Yields and yield components of sunflower hybrids

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Sunflower production has increased markedly over the last decade since the commercial availability of sunflower hybrids. These hybrids have high-yielding capacity and high oil concentrations in the seed. This study was undertaken in order to establish the important yield components resulting in high oil yields.

Methods

A field experiment was conducted at Dundee Agricultural Research Station, South Africa in 1980/81, a season of below average rainfall in which 468 mm of rain fell from November to March. Plants were severely wilted at flowering. Fifteen hybrids, the progeny of six inbreds, were arranged in a randomized block design with three replications.

Results and Discussion

The 15 hybrids exhibited a considerable range in all characters measured except for heads per m^2 (Table 1).In spite of sub-optimal moisture conditions, high seed and oil yields were recorded. Oil yield was significantly, positively correlated with seed yield, oil concentration in the seed, seed weight, seeds per head, head diameter, plant height and days from emergence to flowering, and significantly, negatively correlated with protein concentration in the seed. Similarly, seed yield was significantly correlated with all the above yield components except for oil concentration in the seed.

Table 1. Yields and yield components of 15 sunflower hybrids

	Oil yield (g m^{-2})	Seed yield	Oil (%)	Protein (%)	Heads per m^2	Seeds per head	Seed weight (g)	Head diam. (cm)	Plant height (m)	Days to flower
Mean	74	162	45.4	17.3	4.8	865	0.039	14.0	1.58	69
SD	27	55	3.3	2.1	0.4	271	0.004	1.6	0.10	4
Lowest	43	97	43.9	14.6	4.6	503	0.032	12.5	1.41	63
Highest	113	237	48.8	21.4	5.2	1287	0.042	17.6	1.71	75

With all the significant correlations recorded, it was difficult to establish the most important yield components resulting in high oil yield. However, oil yield may be considered to be a function of seed yield and oil concentration in the seed. Also, because of the highly significant, negative correlation between oil yield and protein in the seed, the latter component might be expected to cause a reduction in oil yield. It was established through the use of path coefficient analysis, that oil yield was largely a function of seed yield with a slight, positive effect of oil in the seed. Protein concentration in the seed had virtually no effect on oil yield. Seed yield may be considered to be a function of the number of heads per m^2, the number of seeds per head and seed weight. Path coefficient analysis indicated that seed yield was largely dependent on the number of seeds per head, with minimal effects of the number of heads per m^2 and individual seed weight. The number of seeds per head appeared to be equally dependent on head diameter, plant height and days from emergence to flowering.

In the hybrids studied, high oil yield was largely a result of high seed yield which, in turn, was largely a result of a large number of seeds per head. Further studies should be undertaken to investigate these aspects more closely and to establish the heritability of the important yield components.