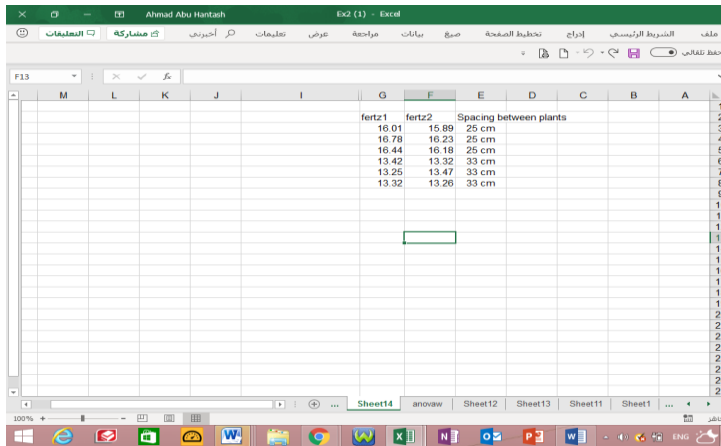


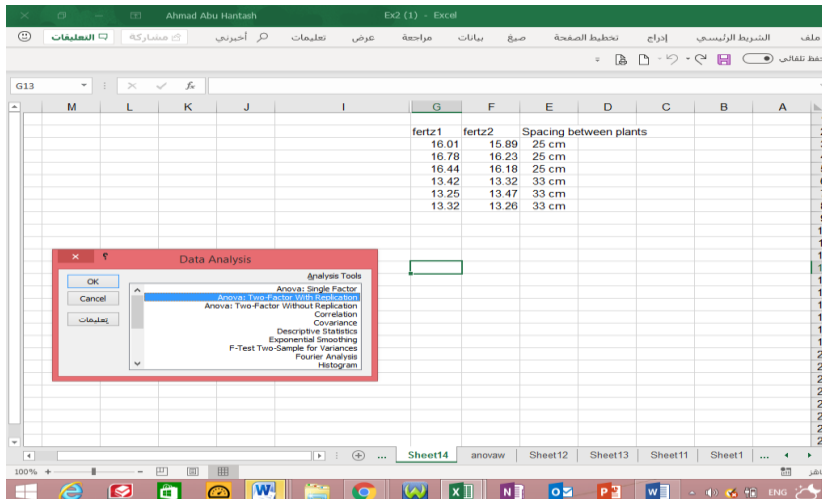
In a study on fertilizer levels and spacing between plants, plots were assigned to combinations and the yield of potatoes (in kg/plot) was measured

Spacing between plants	Fertilizer level (in tons/ha)	
	1	2
25 cm	16.01	15.89
	16.78	16.23
	16.44	16.18
33 cm	13.42	13.32
	13.25	13.47
	13.32	13.26

Make all appropriate tests ( $\alpha=0.05$ )



\*Data analyze ..... Anova :Two factor with replication



Excel interface showing a data table and the 'Anova: Two-Factor With Replication' dialog box.

	fertz1	fertz2	Spacing between plants
16.01	15.89	25 cm	
16.78	16.23	25 cm	
16.44	16.18	25 cm	
13.42	13.32	33 cm	
13.25	13.47	33 cm	
13.32	13.26	33 cm	

**Anova: Two-Factor With Replication**

Input Range: \$E\$2:\$G\$8  
 Rows per sample: 3  
 Alpha: 0.05

Output options:  
 Output Range:   
 New Worksheet By:  New Worksheet  New Workbook

Excel interface showing the ANOVA results table.

Source of Variation	SS	df	MS	F	P-value	F crit
Spacing between plants	25.4917	1	25.4917	505.787	1.6E-08	5.31766
Fertilizer level	0.06308	1	0.06308	1.25149	0.29573	5.31766
Interaction	0.08167	1	0.08167	1.62054	0.23876	5.31766
Within	0.4032	8	0.0504			
Total	26.0396	11				

1) Test for Spacing between plants:

$H_0$ : The spacing having same effect

$H_1$ : at least one of the spacing having different effect

Then ,

$H_0: \alpha_{25cm} = \alpha_{35cm}$

$H_1$ : at least one of the means is different

Results:

$F = 505.787$

$F\text{-critical} = 5.317$

$p\text{-value} = 1.6E-8$

Conclusion :

Since  $P\text{-value} < \alpha$ , (  $0 < 0.05$  ) ,then we

reject  $H_0$  (Accept  $H_1$  : There is at least one of the means is different )

2) Test for Spacing between plants:

$H_0$ : The fertilizer having same effect

$H_1$ : at least one of the fertilizer having different effect

Then ,

$H_0: \beta_1 = \beta_2$

$H_1$ : at least one of the means is different

Results:

$F = 1.25149$

$F\text{-critical} = 5.317$

$p\text{-value} = 0.29573$

Conclusion :

Since  $P\text{-value} > \alpha$ , (  $0.29573 > 0.05$  ) ,then we

accept  $H_0$ : There is no significant different between fertilizer

3) Test interaction :

$H_0$ : There is no interaction between spacing and fertilizer

$H_1$ : There is interaction between spacing and fertilizer

Then ,

$$H_0: \alpha\beta_{25,1} = \alpha\beta_{35,2} = \alpha\beta_{25,2} = \alpha\beta_{35,1}$$

$H_1$ : at least one of the means is different

Results:

$$F = 1.62054$$

$$F\text{-critical} = 5.317$$

$$p\text{-value} = 0.23785$$

Conclusion :

Since  $P\text{-value} > \alpha$ , (  $0.23785 > 0.05$  ) , then we accept  $H_0$ : There is no interaction between spacing and fertilizer