

IV. MATERIALS AND METHODS

EXPERIMENT 1

The experiment titled "Effect of Irrigation Levels on Wheat under Bed-System of Planting" was conducted at Agricultural Research Farm of NWFP Agricultural University, Peshawar, for 2-years during 2001-02 and 2002-03. Following is the brief methodology for the research work conducted under the study.

The following factors and their levels were studied in the experiment.

FACTOR: A: PLANTING METHODS.

- P₁ = Flat planting in rows
- P₂ = Flat planting 3rd row skip
- P₃ = Bed planting broadcast on beds
- P₄ = Bed planting 3 rows on beds

FACTOR: B: IRRIGATION LEVELS

- I₂ = 2-Irrigation
- I₃ = 3-Irrigation
- I₄ = 4-Irrigation
- I₅ = 5-Irrigation

DESIGN: RCB with split-plot arrangement.

Main-plots: Planting system & irrigation levels: 4x4=16 Combinations

Sub-plot = Irrigation levels

Replications = 4

Main plot size = 14.4 m x 27 m

Sub-plot size = 3.6 m x 6 m.

P₁ = (Rows 30 cm apart in case of flat planting).

P₂ = (30 cm apart rows 3rd row skip, in case of flat planting).

P₃ = (3-beds in case of bed-planting. 90 cm bed and broad cast on beds)

P₄ = (3-beds in case of bed-planting. 90 cm bed and 3 rows on beds)

Irrigation schedules:

I₂ = 3rd week after emergence + irrigation at Boot stage.

I₃ = 3rd week after emergence + irrigation at boot stage + Milk stage.

$I_4 = 3\text{rd week after emergence} + \text{Tillering} + \text{Irrigation at anthesis} + \text{Milk stage}$

$I_5 = 3\text{rd week after emergence} + \text{irrigation at jointing} + \text{Boot} + \text{Anthesis} + \text{Milk}$

Soil test was done to find out fertility status and soil characteristics (Table-III). The experimental plot was irrigated and at proper moisture level the land was thoroughly prepared. The recommended dose of NPK (120:90:60 kg ha⁻¹) were applied as basal dose. Full dose of P and K and half of N dose were applied and mixed with the soil during seed bed preparation. The remaining half of the N-dose was applied with first irrigation. Sowing was done in 2nd week of November using variety Fakhri-e-Sarhad.

The data were analyzed using the following

ANOVA.

<u>S.V.</u>	<u>D.F.</u>
Replications:	3
P. system	3
Error. a	9
Irrigation	3
P x I	9
Error. b	36
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Total: (4 x 4 x 4) - 1 =	63

Data were recorded on the following parameters

1. Phenological data:

- a. Days to emergence
- b. Days to anthesis
- c. Days to maturity
- d. Seed fill duration

2. Yield and yield component

- a. Number of tillers m⁻²
- b. Number of productive tillers m⁻²
- c. Number of grains per spike
- d. 1000 grain weight (g)

- e. Grains yield (kg ha^{-1})
 - f. Harvest index (%)
 - g. Biological yield (kg ha^{-1})
- 3. Physiological parameters**
- a. Leaf area (sq.cm)
 - b. Leaf area index
 - c. Mean seed growth rate
- 4. Other Data**
- a. Emergence m^{-2}
 - b. Plant height (cm)
- 5. Metrological Data**
- a. Maximum and minimum temperature
 - b. Total rainfall

Procedure for Data Recording

1. Days to Emergence

Date on which majority of the seedlings emerged was recorded for each experimental unit. Days to emergence were calculated as difference between date of emergence and date of sowing.

2. Emergence m^{-2}

Two representative rows were selected in each experimental unit. Number of plants emerged were counted in the selected rows well after seedling emergence but before start of tillering. Emergence m^{-2} was calculated from the number of seedlings counted and the area sampled.

3. Plant height (cm)

Plant height (cm) was measured at physiological maturity. Seven representative tillers were selected in each experimental unit and the height measured from ground level to the tip of the spike.

4. Days to anthesis:

Date on which 75 percent of the spikes reach anthesis stage was recorded from each experimental unit. Days to anthesis were calculated as difference between date of anthesis and date of sowing.

5. Leaf area at anthesis

A random sample of 5 tillers from each sub-plot were selected; the leaves were cut with scissor and put in plastic bags. After that leaf area was measured by leaf area machine.

6. Leaf Area Index

Leaf area index was calculated according to the following formula:

$$\text{Leaf area per tiller sq.cm} \times \text{No. of tillers m}^{-2} \div 10000 = \text{LAI}$$

7. Mean CGR upto Anthesis

The mean CGR upto anthesis was calculated using the said formula as:

$$(\text{Tiller weight at anthesis} \div \text{Days to anthesis}) \times \text{Tillers m}^{-2}$$

8. Mean Seed Growth Rate

Mean seed growth rate was calculated by using the following formula:

$$\text{Thousand grain weight} \div \text{Seed fill duration} = \text{MSGR}$$

9. Tissue Nitrogen Concentration

The total nitrogen was determined by using the Kjeldahl method as described by Bremner and Mulveni. Five plants leaves were collected and dried and then analyzed in the laboratory for the concentration of the nitrogen i.e. to find out the total nitrogen determination (concentration), so, by that way after getting the average sample value, the values were then put in the following formula and the percent nitrogen in tissues was calculated.

$$\frac{(S - B) \times 0.005 \times 0.014 \times 100}{0.2g \times 20ml} \times 100$$

$$= (S-B) \times 0.175 = \text{Percent nitrogen (e.g. = 1.98\% nitrogen)}$$

Whereas;

- | | |
|--------------------------------|--|
| (1) S = Sample reading | (2) B = Blank reading |
| (3) 0.005 = Normality of HCl | (4) 0.014 = Melli Equilant of nitrogen |
| (5) 100 = Dilution | (6) 100 = for percentage |
| (7) 20ml = Volume of titration | (8) 0.2g = Weight of the sample |

10. Seed Fill Duration

Seed fill duration was calculated by using the formula i.e.
Days to maturity (D.T.M) – Days to anthesis (D.T.A) = S.F.D.

11. Productive tiller m⁻²

Two representative rows were selected in each experimental unit. Number of productive tillers were counted in the selected rows. Productive tillers m⁻² were calculated from the number of productive tillers counted and the area sampled.

12. Days to Maturity

Date of physiological maturity was recorded for each experimental unit. Complete loss of green colour from glumes and peduncle was used as criteria for physiological maturity. Days to maturity were calculated as difference between the date of physiological maturity and date of sowing.

13. Grains per spike

Ten representative spikes were selected from each experimental unit. The grains were separated and counted to record data on grains per spike.

14. Biological yield (kg ha⁻¹)

Six central rows were harvested; the material was air-dried and weighed to record biological yield and then biological yield kg ha⁻¹ was calculated.

15. Grain yield (kg ha⁻¹)

The six rows harvested for biological yield were threshed. The grains were cleaned, dried and weighted to record the grain yield and then grain yield kg ha⁻¹ was calculated.

16. Harvest index (%)

Harvest index was calculated by using the formula:

$$\text{Harvest index} = \frac{\text{Economic yield}}{\text{Biological yield}} \times 100$$