Comparison of selection criteria in normal and limited irrigation in sunflower

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Summary

Research was conducted to study interrelationships between agronomic and seed characters and their direct and indirect effects on seed yield per plant under normal and limited irrigation regimes. Two field experiments were conducted in 1996 at the Experimental Station of College of Agriculture, Shiraz University at Badjgah. Fourteen sunflower (*Helianthus annuus* L.) cultivars consisting of eight hybrids and six open pollinated varieties were grown in two randomized complete block designs with four replications. Two experiments differed in respect to irrigation regime. The cause and effect relationships of 12 different characters were assessed.

Most of the characters including seed yield and oil content showed considerable genotypic and phenotypic variations. Water stress significantly decreased yield and its components, however, oil content did not differ significantly. Genotypic and phenotypic correlations revealed that seed yield had significant positive correlations with days to flowering, days to physiological maturity, head diameter, plant height, 1000-seed weight and oil yield under normal and limited irrigation. Seed yield had significant correlations with oil content and kernel percentage under normal irrigation regime, while these correlations were largely reduced under stress conditions and were not significant. The highest direct effect, was exhibited by 1000-seed weight and number of filled seeds per head in normal and limited irrigation environments. However, cause and effect relations of other traits with seed yield changed due to irrigation conditions. Direct effect of oil content was quite lower than its correlation with seed yield. The lowest direct effect was found for plant height and oil content under normal and stress environments, respectively.

Introduction

Sunflower (*Helianthus annuus* L.) is one of the important oilseed crops in semi-arid environments. The area under sunflower has been increased in Iran and it is expected to become an important oilseed crop in the country. One of the main problems in breeding plant genotypes resistant to water deficit in semi-arid areas is the understanding of interrelationships between plant characters in optimal and stress conditions. Should breeders rely on selection criteria under both optimal and stress conditions, or on selection in either environment alone?

Correlation coefficients have been used by many researchers (Ahmad et al., 1991; Dhaduk et al., 1985; Fick et al., 1974, and Pathak et al., 1983) in deter-mining interrelationships between seed yield and other characters in sunflower. Path-coefficient analysis described by Li (1958), allows the separation of the direct influence of each character on grain yield from indirect via mutual relationships among different characters. Path analysis was used by several researchers (Badwal et al., 1993; Beard & Shu Geng, 1982; Marinkovic, 1992; Singh et al., 1985) to examine the direct and indirect effects of the sunflower characters in normal environments. But the interrelations between plant yield and other characters may vary in different environments (Fereres et al., 1986; Nasir Ud-Din et al., 1992; Simane & Struik, 1993; Simane et al., 1993).

Several researchers (Alessi et al., 1977; Bremner & Preston, 1990; Cox & Jollif, 1986; Gimenez &