

Scheffé Test for Multiple Comparisons

José Maurício Schneedorf Ferreira da Silva

2026-02-18

The *Scheffé test* is a post-hoc procedure based on the F-Snedecor distribution, used to compare a specific group against others in a sample. As a post-hoc method, it follows an ANOVA and allows the comparison of **any linear contrast of means**. It is often considered more general than the Tukey test, although it is more conservative and has lower statistical power.

1 Equation

For pairwise mean differences, the minimum significant difference under Scheffé's criterion may be expressed as:

$$dmS = \sqrt{(k-1)_\alpha} * \sqrt{\frac{2 * qmr}{k-1}}$$

Where:

- dm_S = minimum significant difference (Scheffé)
- k = number of groups
- n = total number of observations
- qmr = mean square of residuals (from ANOVA)
- r = number of observations per group
- $F_{\alpha, (k-1, n-k)}$ = critical F value at significance level α

To determine whether a given contrast is significant, the following statistic is evaluated:

$$S = \sqrt{(k - 1) * V_L * F}$$

Where:

- S = critical Scheffé value
- F = value from the F-Snedecor distribution
- V_L = variance of the contrast vector

2 Files

1. Program;
2. ANOVA program;
3. Example;
4. Source code;
5. This tutorial

3 Use and example

Data must be entered as a matrix, with the group to be compared placed in the last column vector.

```
# Input:
1. Enter the data matrix;
2. Run the program "1ANAVA1matrix";
3. Run the program "Schf1matrix".

# Output:
```

1. "contrst" - contrast value;
2. "Fval" - F distribution value;
3. "Schf5%" - critical value of the test (= 0.05);
4. "dmS" - minimum significant difference.

The logic of the Scheffé test consists of calculating the contrast value (vector of mean differences) pairwise (one selected group versus each of the others), and comparing it to the predicted value from the F distribution at $\alpha = 0.05$ (5%).

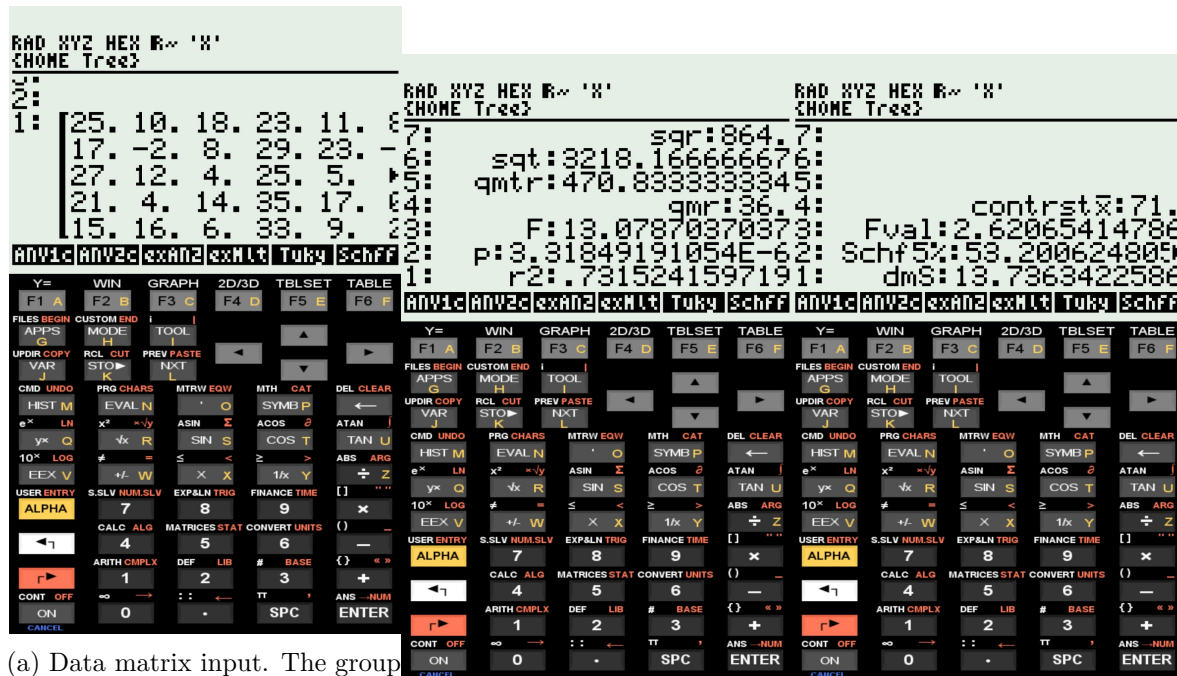


Figure 1: Program *Schf1matrix* running on the Android HP50G emulator (Go49gp), showing data entry, ANOVA, and Scheffé test results.

The results produced by *Schf1matrix* agree with the published example in Vieira (2026), yielding $Schf5\% = 53.20$ compared to 5.194 reported in the source.

4 References

1. Vieira, Sônia. *Beyond F: Accurate Comparisons with the Scheffé Test*. Blogspot, 2016. Accessed Feb 18, 2026.

Author

José Maurício Schneedorf Ferreira da Silva
Dept. Biochemistry, Institute of Biomedical Sciences
Federal University of Alfenas - UNIFAL-MG, Brazil
Email: jose.dasilva@unifal-mg.edu.br

Site: <https://bioquanti.netlify.app>
Lattes: <http://lattes.cnpq.br/0436922594542722>
ORCID: 0000-0002-2031-6315