TALKING ABOUT THE DESIGNS

Revision for designs

REVISION FOR DESIGNS

- Designs can be dependent or independent

- Designs can be:

(1) simple random sample design,

(2) before-after design,

(3) matched-pair design,

(4) completely randomized design,

(5) randomized complete block design

Tests

- A single random sample can be test a hypothesised mean value. (One sample t test or z test)

- Testing two matched groups. There is a structure (pairing or a before and after measurements) – due to a design element in the study. The analysis of this is very similar to a one sample t test. There is a dependence between the two group measurements.

- Two random samples can be comparing to find if they are similar or the difference (Two Sample t test or z test)

- More than two samples can be tested (ANOVA)

SCENARIO A SLIDE 1

A survey was conducted in an area around town A to estimate the average income of farmers. Thirty farmers were selected at random. Right Click on the most appropriate answer.

1. Explain how you might randomly sample a village in practice?

   - number all farmers by location then choose every 4th;

   - all the farmers names into a hat and pull out 30 farmers' names;

   - pick 2 farmers from each type of farming;

   - chose all the farmers from one side of the town

SCENARIO A SLIDE 2

2.   What could bias an income estimate of farmers?

Click most appropriate answer

- the farmers chosen were within the same location

- all 30 farmers lived fair distances apart

- Specifically choosing each types of farming carried out around the town

SCENARIO A QUESTION 3

3. What is the research question? Click on the correct answer

- the average farmer's income is similar

- the average farmer's income is dissimilar

- the farmers farm similar commodities

- the types of farming are dissimilarly

- the average income of the farmers

THE AVERAGE FARMER'S INCOME IS SIMILAR

- The research question was what you wanted to find out, what you are interested in

- Go back to the question

THE AVERAGE FARMER'S INCOME IS DISSIMILAR

- The research question was what you wanted to find out, what you are interested in

- Go back to the question

THE FARMERS FARM SIMILAR COMMODITIES

- The research question was what you wanted to find out, what you are interested in

- Go back to the question

THE FARMERS FARM DISSIMILARLY

- The research question was what you wanted to find out, what you are interested in (hint check question 1)

- Go back to the question

THE AVERAGE INCOME OF THE FARMERS

- Correct this is what the survey was trying to find out.

- Go onto the next question

SCENARIO A SLIDE 4

4. What is the design structure of this experiment? Click on the correct answer

- matching

- blocking

- paired

- single sample

SCENARIO B (FORESTRY)

- A survey was conducted on a forestry plantation in Laos to estimate the average annual growth of teak between 5 and 6 years from the establishment of the plantation. Twenty trees were selected at random and their heights (H) and diameters (D) were measured at year 5 and year 6 after the establishment of the plantation. For each tree, the height and diameter were converted into the stem volume (V) by using the simple formula $V = D^2H$. The calculations were done at year 5 and 6 for each tree.

SCENARIO B FORESTRY LAYOUT

SCENARIO B SLIDE 1

1. What is the research question?

- the volume of the trees was the same for all trees

- the rate of growth was the same for all trees

- The diameter of the trees is not the same for all trees

- The height of the trees is not the same for all trees

SCENARIO B SLIDE 2

2. What are the measurements used for the analysis?

- height of trees

- Diameter of trees

- Volume of trees

- Growth of trees

SCENARIO B SLIDE 3

2. What structure (e.g. matching, blocking) of design is this?

- [Paired](#)

- [Matching](#)

- [Single sample](#)

- [Two samples](#)

- [More than two samples](#)

SCENARIO B SLIDE 4

- Now how would you analysis this?

- ANOVA,

- 1 sample t test,

- 1 sample z test,

- 2 sample t test,

- paired t test

-

ANOVA

- Not correct the measurements used are on the same tree only twice

- Go back to the question

1 SAMPLE T TEST

- Not correct the measurements used are on the same tree but taken twice

- Go back to the question

1 SAMPLE Z TEST

- Not correct the measurements used are on the same tree

- Go back to the question

2 SAMPLE T TEST

- Not correct the measurements used are on the same tree

- Go back to the question

PAIRED T TEST

- Yes, you would analysis this as a Paired t test because the measurements used in the analysis come from the same tree volumes just on at different times

- Go to the next question

SCENARIO B SLIDE 5

4. Write the test statistic you would use to test this design etc.

SCENARIO B SLIDE 6

4. What are the degrees of freedom for the test?

- 2,
- 10,
- 9,
- 19,
- 20,
- 40,

SCENARIO B SLIDE 5

5. Find the critical value you would compare your test statistic against.

- t(0.95,20),

- t(0.95, 10),

- t(0.95, 19),

- t(0.95, 40))

ONE SAMPLE T TEST

- What is the research question?

- What structure (e.g. matching, blocking) of design is this?

- What are the measurements being collected?

- In factorials designs what are the relevant factorials?

- Now how would you analysis this?

- Write the test statistic you would use to test this design etc.

- What are the degrees of freedom for the test?

- Find the critical value you would compare your test statistic against.

- Correct this is a one sample - This particular design is one group or sample compared to a proposed mean.

QUESTION 2

A. Research question: Does a new Variety of wheat (A) have a similar yield to the recommend variety of wheat (B)?

❖ Left click on appropriate design

1. (Independent design)

2. (Dependent design)

Variety A	Variety B	Variety A
Variety B	Variety A	Variety B
Variety A	Variety B	Variety A
Variety A	Variety B	Variety B

QUESTION 2 A

❖ **Null Hypothesis (click appropriate hypothesis)**

1. A new Variety of wheat (A) has a similar yield to the recommend variety of wheat (B)

2. A new variety of wheat (A) has a better yield to the recommended variety of wheat (B)

QUESTION 3

- You are told of a known mean, μ_0 and asked if "your" sample mean, $\bar{x}$ is similar

- μ_0 = 12 microns

- You have 10 measurements of 9, 10, 13,16, 15, 17, 10, 12, 8, and 7 microns

  your mean, $\bar{x}$ = 11.7 microns

Left click on appropriate design

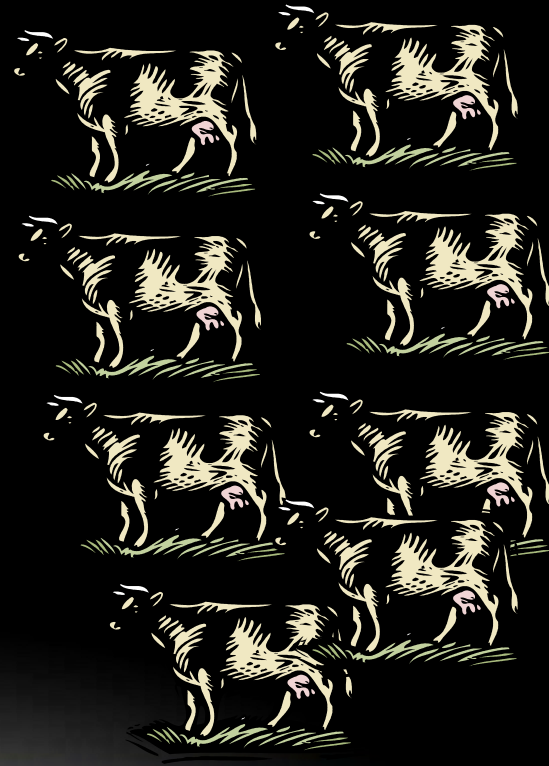1. (Dependent design)
2. (Independent design)

QUESTION 4

RESEARCH QUESTION: DOES THE VACCINATION INCREASE MILK YIELD?
EXPERIMENTAL DESIGN

Group of vaccinated cows

Group of non vaccinated cows

QUESTION 4 A

From previous slide of cows

- Research Question: Does the vaccination increase milk yield?
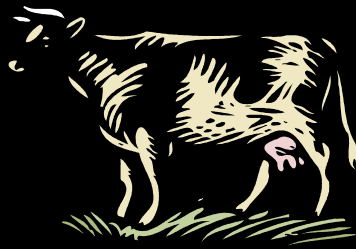
Left click on appropriate design

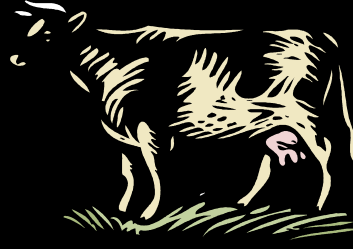1. (Dependent design)
2. (Independent design)

QUESTION 5

EACH COW HAS ONE MEASUREMENT (B) TAKEN THEN THEY WERE VACCINATED WITH VACCINE R. TWO WEEKS AFTER VACCINATION ANOTHER MEASUREMENT (A) WAS TAKEN
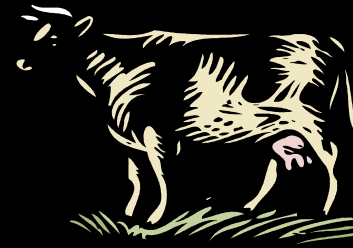

- Cow 1

Cow 2

Cow 3

- Cow 4

Cow 5

Cow 6

QUESTION 5 A

A Each cow has one measurement (B) taken then they were vaccinated with vaccine R. Two weeks after vaccination another measurement (A) was taken

Left click on appropriate design

1. (Dependent design)

2. (Independent design)

QUESTION 5B

Alternative Hypothesis is

Click the appropriate
1. The milk yield of the cows does not change after the vaccine R

2. The milk yield of the cows does change after the vaccine R

QUESTION 6

- Each of the 8 dogs with eye infections in both eyes were treated with eye drop C in the left eye and eye drop E in the right eye

Dog 1

Dog 2

Dog 3

Dog 4

Dog 5

Dog 6

Dog 7

Dog 8

QUESTION 6A

The research question: Does eye drop C clear eye infections better than eye drop E

Left click on appropriate design

1. (Dependent design)
2. (Independent design)

QUESTION 7

Assumptions for a t test

Left click on the appropriate assumptions required

1. Random collection of data,

2. independent sampling,

3. data follows a normal distribution

4. All of the above

5. The p-vale is less than the significance level

6. The test statistic is greater than the critical value

QUESTION 8

- Research Question: Does treatment A clear water better than treatment B in fish tanks?

- Are the assumptions for a t test meet with this design?

A	B	A
B	A	B
A	B	A
B	A	B
B	A	A
A	B	B

- Click correct answer

- The assumptions for a t test are met

- The assumptions for a t test are not met

- Click correct t test

- Two sample

- One sample

- Paired

HYPOTHESIS TESTING

There three ways to check whether a test is significant of not

- Check confidence Interval

- P-value

- Test statistic

QUESTION 9

Click the correct statements

1. The null hypothesis is the both varieties of corn have a similar yield

2. If the p-value is greater than the significance level of 0.05 the test is significant

3. If the test statistic is less than the critical value the test is significant.

4. If the test statistic is 4.5 and the critical value is 1.812 the test is not significant.

QUESTION 10

Two varieties (VA and VB) of peanut grown in 10 plots each were tested to find which yielded more peanuts.

Plot 1 VA	Plot 2 VA	Plot 3 VB	Plot 4 VB	Plot 5 VA	Plot 6 VB	Plot 7 VB	Plot 8 VB	Plot 9 VA	Plot 10 VB
Plot 11 VA	Plot 12 VB	Plot 13 VA	Plot 14 VA	Plot 15 VA	Plot 16 VB	Plot 17 VB	Plot 18 VB	Plot 19 VB	Plot 20 VB

- Would you set out a design like this?

- Yes

- No

QUESTION 11

A test was used to comparing the effect of 5 fertilizers A (FA), B (FB), C (FC), D (FD) and E (FE) in an experiment on a variety of wheat grown in 10 plots each.

FC	FA	FC	FD	FB	FE	FA	FB	FE	FD
FA	FE	FA	FE	FC	FD	FE	FB	FC	FA
FD	FC	FB	FE	FD	FA	FC	FD	FB	FC
FC	FA	FD	FE	FB	FD	FC	FB	FA	FE
FE	FB	FD	FA	FC	FB	FE	FA	FB	FD

- Click the appropriate response
- How many experimental units are there in the entire experiment? (10, 14, 20, 40, 50)
- What are the 5 treatments?(Wheat, fertilized, plots)
- What are the experimental units? (Wheat, fertilized, plots)
- What test would you use? (T Test, ANOVA)
- What measurements would you test? (variances, means, standard deviations, coefficient of variation)

QUESTION 12

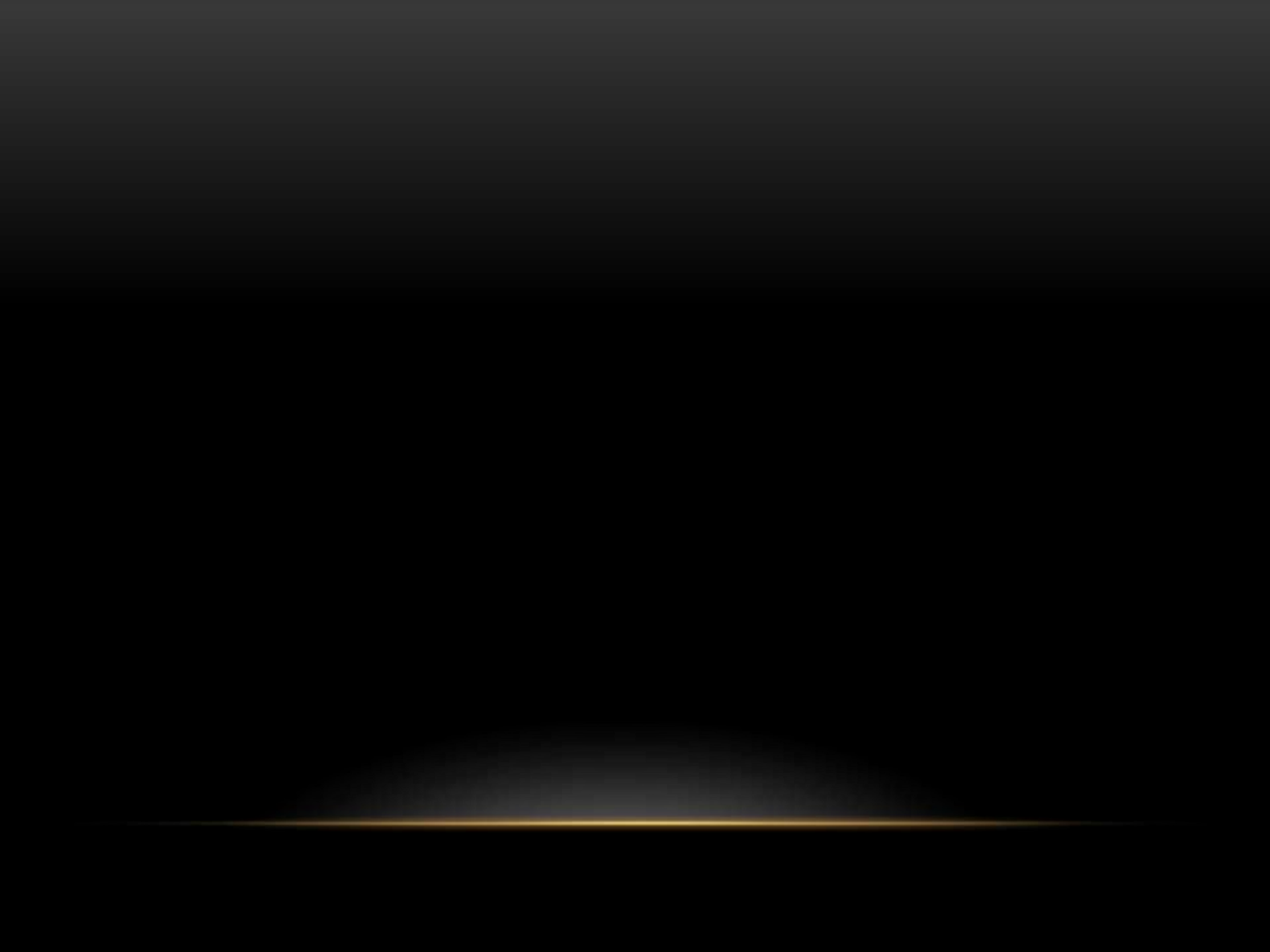The three ways to check whether you accept or do not accept your null hypothesis?

1. Confidence interval

2. P- value

3. Test statistic t

What value do you use to check

1. Confidence interval (test statistic, p-value, critical value, hypothesised mean, significance level)

2. P-value (test statistic, critical value, hypothesised mean, significance level)

3. Test statistic (p-value, critical value, hypothesised mean, significance level)
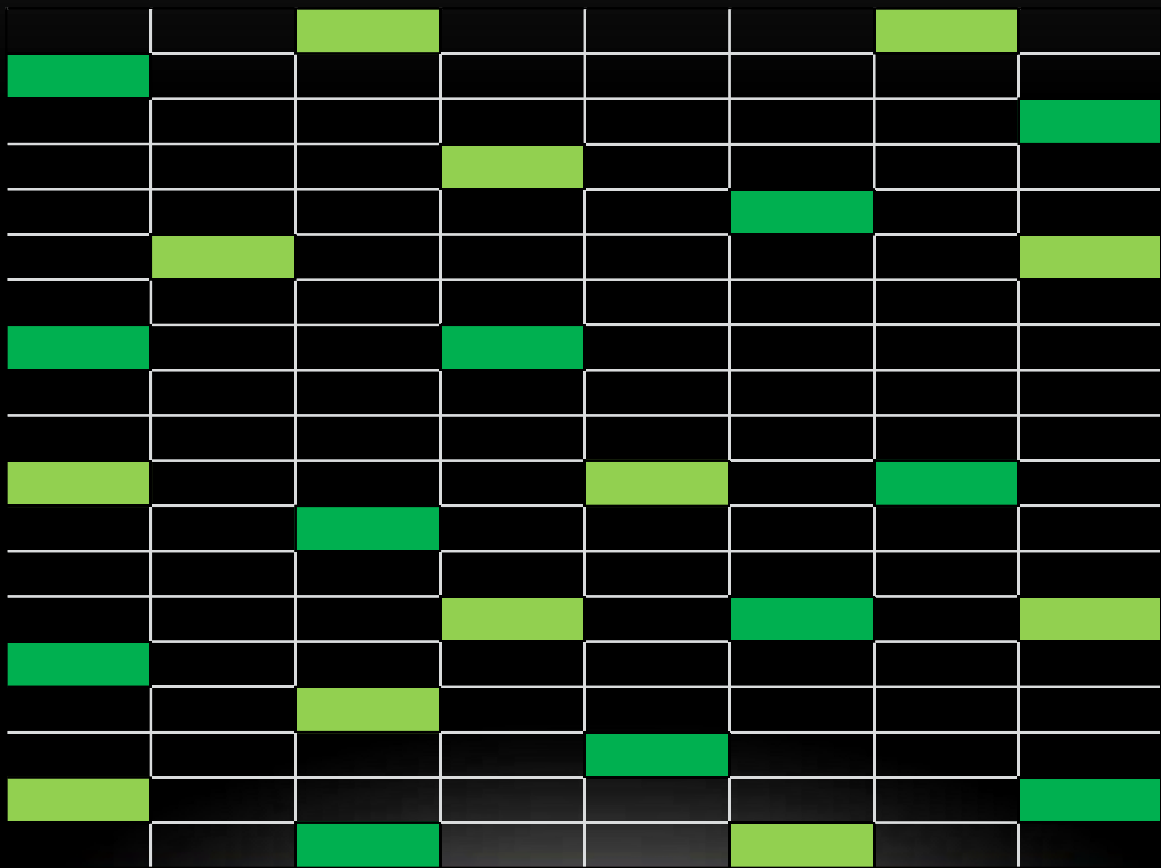
FERTILIZER NF

FERTILIZER NF   FERTILIZE NF

NF FERTILIZE   NF FERTILIZE

FERTILIZE NF

FERTILIZE NF

FERTILIZE NF

NF FERTILIZE

FERTILIZE NF   NF FERTILIZE   NF FERTILIZE

SCENARIO E

1	7	5
7	2	12
9	11	8
6	10	4

SCENARIO F (PLOT LAYOUT)

Susceptible matter	1	7	13	Susceptible matter
Susceptible matter	2	8	14	Susceptible matter
Susceptible matter	3	9	15	Susceptible matter
Susceptible matter	4	10	16	Susceptible matter
Susceptible matter	5	17	21	Susceptible matter
Susceptible matter	6	12	18	Susceptible matter

SCENARIO F (CULTIVARS)

Susceptible matter	D	B	E	Susceptible matter
Susceptible matter	C	D	A	Susceptible matter
Susceptible matter	A	C	D	Susceptible matter
Susceptible matter	B	E	F	Susceptible matter
Susceptible matter	E	A	B	Susceptible matter
Susceptible matter	F	F	C	Susceptible matter

SCENARIO D

FERTILIZER	CONTROL	CONTROL
CONTROL	FERTILIZER	FERTILIZER
CONTROL	FERTILIZER	CONTROL
FERTILIZER	CONTROL	FERTILIZER
FERTILIZER	FERTILIZER	CONTROL
CONTROL	CONTROL	FERTILIZER
CONTROL	FERTILIZER	FERTILIZER
CONTROL	FERTILIZER	CONTROL