

Practical No. 8 : Kruskal-Wallis H test

A study was conducted to see which of the four colors attracts cereal leaf beetles. Here are the data:

Color	Insects Trapped						
Lemon yellow	45	59	48	46	38	47	52
White	21	12	14	17	13	17	16
Green	37	32	15	25	39	41	35
Blue	16	11	20	21	14	7	10

Enter this data in Minitab and generate the following reports:

Questions :

- What hypotheses does Kruskal-Wallis test?
- Find the median number of beetles trapped by boards of each color. Which colors appear more effective?
- Use the Kruskal Wallis test to see if there are significant differences among the colors. What do you conclude?

Solution :

Step 1 : Type your data into the data pane of a worksheet. Make sure you put your data into columns. Use column header for "Insect Trapped" and "Color". Type the "Insect Trapped" data into column C1 and "Color" data into column C2-T.

Step 2 : To perform Kruskal-Wallis H test, under the drop-down menu "STAT", choose "Nonparametrics" then "Kruskal-Wallis...". A "Kruskal-Wallis" dialogue box will appear. Set the "Response:" as "C1 Insect Trapped" and "Factor:" as "C2 Color" from the table on the left. Click "OK".

Step 3 : For the descriptive statistics, under the drop-down menu "Stat", choose "Basic Statistics" then "Display Descriptive Statistics...". A "Display Descriptive Statistics" dialogue box will appear. In the "Variables:" box, choose "C1 Insect Trapped" and in the "By variable (optional):" box, choose "C2 Color" from the table on the left. Click the "Statistics..." option. A "Display Descriptive Statistics: Statistics" dialogue box will appear. Check the "Mean", "Minimum", "Maximum", "First quartile", "Median" and "Third quartile" checkboxes. Click "OK".

Step 4 : Click the "Graphs..." option. Click "OK". Check the "Boxplot of data" option. Click "OK". Click "OK" again. The following boxplot will be generated.

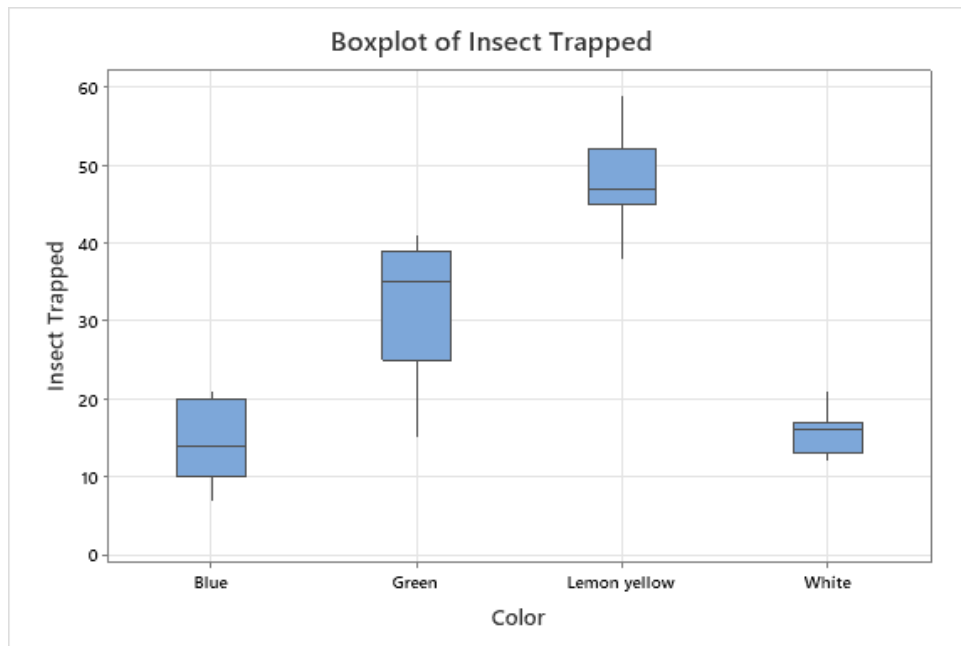


Fig 1 : Boxplot of Insect Trapped

Interpretation :

From the boxplot, it is seen that in terms of variability, the most variable color category is green, and the least variable color category is white. In terms of shape, the color blue is almost symmetrical, while the color blue is highly left skewed. The color lemon yellow is right skewed, and color white is somewhat right skewed.

Descriptive Statistics :

Variable	Color	Mean	Minimum	Q1	Median	Q3	Maximum
Insect Trapped	Blue	14.14	7.00	10.00	14.00	20.00	21.00
	Green	32.00	15.00	25.00	35.00	39.00	41.00
	Lemon yellow	47.86	38.00	45.00	47.00	52.00	59.00
	White	15.71	12.00	13.00	16.00	17.00	21.00

Interpretation :

The cereal leaf beetles are most attracted to the color lemon yellow (median = 47), the next to which is the color is green (median = 35). The least attractive colors are blue (median = 14) and white (median = 16). Clearly there are three groups or clusters: lemon yellow (most popular), green (moderately popular) and blue and white (least popular).

Descriptive Statistics :

Color	N	Median	Mean Rank	Z-Value
Blue	7	14	7.1	-2.76
Green	7	35	17.3	1.03
Lemon yellow	7	47	24.7	3.79
White	7	16	8.9	-2.07
Overall	28		14.5	

Hypothesis :

Null hypothesis H_0 : All medians are equal
 Alternative hypothesis H_1 : At least one median is different

Test :

Method	DF	H-Value	p-value
Not adjusted for ties	3	20.52	0.000
Adjusted for ties	3	20.54	0.000

Conclusion :

The Kruskal-Wallis H test is a non-parametric statistical test that examines whether there are significant differences between the medians of three or more independent groups. Since the p-value of the test (0.0000) is much smaller than significance probability (0.05), we strongly reject the null hypothesis at 5 % level of significance. The median no. of insects trapped using different colors is not the same i.e. there is a significant difference in the median no. of insects trapped using various colors.

Worksheet :

↓	C1	C2-T	C3
	Insect Trapped	Color	
1	45	Lemon yellow	
2	59	Lemon yellow	
3	48	Lemon yellow	
4	46	Lemon yellow	
5	38	Lemon yellow	
6	47	Lemon yellow	
7	52	Lemon yellow	
8	21	White	
9	12	White	
10	14	White	
11	17	White	
12	13	White	
13	17	White	
14	16	White	
15	37	Green	
16	32	Green	
17	15	Green	
18	25	Green	
19	39	Green	
20	41	Green	
21	35	Green	
22	16	Blue	
23	11	Blue	
24	20	Blue	
25	21	Blue	
26	14	Blue	
27	7	Blue	
28	10	Blue	