Water Use Efficiency of Sunflower Genotypes under Drip Irrigation

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Introduction

Available water as a limited factor for the expansion of agriculture in the desert which occupied about 93 % of the total area in Egypt. Development new genotypes of crops have the ability to tolerant to drought is the useful way to expand in the desert cultivation using modern irrigation systems. Sunflower (*Helianthus annuus* L.) is one of the four most important oil crops in the world (Demir *et al*., 2006). Because of its moderate cultivation requirements and high oil quality, its acreage has increased in both developed and developing countries (Skoric, 1992). In Egypt great emphasis must be given towards this crop to decrease the gab in oil production. Although sunflower is known to be a drought tolerant crop or grown under dry land conditions, substantial yield increases can be achieved by supplementary irrigation, which is one of the most effective strategies to mitigate the effects of dry spells in crop production (Fox and Rockstrom, 2000; Xiao *et al*., 2007).

Objective

To determine the productivity and water use efficiency for new sunflower genotypes obtained from selfing and induce mutation.

Methodology

Selfing — **4 inbred lines: 20, 48, 61 and 63**

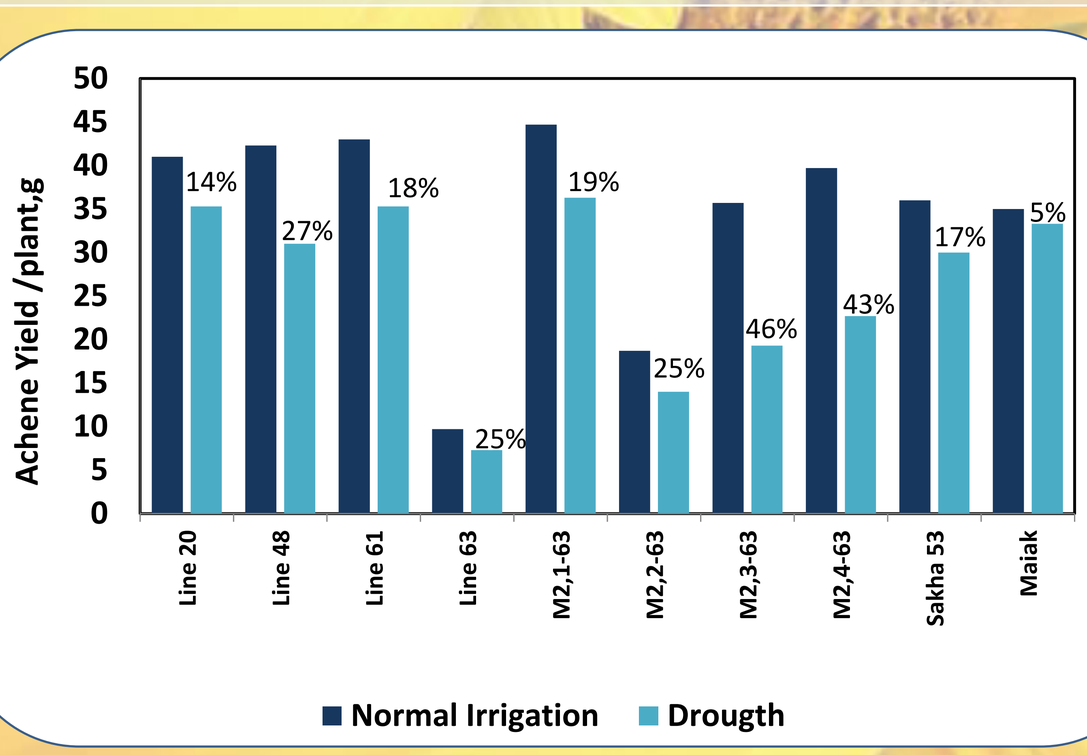
γ-rays — **4 mutants: $M_{2,1}$-63, $M_{2,2}$-63, $M_{2,3}$-63, $M_{2,4}$-63**

Parent :Maiak cv.

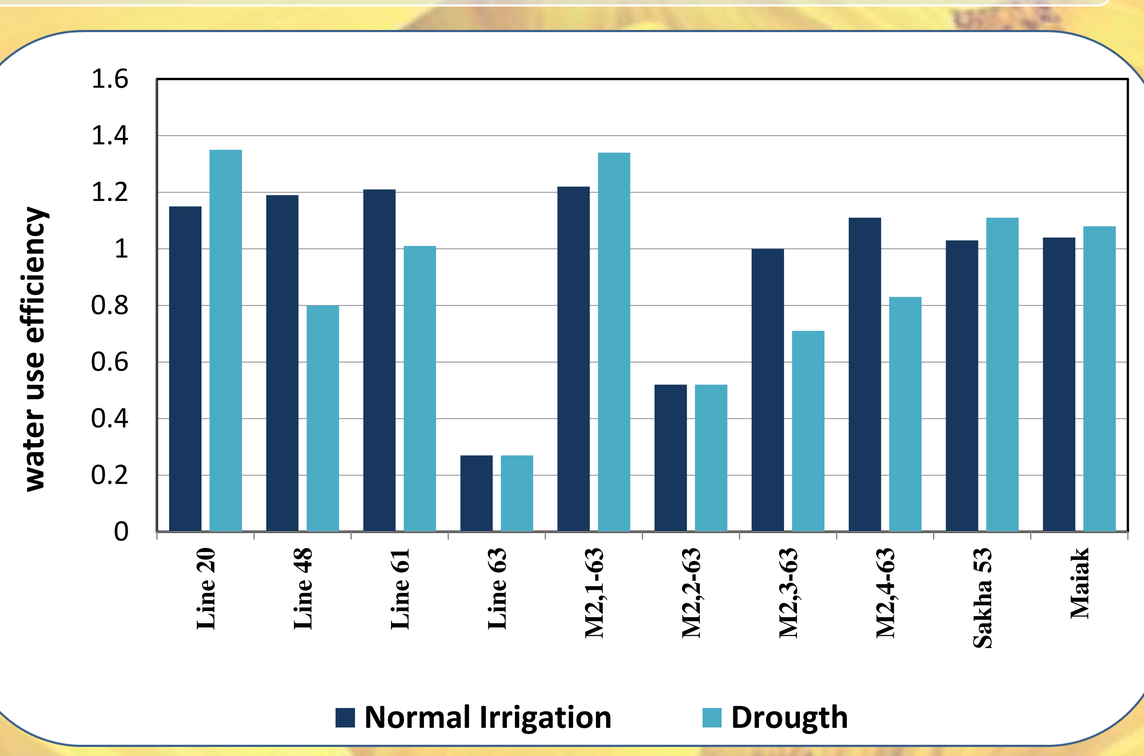
Check: Sakha-53 cv.

Evaluation under drip irrigation (100 – 70%)
water requirement of sunflower
RCBD split plot – 3 replicates

- Days to 50% flowering
- Water use efficiency
10 random plants
-Plant height (cm)
-Head diameter (cm)
-Achene yield/plant (g)
-100 seed weight (g)
-% of oil



Achene yield /plant (g) for sunflower genotypes under drought and normal conditions



Water use efficiency for sunflower genotypes under drought and normal conditions

Results

- Decreasing the amount of irrigation water from 1500 to 1130 mm/hectar significantly reduced all studied traits.
- Results showed differences among the sunflower genotypes under study with respect to all studied traits.
- The Lines which gave the highest yield of achene (Line M1-63 and Line 20) have water use efficiency under drought conditions higher than water use efficiency under normal irrigation. This observation was also in commercial variety (Sakha 53).
- The lowest depression in achene yield due to drought conditions compared to the achene yield under normal irrigation has been registered for Maiak cv. , Line 20 and Sakha 53 genotypes (5, 14 and 17%, respectively).
- The highest depression in achene yield recorded for Line $M_{2,3}$-63, Line $M_{2,4}$-63 and Line 48 (46, 43and 27 %, respectively).
- The genotypes (Line $M_{2,1}$-63, Line 20 and Line 61) gave the highest yield under drought conditions and we can used its in breeding program to develop sunflower hybrids suitable for cultivation under drought condition.

conclusion

Selfing and mutation are effective methods to obtain new genotypes in sunflower. Genotypes which gave the highest achene yield have water use efficiency under drought conditions higher than water use efficiency under normal irrigation. The genotypes (Line $M_{2,1}$-63, Line 20 and Line 61) can used in breeding program to develop sunflower hybrids suitable for cultivation under drought condition.

References

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