

Tukey1matrix - Multiple Comparisons Using Tukey's HSD Test

José Maurício Schneedorf Ferreira da Silva

2026-02-10

Tukey's HSD (*Honestly Significant Difference*) test is one of the most widely used *post-hoc* procedures when the goal is to determine whether there are statistically distinct group(s) within a sample, based on pairwise comparisons. As with other *post-hoc* tests, Tukey's HSD is performed after conducting an ANOVA.

It is considered a conservative test and relies on the *studentized range* distribution (q table). The standard Tukey–HSD test is applied when groups have equal sample sizes. For unequal group sizes, its extension—the *Tukey–Kramer* test—is used.

1 Equation:

$$HSD = q_{(df,k)} \frac{qmr}{r}$$

Where:

- df = degrees of freedom of the sample ($n - k$);
- k = number of groups;
- qmr = mean square of residuals;
- q = critical value from the studentized range distribution (q -critical).

2 Files:

1. Program
2. q -critical table (HP50)
3. q -critical table (PDF)

4. ANOVA Program (HP50)
5. Source code
6. This tutorial

3 Usage and example

```
# Input:
1. Enter a matrix containing the dataset;
2. Run the program "1ANOVA1matrix";
3. Run the program "Tukey1matrix".

# Output:
1. "qcrit5%" - value from the *q* distribution;
2. "HSD" - minimum significant difference;
3. Matrix containing comparison values for each pair of groups.
```

Pairs are considered significantly different when:

$$\Delta AB > HSD$$

The results are identical to those reported in the reference source (Vieira, 2000).

4 References:

1. Vieira, Sônia. *Analysis of Variance: ANOVA*. Atlas Publishing, 2000.

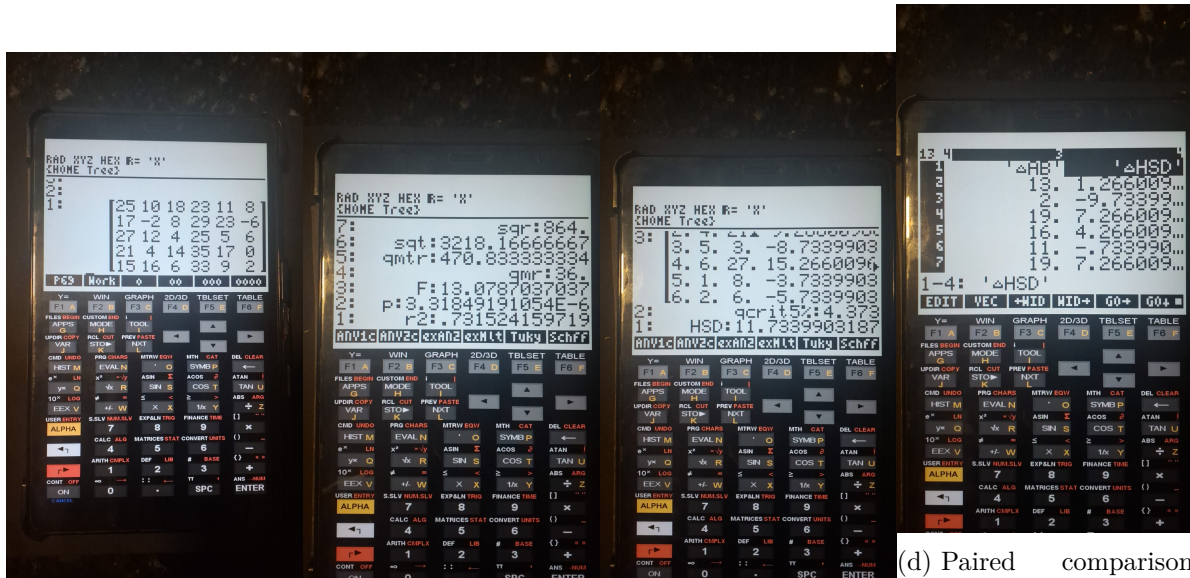


Figure 1: *Tukey1matrix* program running on the Android version of the HP50G calculator (Go49gp), showing data input, ANOVA, test results, and the pairwise comparison table. The table (matrix) contains columns A , B , ΔAB , and ΔHSD .

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