
SUMMARY

5-SUMMARY

The current investigation was carried out at Giza Agricultural Research Station, Agricultural Research Center, Giza, Egypt during the two successive growing seasons of 2001 and 2002, to study the impacts of row width and phosphorus levels on water relations, growth, yield and nutritional value of sunflower plant. Moreover, potential evapotranspiration estimated from some ET formulae (i.e. Modified Penman, Penman Monteith and Doorenbos – Pruitt formulae), were compared with the actual ET to evaluate the efficiency of these formulae in prediction of water consumptive use and scheduling irrigation of sunflower.

The cultivar used in this study was Ero-Floor C.V. Sowing dates were 2nd of June and 28th of May in the first and second seasons, respectively. The harvesting dates were 5th and 2nd of September in the two seasons.

5.1. The Experimental Design

The experiments were laid out in split plot design with four replicates. The plot was 5.0m in length and 4.2m in width (plot area was 21 m^2) and contained 6 ridges with the 70 cm row width treatment and 3 ridges with the 140 cm row width treatment. The main plots were devoted to row width treatments and the subplots were assigned to phosphorus treatments. The experiment included 10 treatments, which were the combination

of 2 row width treatments and 5 phosphorus level treatments. Thus the experiment consists of 40 plots.

The description of the experimental factors and treatments was as follows:

5.1.1. The main plot: Row width treatments

1- 70 cm row width.

2- 140 cm row width.

5.1.2. The sub main: Phosphorus fertilizer treatments applied as ordinary super phosphate (OSP, $Ca(H_2PO_4)_2 .CaSO_4$)

1. 100 kg OSP/ fed (6.50 kg P/ fed).
2. 125 kg OSP/ fed. (8.13 kg P/ fed).
3. 150 kg OSP/ fed. (9.75 kg P/ fed).
4. 175 kg OSP/ fed. (11.38 kg P/ fed).
5. 200 kg OSP/ fed. (13.00 kg P/ fed).

Irrigation was practiced according to the available soil moisture storage and the crop was irrigated every two weeks to complete the available soil moisture storage or to full available soil moiture or to compensate available moiture depletion from the two row width treatments. Phosphorus fertilizer was added before the life irrigation (second irrigation). Nitrogen and potassium fertilizers were added as recommended in the area for this crop. The nitrogen fertilizer was added in the form of

ammonium nitrate (33.5 % N) into two equal doses, the first one before the life irrigation and the other before the third irrigation. Potassium was added in the form of potassium sulphate (48 % K_2O) into two equal portions at the same time of nitrogen application.

The proceeding crops to sunflower were canola and wheat in the first and second seasons, , respectively.

5. 2.Characters Studid:

5.2.I. Soil water relations:-

1- Actual Water consumptive use.

1.1- Seasonal water consumptive use (ETa).

1.2- Monthly water consumptive use

1.3- Water use efficiency.

2- Potentaial evapotranspiration by some ET formulae (i.e. Modified Penman, Penman Monteith and Doorenbos – Pruitt).

3-Comparison between actual and potentaial evapotranspiration, estimated by some ET formulae.

5.2.2. Growth parameters:

1- Plant height (cm)

2- Stem diameter (cm)

3- Number of green leaves/ plant

4- Dry wight/ plant (g)

5.2.3.Yield components:

1- Head diameter (cm) 2- Head weight (g).

3- Seed weight / head (g) 4- Number of seeds/ plant.

5- 100- Seed weight (g) 6- Seed yield (kg/ fed)

7- Biological yield (kg/ fed)

5.2.4. Chemical analysis:

1-Seed oil percentage

2-N, P and K percentages in seeds

3- Crude protein percentage in seeds

The important results of this study can be summarized as follows:

5.3.1. SOIL WATER RELATIONS:-

1. Seasonal water consumptive use for sunflower crop (ETa) as a function of row width and phosphorus fertilizer levels together were 46.65 and 45.50 cm in 2001 and 2002 seasons, respectively.
2. Seasonal water consumptive use was increased with normal furrows (70 cm apart, R1) as compared with the wider furrows (140 cm apart, R2)
3. Seasonal water consumptive use was increased with increasing P levels up to 13.00 kg P/ fed (P5).
4. The highest ETa values were 55.8 and 53.8 cm in 2001 and 2002 seasons, respectively resulted from normal furrows (R1) with 13.0 kg P/fed (P5).

5. Monthly ETa values were lowest with closed furrows (R2) treatment, during all concerned months as compared with normal furrows (R1) treatment ones.
6. Monthly ETa started low when plants were in the seedling stage and increased gradually with increasing plant age to reach maximum value during the flowering stage (July) and then decreased again at late season till harvesting.
7. Monthly ETa during the all months of the season was increased with increasing P levels up to P5. The optimum monthly ETa was recorded in July with all P levels treatment.
8. Planting sunflower crop under closed furrows irrigation method is more efficient in water utilization than the normal furrows row width.
9. Water use efficiency was increased by adding 9.75 kg P/ fed and planting sunflower in 140 cm row width.
10. Potential or reference evapotranspiration (ET0) was low during June then increased in July and declined in August and September in the two growing seasons.
11. The most efficient method in calculating ET crop of sunflower Eiro- Floor CV. under Giza region conditions was Penman-Monteith Method.

5.3.2. GROWTH PARAMETERS: -

1. Plant height, stem diameter, number of leaves/ plant and dry weight/ plant were increased with normal row width

(70 cm apart) in both growing seasons, but this increase didn't reach the limit of significant.

2. Plant height was significantly increased with increasing P levels up to 13.00 kg P/ fed in both growing seasons.
3. Stem diameter, number of leaves/ plant and dry weight/ plant were increased with increasing P levels up to 11.38 kg P/ fed.
4. The best interaction was obtained from normal furrows (R1) with 11.38 (P4) which gave the highest values of stem diameter, number of leaves/ plant and dry weight/ plant

5.3.3. YIELD AND YIELD COMPONENTS:

1. Row width had a significant effect on head weight, number of seeds/ plant, seed weight/ fed and biological yield.
2. Row width showed on significant effect on head diameter, seed weight/ head and 100-seed weight in both seasons.
3. All yield components were increased with normal row width (70 cm apart) in 2001 and 2002 seasons.
4. Phosphorus levels showed a significant effect on head weight, number of seeds/ plant, seed weight/ fed and biological yield in both growing seasons.
5. Phosphorus levels showed no significant effect on head diameter, seed weight/ head and 100-seed weight in 2001 and 2002 seasons.

6. Head diameter, head weight, seed weight/ head , 100-seed weight, number of seeds/ plant, seed yield/ fed and biological yield were increased with increasing P levels up to 11.38 kg P/ fed.
7. The positive interaction was found between normal ferrous (R1) and 11.38 kg p/ fed (P4) which led to the highest values of head diameter, head weight, seed weight/ head , 100-seed weight, number of seeds/ plant, seed weight/ fed and biological yield.

5.3.4. CHEMICAL ANALYSIS OF SEEDS:

1. Row width showed no significant effect on N , P , K, protein and oil percentage in seeds of sunflower.
2. Oil percentage, P and K % were increased with normal row width (70 cm apart) in 2001 and 2002 seasons.
3. Nitrogen and protein percentage were increased with closed furrows (R2).
4. Phosphorus levels showed a significant effect on N, K, protein and oil percentage.
5. Phosphorus levels had no significant effect on phosphorus percentage in seed of sunflower.
6. Nitrogen, Phosphorus and protein percentage were increased with increasing P levels up to 9.75 kg P/ fed, while oil and Potassium % were increased with increasing P rate up to 11.38 kg P/ fed in both growing seasons.
7. The interaction between close furrows (R2) with 9.75 kg P/ fed (P3) led to the highest values of N and protein %.

8. The highest values of K and oil % were recorded for normal furrows (R1) with the combination of 11.38 kg P/ fed (P4), while the highest value of P % was resulted from normal furrows (R1) with 9.75 kg P/ fed (P3).