

artificial applied broadcast in April). All other pairwise comparisons show a significant difference.

A less conservative method of comparing all possible cell means was developed independently by Newman (1939) and Keuls (1952). This method is also based on the studentized range statistic, but is based on the range of the particular pair of means being compared, within the entire set of ordered means, rather than the range of the largest to smallest as Tukey's HSD. The means comparison using the student Newman-Keuls method can be made using the `Snk.test` function in the R package `agricolae` (de Mendiburu, 2012a). The arguments for the `Snk.test` function are similar to the `TukeyHSD` function and are illustrated below using the data from the sugar beet experiment.

```
> library(agricolae)
> compare <- SNK.test( mod4, "treat", alpha = 0.05 )
> print(compare)
```

A portion of the output is shown below.

```
$statistics
  MSerror Df Mean  CV
    2.11 14 45.7 3.18

$parameters
  test name.t ntr alpha
    SNK  treat   4 0.05

$comparison
NULL

$groups
  yield groups
C 48.8      a
D 48.7      a
B 45.0      b
A 38.7      c
```

In the last section of output, means with the same Group indicator on the left are not significantly different. This shows the sugar beet yield for treatment (C—artificial applied broadcast in January) is not significantly different than the yield for treatment (D—artificial applied broadcast in April). All other pairwise comparisons show a significant difference (in this case same results as Tukey's HSD method).

The last section of the output of the `Snk.test` function illustrates a compact way of presenting the significant differences in treatment means that