOUTH     2     TOTAL S2TOTAL 1239   1.13  1.13  1.20 10.0
## 56       1 2012 SOUTH     2     TOTAL S2TOTAL 1240   1.25  1.25  0.90 10.0
## 57       1 2012 SOUTH     2     TOTAL S2TOTAL 1251   1.10  1.20  1.10 10.0
## 58       1 2012 SOUTH     2     TOTAL S2TOTAL 1252   2.20  2.70  2.40 25.0
## 59       1 2012 SOUTH     2     TOTAL S2TOTAL 1253   1.45  1.65  1.25 10.0
## 60       1 2012 SOUTH     2     TOTAL S2TOTAL 1254   1.60  2.45  2.10 13.0
## 61       1 2012 SOUTH     2     TOTAL S2TOTAL 1255   1.55  2.40  1.80 13.0
## 62       1 2012 SOUTH     2     TOTAL S2TOTAL 1256   1.50  2.40  2.15 13.0
## 63       1 2012 SOUTH     2     TOTAL S2TOTAL 1257   1.03  1.20  1.00 10.0
## 64       1 2012 SOUTH     2     TOTAL S2TOTAL 1258   2.14  1.90  1.70 13.0
## 65       1 2012 SOUTH     2     TOTAL S2TOTAL 1259   1.20  1.90  1.65 12.0
## 66       1 2012 SOUTH     2     TOTAL S2TOTAL 1260   1.05  1.10  1.00  9.0
## 67       1 2012 SOUTH     2     TOTAL S2TOTAL 2131   1.80  2.60  2.40 15.0
## 68       1 2012 SOUTH     2     TOTAL S2TOTAL 2132   1.20  1.00  0.95  7.0
## 69       1 2012 SOUTH     2     TOTAL S2TOTAL 2133   1.75  1.40  1.10 10.0
```

```
## 70       1 2012 SOUTH     2     TOTAL S2TOTAL 2134   1.45  3.10  1.80 10.0
## 71       1 2012 SOUTH     2     TOTAL S2TOTAL 2135   1.17  1.20  1.10  5.0
## 72       1 2012 SOUTH     2     TOTAL S2TOTAL 2136   2.15  3.10  2.58 22.0
## 73       1 2012 SOUTH     2     TOTAL S2TOTAL 2137   1.70  1.70  1.40 12.0
## 74       1 2012 SOUTH     2     TOTAL S2TOTAL 3132   1.98  2.85  2.70 12.0
## 75       1 2012 SOUTH     2     TOTAL S2TOTAL 3133   1.26  1.95  1.75 17.0
## 76       1 2012 SOUTH     2     TOTAL S2TOTAL 3134   1.11  1.95  1.50 10.0
## 77       1 2012 SOUTH     2     TOTAL S2TOTAL 3135   1.14  1.32  1.05 10.0
## 78       1 2012 SOUTH     2     TOTAL S2TOTAL 3136   1.26  1.60  1.40 10.0
## 79       1 2012 SOUTH     2     TOTAL S2TOTAL 3137   1.30  1.40  0.80 10.0
## 80       1 2012 SOUTH     2     TOTAL S2TOTAL 3138   1.29  1.44  1.35 13.0
## 81       1 2012 SOUTH     2     TOTAL S2TOTAL 3139   1.31  1.35  1.15  7.0
## 82       1 2012 SOUTH     2     TOTAL S2TOTAL 3140   1.15  1.70  1.28 10.0
## 83       1 2012 SOUTH     2     TOTAL S2TOTAL 3151   1.87  3.40  1.85 15.0
## 84       1 2012 SOUTH     2     TOTAL S2TOTAL 3152   1.47  2.10  1.61  8.0
## 85       1 2012 SOUTH     2     TOTAL S2TOTAL 3153   1.05  1.79  1.50 10.0
## 86       1 2012 SOUTH     2     TOTAL S2TOTAL 3154   2.10  4.90  3.75 25.0
## 87       1 2012 SOUTH     2     TOTAL S2TOTAL 3155   1.99  1.80  1.35 13.0
## 88       1 2012 SOUTH     2     TOTAL S2TOTAL 3156   1.42  1.90  1.80 14.0
## 89       1 2012 SOUTH     2     TOTAL S2TOTAL 3157   1.50  2.11  1.75 12.0
## 90       1 2012 SOUTH     2     TOTAL S2TOTAL 3158   1.06  1.05  0.85  4.0
## 91       1 2012 SOUTH     2     TOTAL S2TOTAL 3159   1.49  1.50  1.15 13.0
## 92       1 2012 SOUTH     2     TOTAL S2TOTAL 3160   1.80  1.60  1.50 14.0
## 93       1 2012 SOUTH     2     TOTAL S2TOTAL 3171   1.93  1.74  1.20 14.0
## 94       1 2012 SOUTH     2     TOTAL S2TOTAL 3172   1.20  1.60  1.30 10.0
## 95       1 2012 SOUTH     2     TOTAL S2TOTAL 3173   1.65  1.25  1.10 11.0
## 96       1 2012 SOUTH     2     TOTAL S2TOTAL 3174   1.52  1.49  1.10 12.0
## 97       1 2012 SOUTH     2     TOTAL S2TOTAL 3175   1.43  2.05  1.54 13.0
## 98       1 2012 SOUTH     2     TOTAL S2TOTAL 3176   1.25  1.40  1.25 13.0
## 99       1 2012 SOUTH     2     TOTAL S2TOTAL 3177   1.88  2.65  2.64 20.0
## 100      1 2012 SOUTH     2     TOTAL S2TOTAL 3179   1.03  1.40  0.60 13.0
## 101      1 2012 SOUTH     2     TOTAL S2TOTAL 3180   1.10  1.30  1.20 10.0
## 102      1 2012 SOUTH     2     TOTAL S2TOTAL 3191   1.40  1.05  1.00 10.0
## 103      1 2012 SOUTH     2     TOTAL S2TOTAL 3192   1.05  1.55  0.90 10.0
## 104      1 2012 SOUTH     2     TOTAL S2TOTAL 3193   1.18  1.20  1.00  7.0
## 105      1 2012 SOUTH     2     TOTAL S2TOTAL 3194   1.40  1.30  1.85 13.0
## 106      1 2012 SOUTH     2     TOTAL S2TOTAL 3195   1.37  2.67  2.19 19.0
## 107      1 2012 SOUTH     2     TOTAL S2TOTAL 3196   1.32  2.15  1.55 11.0
## 108      1 2012 SOUTH     2      MEGA  S2MEGA  182   1.55  2.20  1.20 20.0
## 109      1 2012 SOUTH     2      MEGA  S2MEGA  183   1.30  1.80  0.90  8.0
## 110      1 2012 SOUTH     2      MEGA  S2MEGA  184   1.24  1.20  1.20 25.0
## 111      1 2012 SOUTH     2      MEGA  S2MEGA  185   1.50  2.10  1.75 16.0
## 112      1 2012 SOUTH     2      MEGA  S2MEGA  186   1.65  2.50  2.20 15.0
## 113      1 2012 SOUTH     2      MEGA  S2MEGA  187   2.17  2.00  1.20 15.0
## 114      1 2012 SOUTH     2      MEGA  S2MEGA  188   1.28  1.60  1.50 10.0
## 115      1 2012 SOUTH     2      MEGA  S2MEGA  189   1.07  1.50  1.50 10.0
## 116      1 2012 SOUTH     2      MEGA  S2MEGA  190   0.67  1.00  0.80  8.0
## 117      1 2012 SOUTH     2      MEGA  S2MEGA  191   0.68  0.70  0.60  4.0
## 118      1 2012 SOUTH     2      MEGA  S2MEGA  192   1.87  1.60  1.40  9.0
## 119      1 2012 SOUTH     2      MEGA  S2MEGA  193   1.35  1.90  1.50 14.0
## 120      1 2012 SOUTH     2      MEGA  S2MEGA  194   1.75  2.10  2.10 15.0
## 121      1 2012 SOUTH     2      MESO  S2MESO  462   1.75  3.30  2.50 23.0
## 122      1 2012 SOUTH     2      MESO  S2MESO  463   1.64  2.30  2.00 14.0
## 123      1 2012 SOUTH     2      MESO  S2MESO 2138   1.42  0.90  0.80 10.0
```

```
## 124      1 2012 SOUTH     3      OPEN  S3OPEN 1301     NA    NA    NA   NA
## 125      1 2012 SOUTH     3      OPEN  S3OPEN 1302   0.90  1.30  1.10 11.0
## 126      1 2012 SOUTH     3     TOTAL S3TOTAL 1061     NA    NA    NA   NA
## 127      1 2012 SOUTH     3     TOTAL S3TOTAL 1062   1.80  2.60  2.60 15.0
## 128      1 2012 SOUTH     3     TOTAL S3TOTAL 1063   2.47  3.10  2.20 18.0
## 129      1 2012 SOUTH     3     TOTAL S3TOTAL 1064   2.15  1.60  1.10 17.0
## 130      1 2012 SOUTH     3     TOTAL S3TOTAL 1066   1.70  2.50  2.15 15.0
## 131      1 2012 SOUTH     3     TOTAL S3TOTAL 1066   1.90  1.80  1.50 20.0
## 132      1 2012 SOUTH     3     TOTAL S3TOTAL 1067   1.95  2.10  1.90 13.0
## 133      1 2012 SOUTH     3     TOTAL S3TOTAL 1068   1.80  1.70  1.40 13.0
## 134      1 2012 SOUTH     3     TOTAL S3TOTAL 1069   1.40  2.00  1.60 14.0
## 135      1 2012 SOUTH     3     TOTAL S3TOTAL 1070   1.00  1.30  1.20  7.0
## 136      1 2012 SOUTH     3     TOTAL S3TOTAL 2139   1.75  1.20  1.10 13.0
## 137      1 2012 SOUTH     3     TOTAL S3TOTAL 2140   1.28  1.50  0.95  4.0
## 138      1 2012 SOUTH     3     TOTAL S3TOTAL 2151   1.00  1.40  1.20  4.0
## 139      1 2012 SOUTH     3     TOTAL S3TOTAL 2152   1.45  1.50  1.30 10.0
## 140      1 2012 SOUTH     3     TOTAL S3TOTAL 2153   1.00  1.00  0.75  8.0
## 141      1 2012 SOUTH     3     TOTAL S3TOTAL 2154   1.03  1.00  0.90  6.0
## 142      1 2012 SOUTH     3     TOTAL S3TOTAL 2155   1.51  2.00  1.80 12.0
## 143      1 2012 SOUTH     3     TOTAL S3TOTAL 2156   1.17  1.10  0.90 10.0
## 144      1 2012 SOUTH     3     TOTAL S3TOTAL 2157   1.33  1.90  1.85 14.0
## 145      1 2012 SOUTH     3     TOTAL S3TOTAL 2158   1.30  1.10  0.85  8.0
## 146      1 2012 SOUTH     3     TOTAL S3TOTAL 2159   1.13  1.10  0.90 10.0
## 147      1 2012 SOUTH     3     TOTAL S3TOTAL 2160   1.58  1.40  1.40 13.0
## 148      1 2012 SOUTH     3     TOTAL S3TOTAL 2171   1.06  1.40  1.00  5.0
## 149      1 2012 SOUTH     3     TOTAL S3TOTAL 2172   1.05  1.40  0.95  7.0
## 150      1 2012 SOUTH     3     TOTAL S3TOTAL 2173   1.45  1.60  1.10  6.0
## 151      1 2012 SOUTH     3     TOTAL S3TOTAL 2174   1.15  1.10  0.90  5.0
## 152      1 2012 SOUTH     3     TOTAL S3TOTAL 2175   1.42  1.45  1.30 13.0
## 153      1 2012 SOUTH     3     TOTAL S3TOTAL 2176   1.02  1.20  1.00  8.0
## 154      1 2012 SOUTH     3     TOTAL S3TOTAL 2177   1.40  1.20  1.00  9.0
## 155      1 2012 SOUTH     3     TOTAL S3TOTAL 2178   1.45  2.10  2.05 15.0
## 156      1 2012 SOUTH     3      MESO  S3MESO 1421   1.95  2.20  1.60 13.0
## 157      1 2012 SOUTH     3      MESO  S3MESO 1422     NA    NA    NA   NA
##     FLOWERS BUDS FRUITS   ANT
## 1         0    0     10    CS
## 2         0    0    150    TP
## 3         2    1     50    TP
## 4         0    0     75    CS
## 5         0    0     20    CS
## 6         0    0      0     E
## 7         0    0      0    CS
## 8         0    0     25    CS
## 9         0    0      0    TP
## 10        0    0     50    TP
## 11        0    0      5    CS
## 12        0    0     60    TP
## 13        0    0     60    TP
## 14        2    0     60    CS
## 15        2    0      0    CS
## 16        0    0      0    TP
## 17        0    0      0    TP
## 18        0    0      0    CS
## 19        0    0      0    CM
```

```
## 20        0    0      0    TP
## 21       NA   NA     NA
## 22        0    0      5    CS
## 23        0    0     45    CS
## 24       40   50     35    CS
## 25        8    2     65    CS
## 26        0    0     20    TP
## 27        0    0     70    CS
## 28        0    0    125    CM
## 29        0    0    200    CM
## 30        0    0     10    CS
## 31        0    0      0    CS
## 32        0    0     35    TP
## 33        0    0    300    CM
## 34        2    2    100    CS
## 35        0    0     30    CM
## 36        0    0     50    TP
## 37        0    0     10    CM
## 38        0    0     25    CS
## 39        0    0     15    TP
## 40        0    0      0    TP
## 41        0    0     15    TP
## 42        0    0      0    TP
## 43        0    0     40    TP
## 44        0    0      0    TP
## 45        0    0     15    CM
## 46        0    0      0    CM
## 47        0    0      0    TP
## 48        0    0      0    TP
## 49        0    0      1    TP
## 50        0    0     20    TP
## 51        0    0      0    TP
## 52        0    0      0    TP
## 53        0    0     20    TP
## 54        0    0      0    TP
## 55        0    0      0    CN
## 56        0    0      0    CN
## 57        0    0      0    TP
## 58        0    0      5    TP
## 59        0    0      0    TP
## 60        0    0     25    TP
## 61        0    0     25    TP
## 62        0    0     20    TP
## 63        0    0      0    TP
## 64        0    0     10    CS
## 65        1    0     25    CS
## 66        0    0      0    TP
## 67        0    0     10    TP
## 68        0    0      0    TP
## 69        0    0      0    TP
## 70        0    0      0    TP
## 71        0    0      0    TP
## 72        0    0      0    CS
## 73        0    0      0    CS
```

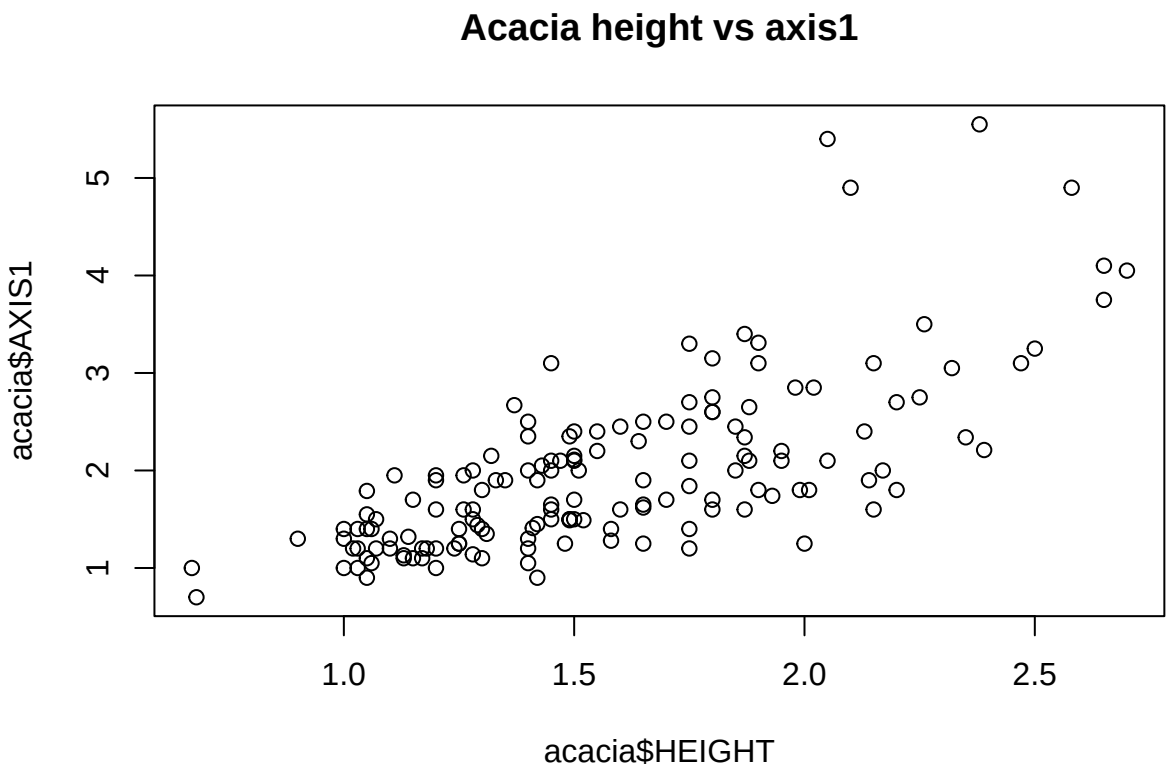
```
## 74        0    0     25 AB_TP
## 75        0    0      0    TP
## 76        0    0      0    TP
## 77        0    0      0    TP
## 78        0    0      0    CS
## 79        0    0      0    CS
## 80        0    0      0    CS
## 81        0    0      0    CS
## 82        0    0      5    CS
## 83        6    0      0    CS
## 84        0    0      0    CS
## 85        0    0      1    CS
## 86        0    0     25    CS
## 87        0    0      0    CS
## 88        0    0      0    CS
## 89        0    0     10    CS
## 90        0    0      0    CS
## 91        0    0     35    CS
## 92        0    0      0    CS
## 93        0    0      0    CS
## 94        0    0      0    CS
## 95        0    0      0    CS
## 96        0    0     20    CS
## 97        0    0      0    CS
## 98        0    0      0    CM
## 99        0    0    100    CM
## 100       0    0      0    CS
## 101       0    0      0    CS
## 102       0    0      0    CS
## 103       0    0      0    CM
## 104       0    0      0    TP
## 105       0    0     30    CS
## 106       0    0     50    TP
## 107       0    0     10    CS
## 108       0    0      0    CS
## 109       0    0     15    CS
## 110       0    0     10    CS
## 111       5    0    200    CS
## 112       0    0     80    CS
## 113       0    0    150    TP
## 114       0    0     40    TP
## 115       0    0     60    TP
## 116       0    0      0    CS
## 117       0    0      0    TP
## 118       0    0     40    CS
## 119       0    0     20    CS
## 120       0    0     75    TP
## 121       0    0     20    CM
## 122       0    0      0    TP
## 123       0    0      0     E
## 124      NA   NA     NA
## 125       0    0      0    TP
## 126      NA   NA     NA
## 127       0    0     50    TP
```

```
## 128       0    0      0    TP
## 129       0    0      0    TP
## 130       0    0      2    TP
## 131       0    0     25    TP
## 132       0    0      0    TP
## 133       0    0      0    TP
## 134       0    0      0    TP
## 135       0    0      0    TP
## 136       0    0      0    TP
## 137       0    0      0    TP
## 138       0    0      0    TP
## 139       0    0      0    TP
## 140       0    0      0    TP
## 141       0    0      0    TP
## 142       0    0      0    TP
## 143       0    0      0    TP
## 144       0    0      0    TP
## 145       0    0      0    TP
## 146       0    0      0    TP
## 147       0    0      0    TP
## 148       0    0      8    TP
## 149       0    0      0    TP
## 150       0    0      0    TP
## 151       0    0      0    TP
## 152       0    0      0    TP
## 153       0    0      0    TP
## 154       0    0      0    TP
## 155       0    0     20    TP
## 156       0    0      2    CS
## 157      NA   NA     NA
```

```
is.numeric(acacia$HEIGHT)
```

```
## [1] TRUE
```

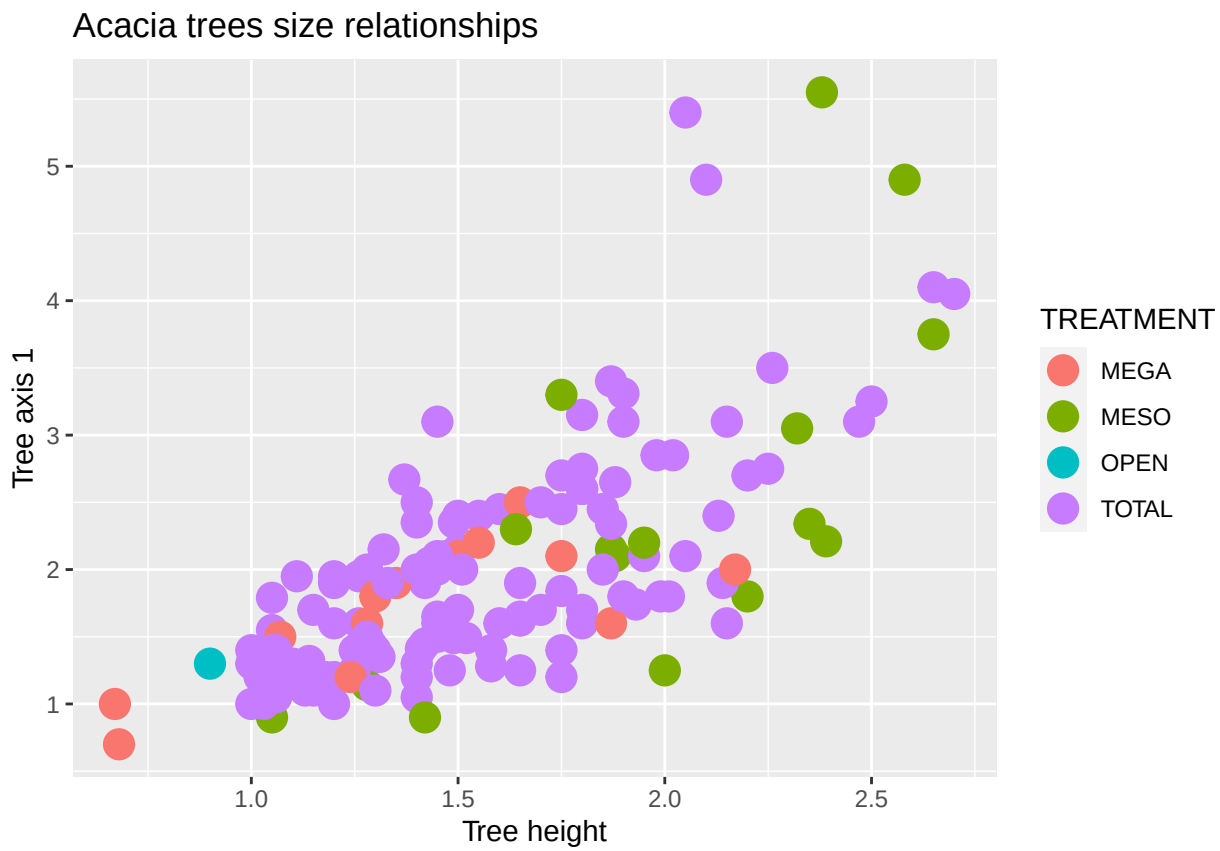
```
plot(x = acacia$HEIGHT, y = acacia$AXIS1, main = "Acacia height vs axis1")
```




```
library(ggplot2)

ggplot(data = acacia, mapping = aes(x = HEIGHT, y = AXIS1, color = TREATMENT)) +
  geom_point(size = 5) +
  labs(x = "Tree height", y = "Tree axis 1", title = "Acacia trees size relationships")
```

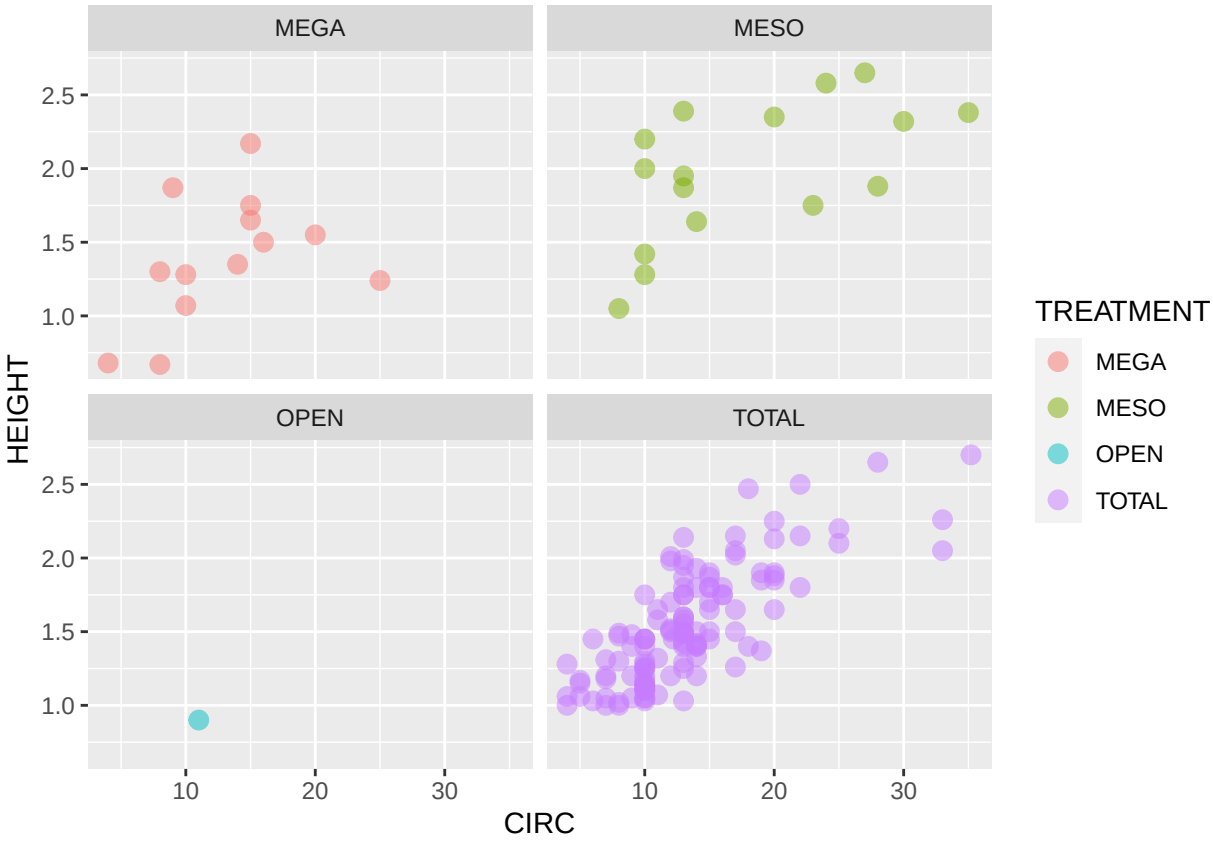
```
## Warning: Removed 4 rows containing missing values (`geom_point()`).
```



facet_wrap

```
ggplot(acacia, aes(x = CIRC, y = HEIGHT, color = TREATMENT)) +
  geom_point(size = 3, alpha = 0.5) +
  facet_wrap(~TREATMENT)
```

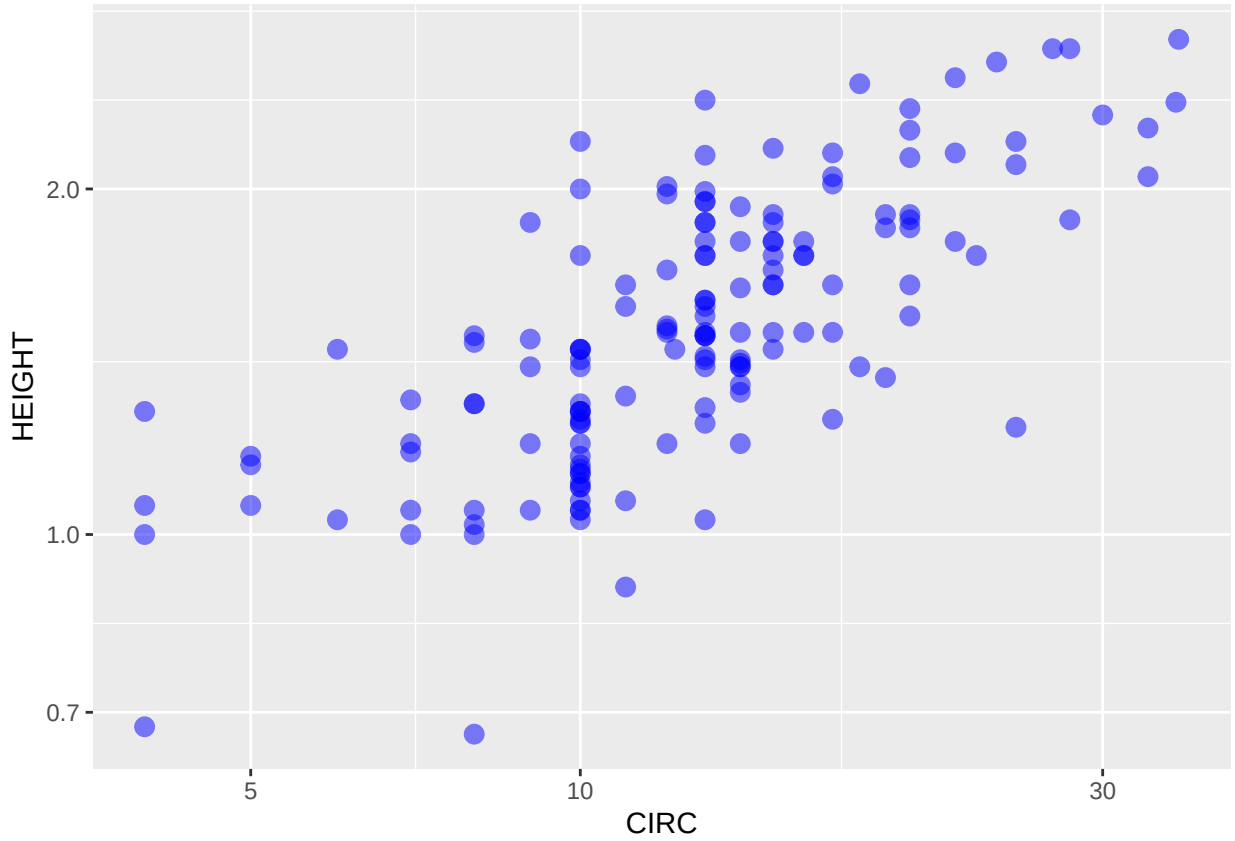
```
## Warning: Removed 4 rows containing missing values (`geom_point()`).
```



rescaling axes excerise 1

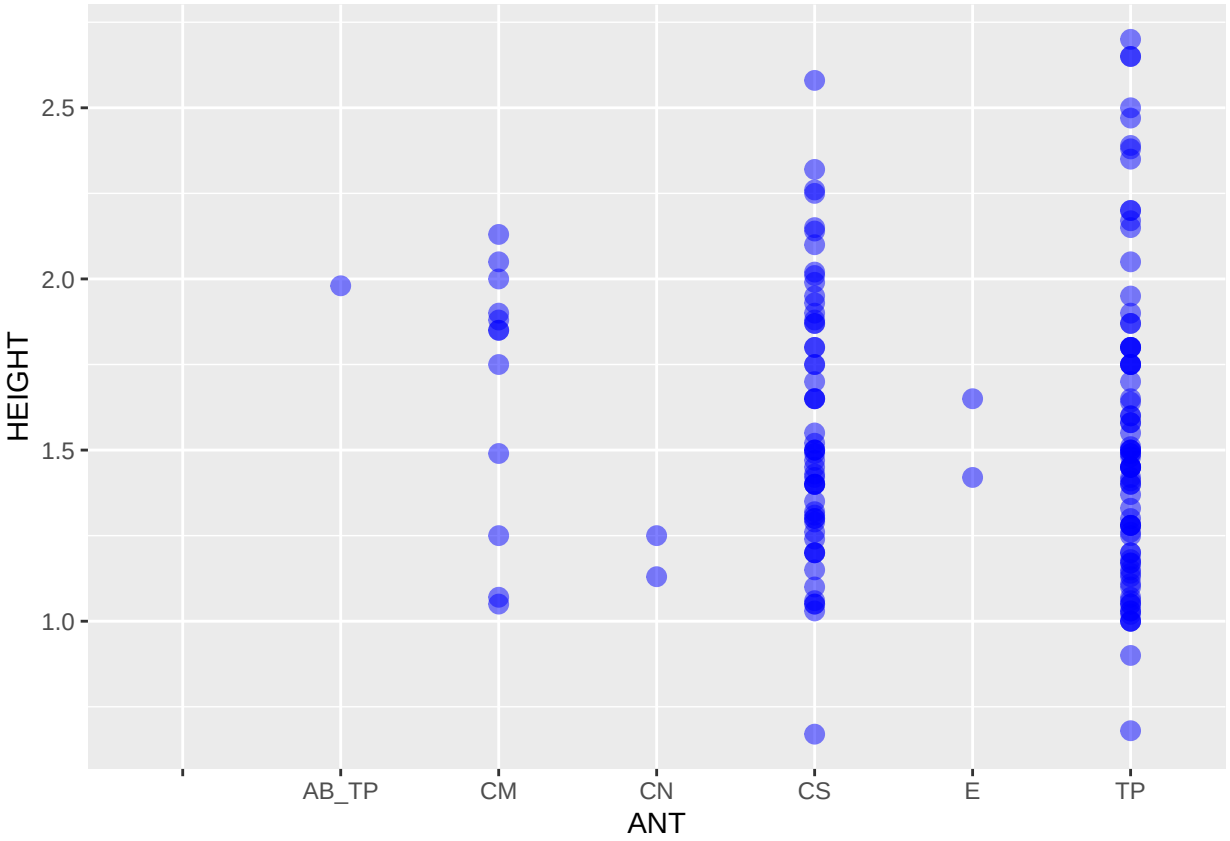
```
ggplot(data = acacia, mapping = aes(x = CIRC, y = HEIGHT)) +
geom_point(size = 3, color = "blue", alpha = 0.5) +
scale_y_log10() +
scale_x_log10() +
labs(xlab = "Circumference",
     ylab = "Canopy Diameter ")
```

```
## Warning: Removed 4 rows containing missing values (‘geom_point()‘).
```



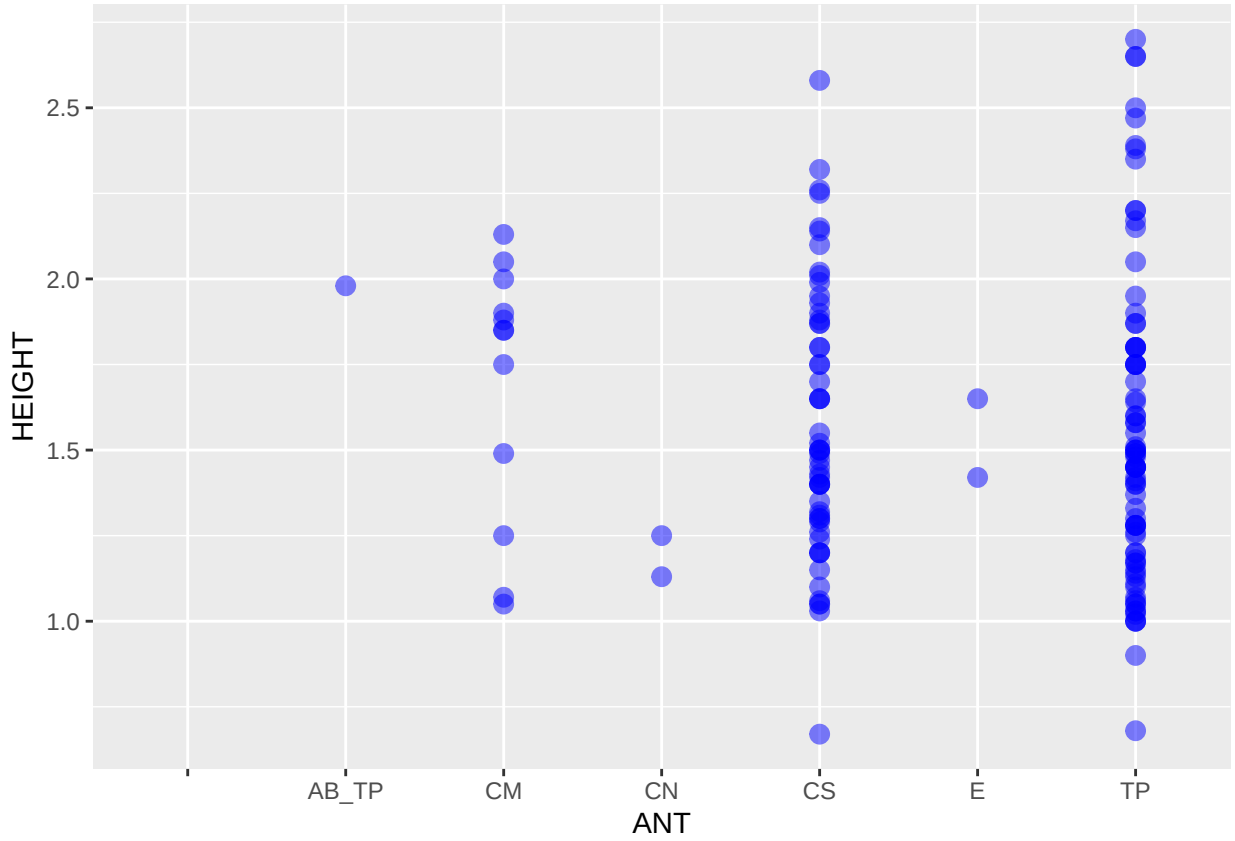

```
ggplot(data = acacia, mapping = aes(x = ANT, y = HEIGHT)) +
geom_point(size = 3, color = "blue", alpha = 0.5)
```

```
## Warning: Removed 4 rows containing missing values (‘geom_point()‘).
```




```
ggplot(data = acacia, mapping = aes(x = ANT, y = HEIGHT)) +
geom_point(size = 3, color = "blue", alpha = 0.5)
```

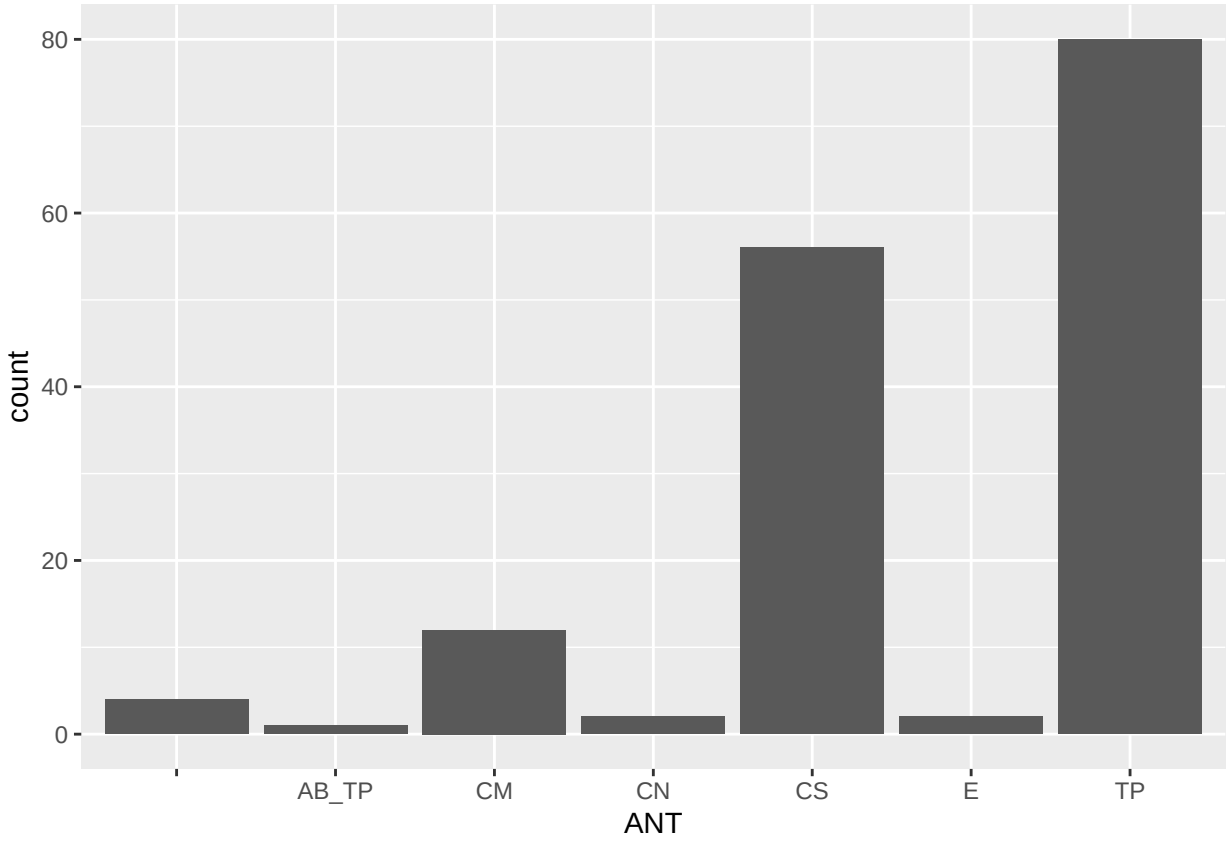
```
## Warning: Removed 4 rows containing missing values (‘geom_point()‘).
```




```
geom_smooth()
```

```
## geom_smooth: na.rm = FALSE, orientation = NA, se = TRUE
## stat_smooth: na.rm = FALSE, orientation = NA, se = TRUE
## position_identity
```

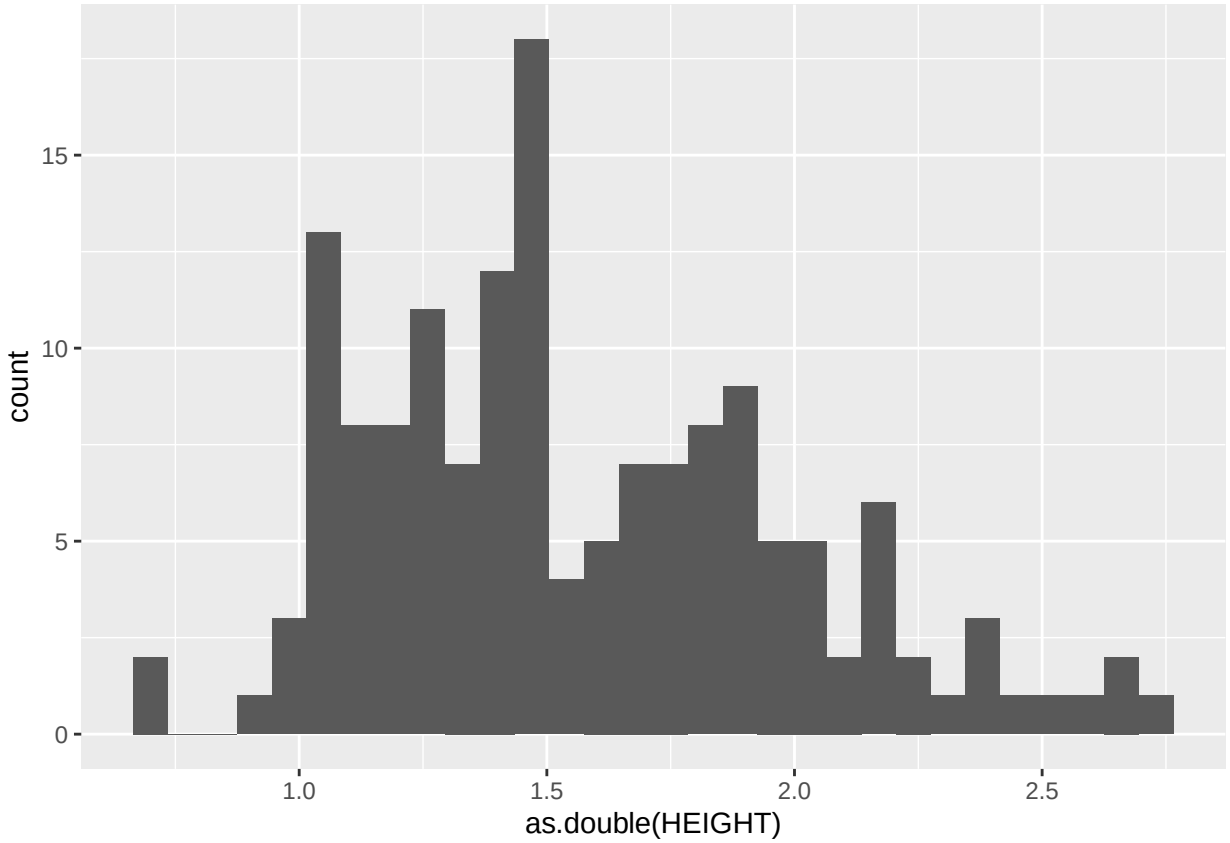
```
ggplot(data = acacia, mapping = aes(x = ANT)) +
  geom_bar()
```




```
ggplot(data = acacia, mapping = aes(x = as.double(HEIGHT))) +
  geom_histogram()
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

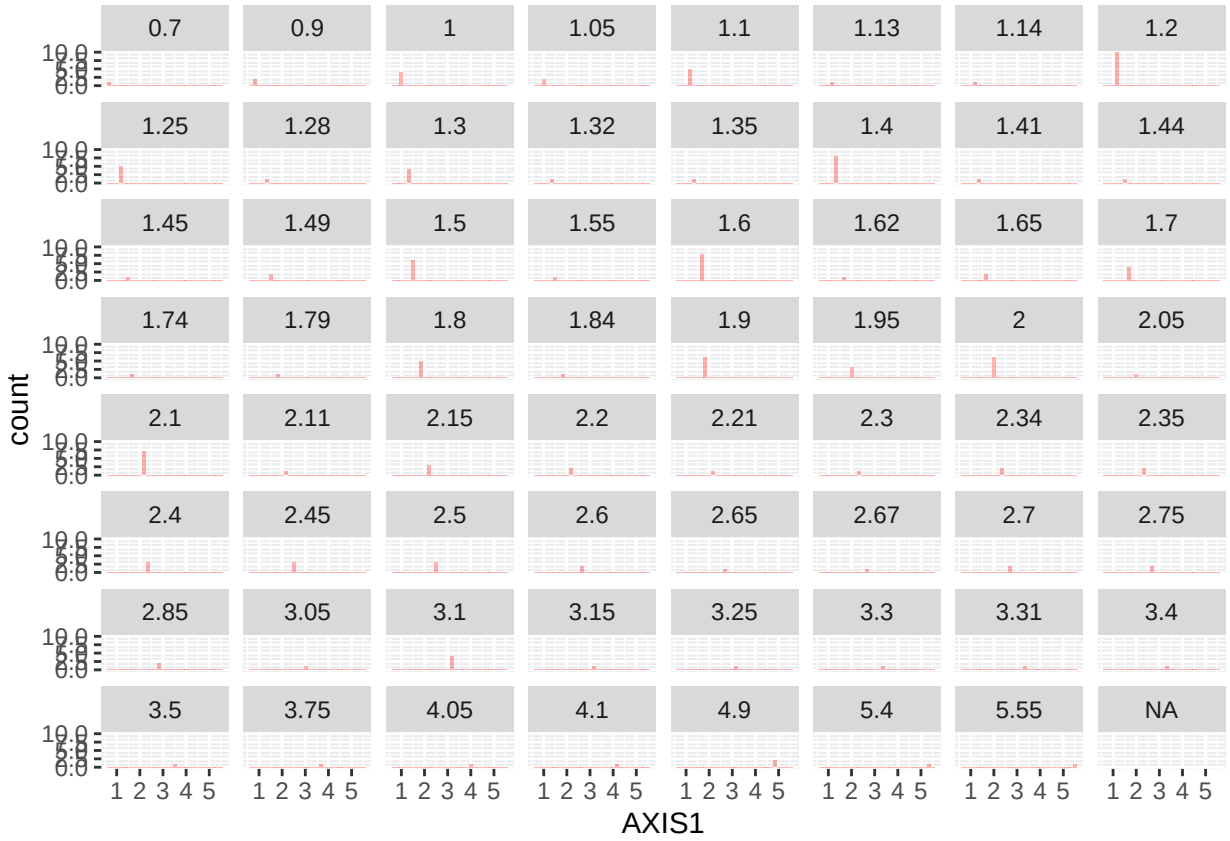
```
## Warning: Removed 4 rows containing non-finite values (`stat_bin()`).
```




```
ggplot(data = acacia, mapping = aes(x = AXIS1)) +
  geom_histogram(fill = "red", alpha = 0.3) + labs(xlab ="Canopy Diameter",ylab = "Number of Acacia") +
  facet_wrap(~AXIS1)
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

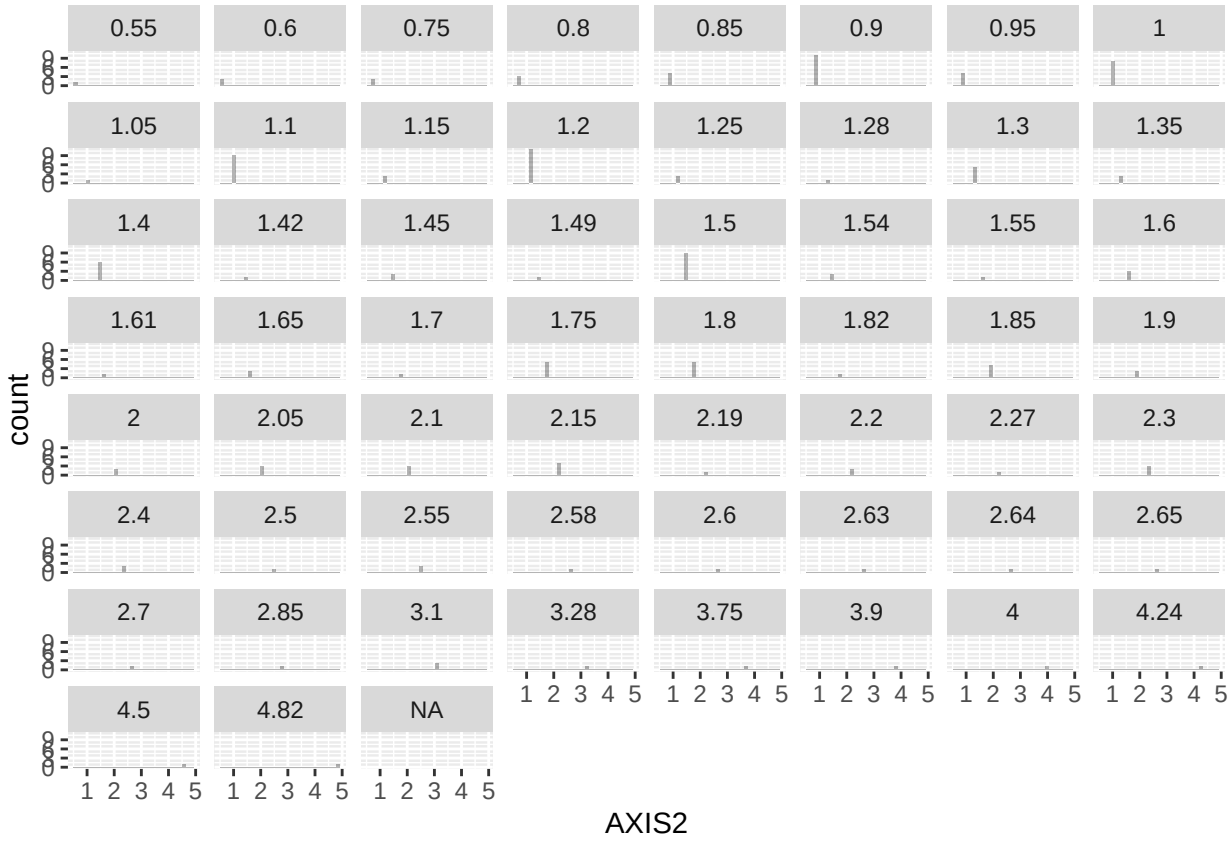
```
## Warning: Removed 4 rows containing non-finite values (`stat_bin()`).
```




```
ggplot(data = acacia, mapping = aes(x = AXIS2)) +
  geom_histogram(fill = "black", alpha = 0.3) + labs(xlab ="Canopy Diameter",ylab = "Number of Acacia") +
  facet_wrap(~AXIS2)
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

```
## Warning: Removed 4 rows containing non-finite values (`stat_bin()`).
```

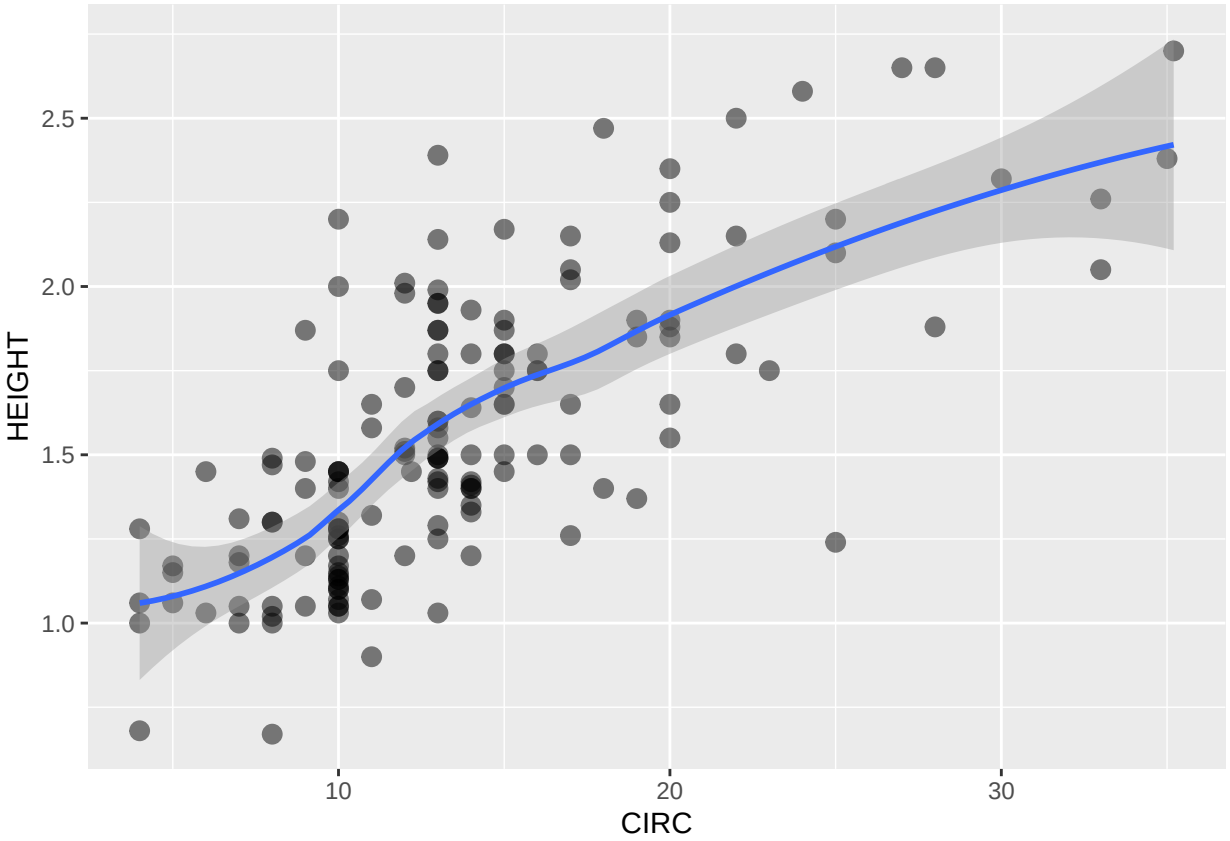



```r
ggplot(acacia, aes(x = CIRC, y = HEIGHT)) +
geom_point(size = 3, alpha = 0.5) +
geom_smooth()
```

```
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'
```

```
## Warning: Removed 4 rows containing non-finite values (`stat_smooth()`).
```

```
## Warning: Removed 4 rows containing missing values (`geom_point()`).
```



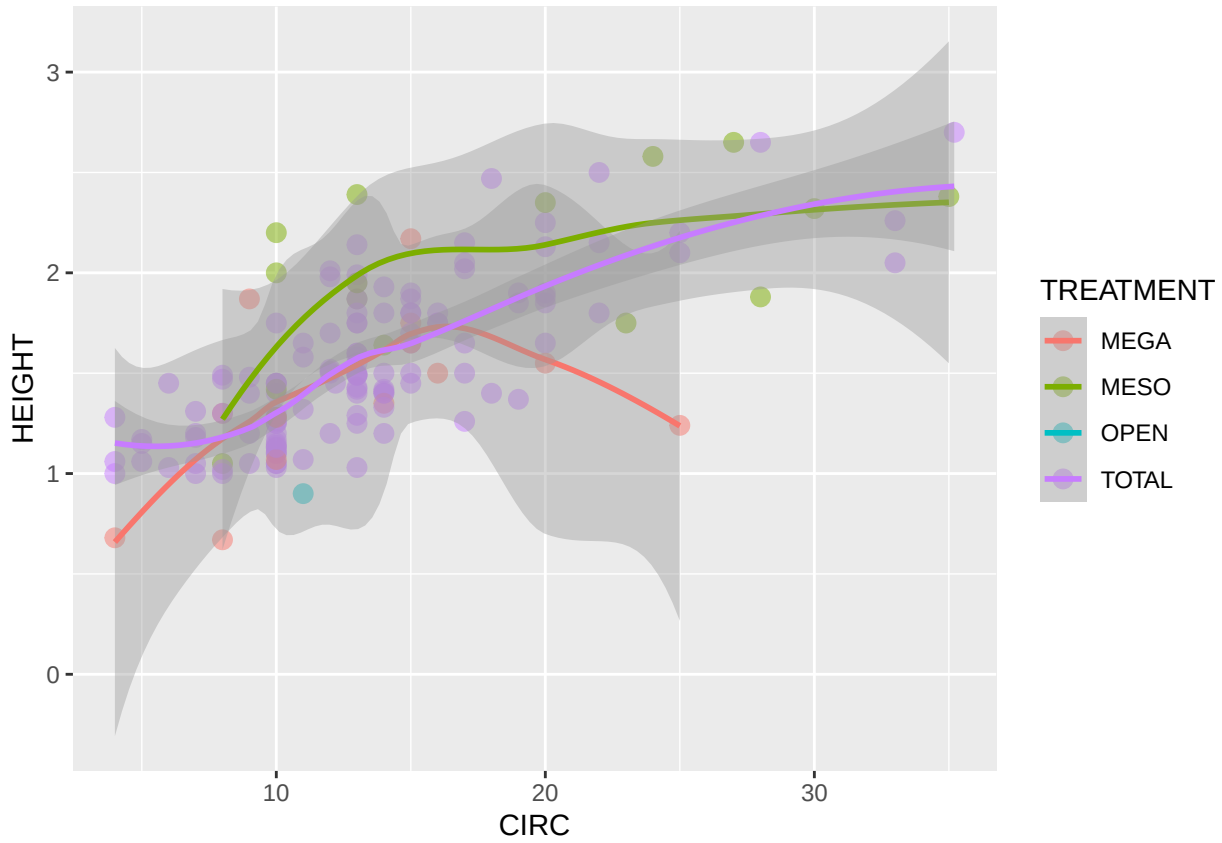
what happens when we fit a linear model to data grouped by treatment?

```
ggplot(acacia, aes(x = CIRC, y = HEIGHT, color = TREATMENT)) +
geom_point(size = 3, alpha = 0.5) +
geom_smooth()
```

```
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'
```

```
## Warning: Removed 4 rows containing non-finite values (`stat_smooth()`).
```

```
## Warning: Removed 4 rows containing missing values (`geom_point()`).
```



What happens is that there is a line of best fit and the data for each treatment

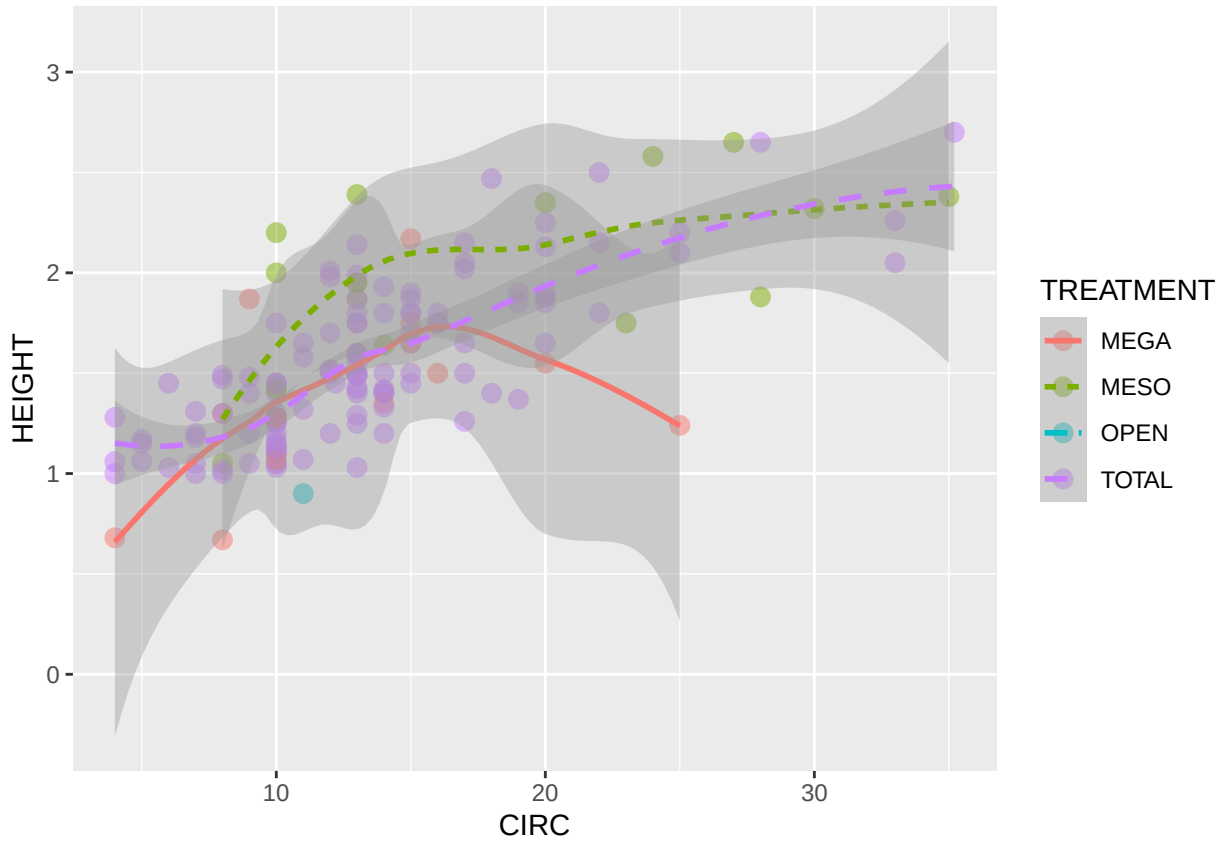
line type

```
ggplot(acacia, aes(x = CIRC, y = HEIGHT, color = TREATMENT, linetype = TREATMENT)) +
geom_point(size = 3, alpha = 0.5) +
geom_smooth()
```

```
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'
```

```
## Warning: Removed 4 rows containing non-finite values (`stat_smooth()`).
```

```
## Warning: Removed 4 rows containing missing values (`geom_point()`).
```



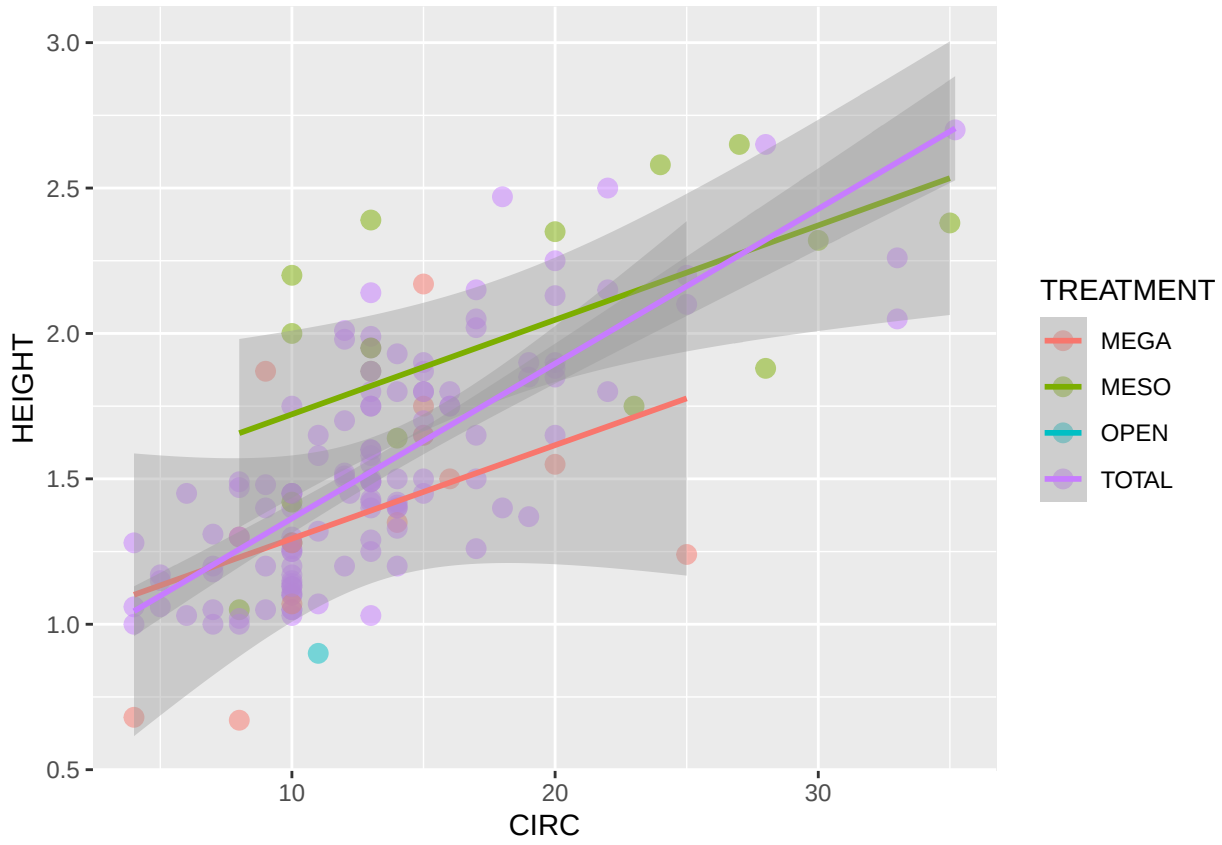
method = geom_smooth()

```
ggplot(acacia, aes(x = CIRC, y = HEIGHT, color = TREATMENT)) +
geom_point(size = 3, alpha = 0.5) +
geom_smooth(method = "lm") # try with "glm"
```

```
## `geom_smooth()` using formula = 'y ~ x'
```

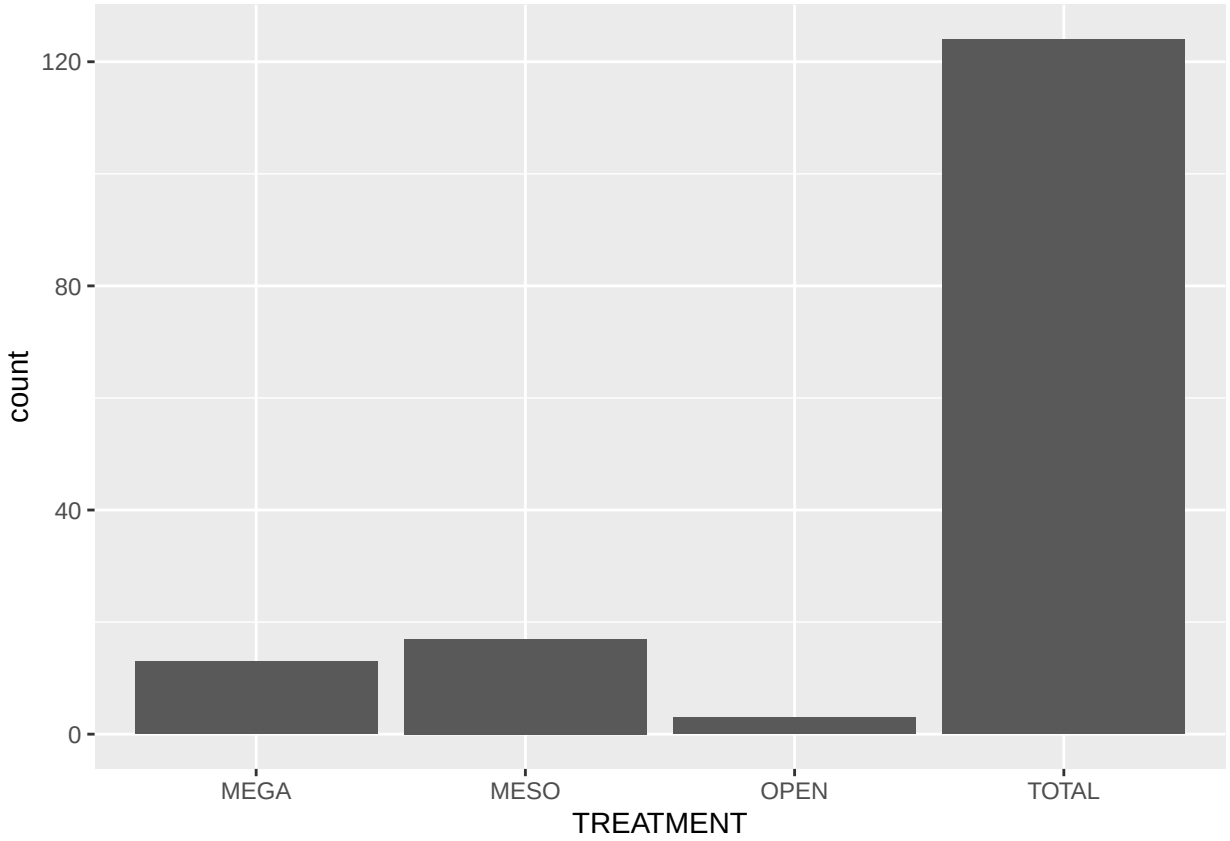
```
## Warning: Removed 4 rows containing non-finite values (`stat_smooth()`).
```

```
## Warning: Removed 4 rows containing missing values (`geom_point()`).
```



geom_bar

```
ggplot(data = acacia, mapping = aes(x = TREATMENT)) +
geom_bar()
```

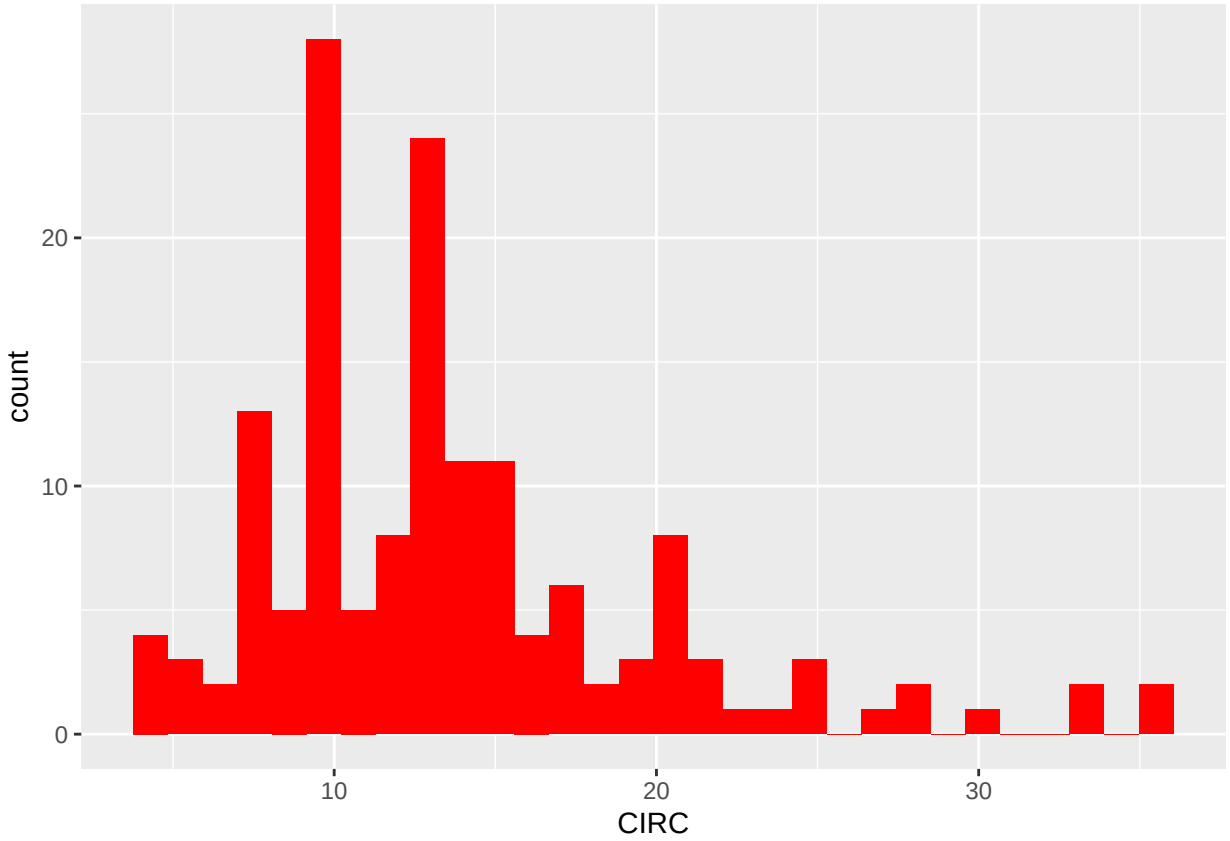


geom_histogram()

```
ggplot(acacia, aes(x = CIRC)) +
geom_histogram(fill = "red")
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

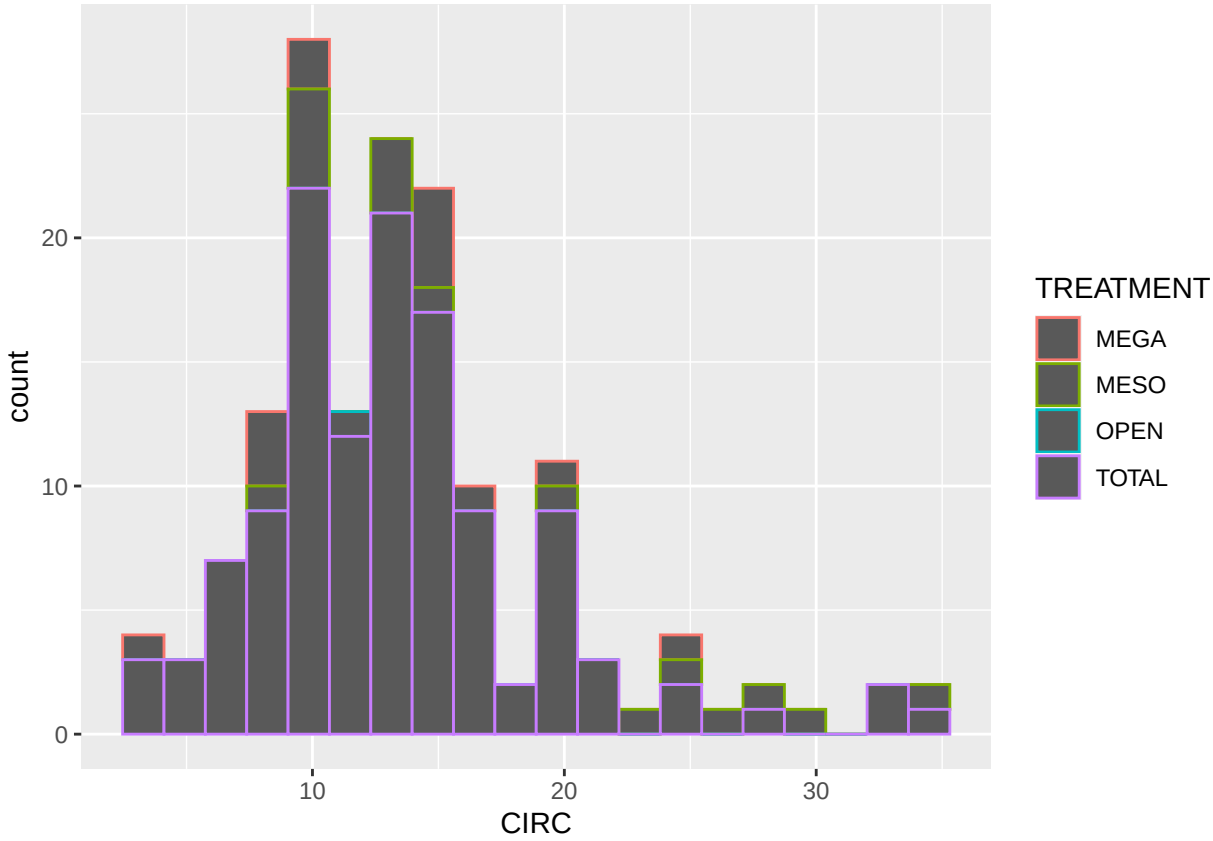
```
## Warning: Removed 4 rows containing non-finite values (`stat_bin()`).
```



proportion of data colored by treatment

```
ggplot(acacia, aes(x = CIRC, color = TREATMENT)) +
geom_histogram(bins = 20)
```

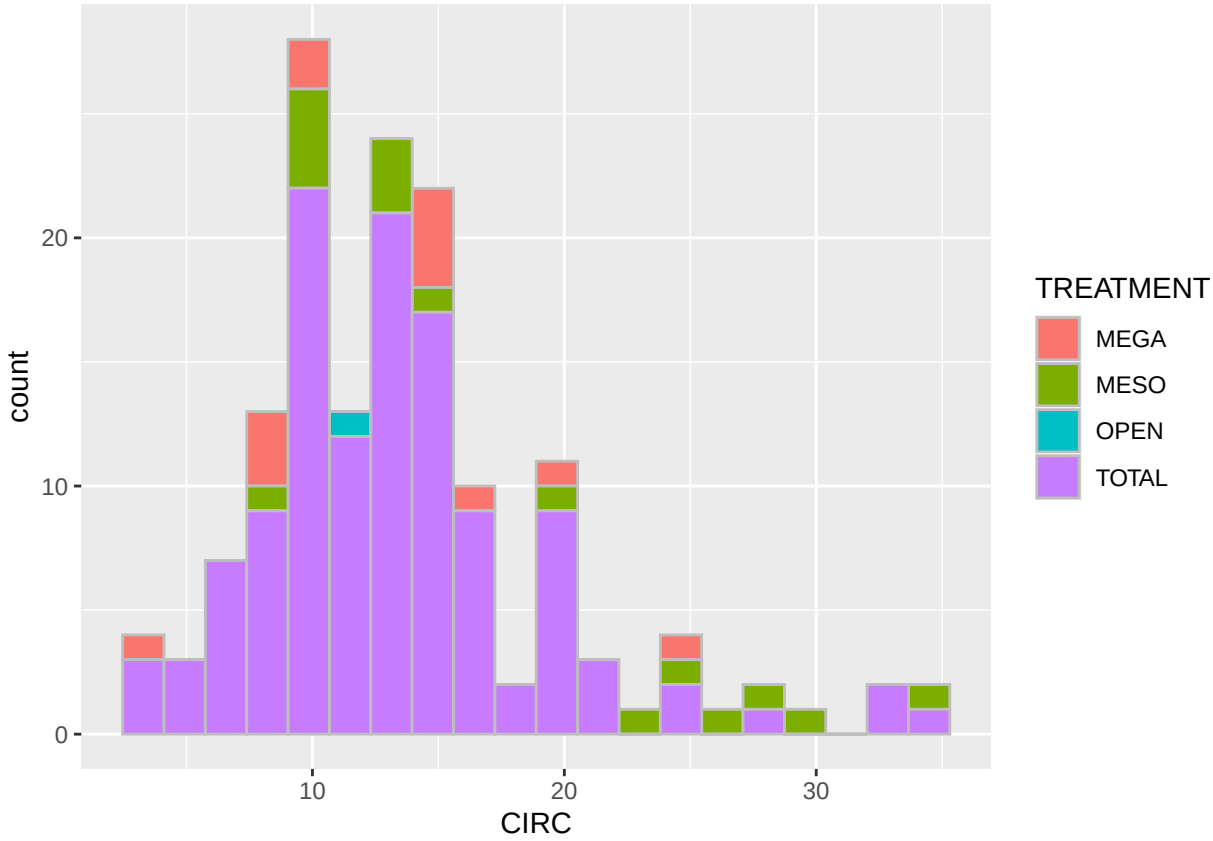
```
## Warning: Removed 4 rows containing non-finite values (‘stat_bin()‘).
```



assign color with gray outline

```
ggplot(acacia, aes(x = CIRC, fill = TREATMENT)) +
geom_histogram(bins = 20, color = "gray")
```

```
## Warning: Removed 4 rows containing non-finite values (‘stat_bin()‘).
```



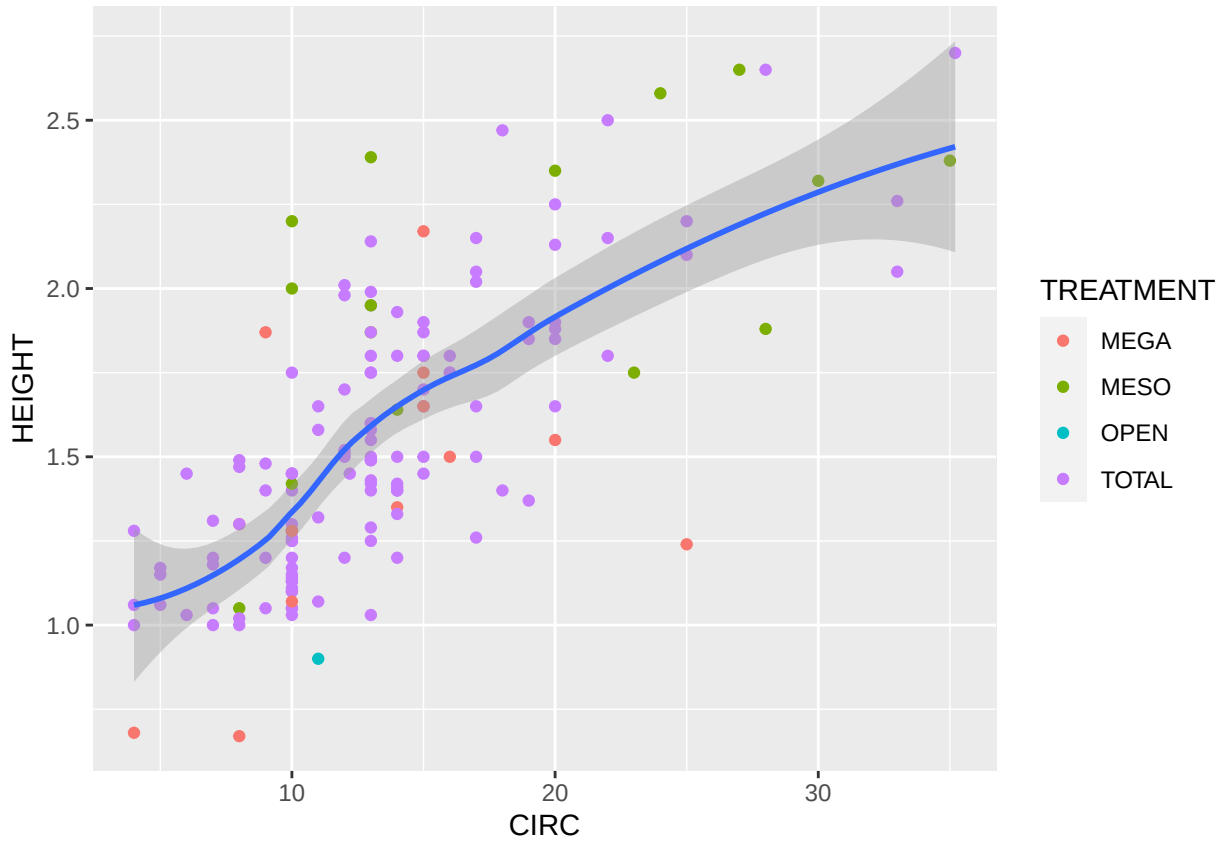
change these values across layers

```
ggplot() +
geom_point(data = acacia,
           mapping = aes(x = CIRC, y = HEIGHT,
                         color = TREATMENT)) +
geom_smooth(data = acacia,
            mapping = aes(x = CIRC, y = HEIGHT))
```

```
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'
```

```
## Warning: Removed 4 rows containing non-finite values (`stat_smooth()`).
```

```
## Warning: Removed 4 rows containing missing values (`geom_point()`).
```



plot categorical and continous data on same plot

```
ggplot() +
geom_point(data = acacia,
           mapping = aes(x = CIRC, y = HEIGHT,
                         color = TREATMENT)) +
geom_smooth(data = acacia,
            mapping = aes(x = CIRC, y = HEIGHT)) +
geom_histogram(data = acacia,
               mapping = aes(x = CIRC, color = TREATMENT),
               alpha = 0.1)
```

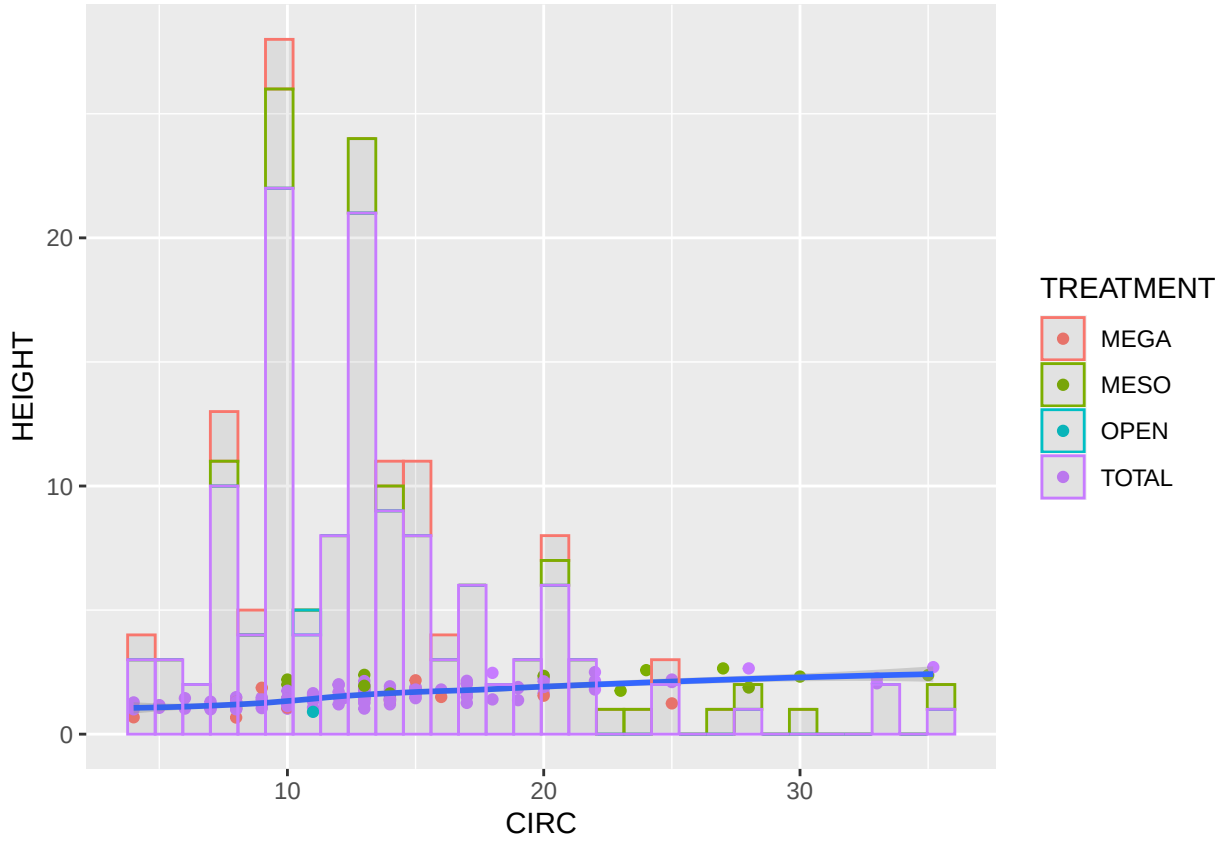
```
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'
```

```
## Warning: Removed 4 rows containing non-finite values (`stat_smooth()`).
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

```
## Warning: Removed 4 rows containing non-finite values (`stat_bin()`).
```

```
## Warning: Removed 4 rows containing missing values (`geom_point()`).
```



#gg save

```
ggsave("acacia_by_treatment.jpg")
```

```
## Saving 6.5 x 4.5 in image
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'

## Warning: Removed 4 rows containing non-finite values (`stat_smooth()`).

## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.

## Warning: Removed 4 rows containing non-finite values (`stat_bin()`).

## Warning: Removed 4 rows containing missing values (`geom_point()`).
```

size of image in inches

```
ggsave("acacia_by_treatment.pdf", height = 5, width = 5)
```

```
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'

## Warning: Removed 4 rows containing non-finite values (`stat_smooth()`).
```

```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.

## Warning: Removed 4 rows containing non-finite values (`stat_bin()`).

## Warning: Removed 4 rows containing missing values (`geom_point()`).
```