GENETIC POTENTIAL OF DWARF SUNFLOWER HYBRIDS IN TEXAS

R.D. Brigham and J.K. Young, Texas A&M University Agricultural Research and Extension Center, Route 3, Lubbock, Texas 79401, USA.

Abstract

Performance of a dwarf hybrid was compared with normal height hybrids grown under irrigation in a replicated trial at Lubbock, Texas, in 1983 and 1984. Plant height plus stem diameter at the cotyledonary node were recorded at 14-day intervals for 10 plants/rep/entry. These parameters were recorded for the last time at or near maturity, and head diameter was recorded at threshing time. Seed yield/head and weight/100 seeds were recorded for each of 10 heads after threshing. Plants of the dwarf hybrid (534 DW) were 18% and 29% shorter (1983 and 1984 respectively) than the average of the three normal height hybrids (SF101, 894A, and Sunbred 254; 120.7 vs 147.0 cm in 1983, and 93.3 vs 131.6 cm in 1984). Stem diameter of the dwarf hybrid was 1.3 mm and 2.4 mm smaller than the average of the normal height hybrids (18.2 vs 19.5 mm in 1983; 16.5 vs 18.9 mm in 1984). Head diameter at threshing was slightly less for the dwarf hybrid each year (17.5 vs 17.8 cm in 1983; 13.7 vs 14.0 cm in 1984). Yield of seed per head was also less for the dwarf hybrid each year (52.5 vs 67.0 g in 1983; 27.3 vs 36.7 g in 1984). Weight/100 seed was slightly higher for the dwarf hybrid each year (5.5 vs 5.4g in 1983; 5.3 vs 4.3 g in 1984). Although short-statured dwarf hybrids have advantages in storm resistance, ease of cultivation, and efficiency of harvest, improvement in genetic potential for yield apparently needs to be made.

Introduction

The recent development of dwarf sunflower hybrids brings up the question of performance in different environments. Is the performance equal to or better than normal height hybrids, and should breeders strive to develop a full line of dwarf hybrids? The short stature of dwarf plants should have advantages in regard to windstorm resistance, ease of mechanical cultivation and harvest, and possibly may require less water to produce the same amount of seed.

Materials and Methods

Three normal height sunflower hybrids -- SF101, 894A, and Sunbred 254 -- were grown in comparison with 534 DW, the dwarf entry, at Lubbock, Texas, in Amarillo loam soil in 1983 and 1984. Plots were 4 rows by 7.6 m, and rows were 1.0 m apart. The experimental design was randomized complete block, with four replications. Planting date was May 3 in both years. Plots were irrigated prior to planting, and as needed during the summer. An insecticide was applied each year to the heads at blooming to control the sunflower moth (Homoeosoma electellum Hulst). Plant height and stem diameter measurements were taken five times at 14-day intervals beginning June 17 in 1983, and June 13 in 1984. Stem diameter was measured with calipers at the cotyledonary node. At maturity, ten plants were harvested from the two center rows. Head diameter was recorded at threshing time, and seed yield/head and weight/100 seeds was recorded after threshing.

Results

Plants of the dwarf hybrid (534 DW) were 18 and 29% shorter in 1983 and 1984 than the average of the three normal height hybrids (SF101, 894A, and Sunbred 254; 120.7 vs 147.0 cm in 1983, and 93.3 vs 131.6 cm in 1984). Stem diameter of the dwarf hybrid was 1.3 and 2.4 mm smaller than the average of the normal height hybrids (18.2 vs 19.5 mm in 1983; 16.5 vs 18.9 mm in 1984). Head diameter at threshing was slightly less for the dwarf hybrid each year (17.5 vs 17.8 cm in 1983; 13.7 vs 14.0 cm in 1984). Yield of seed per head was also less for the dwarf hybrid each year (52.5 vs 67.0 g in 1983; 27.3 vs 36.7 g in 1984), which amounted to differences of 22 and 26% for the respective years. Weight per 100 seed was slightly higher each year for the dwarf hybrid in comparison with the average of the three normal height hybrids (5.5 vs 5.4 g in 1983; 5.3 vs 4.3 g in 1984).

Discussion

Plant height and stem diameter for all entries decreased slightly in the last 14-day interval, which indicated drying and shrinking of the plants occurred as they matured. The smaller stem size of the dwarf hybrid was not expected, as dwarf hybrids usually appear to have slightly larger stems than normal height hybrids. Similarly, head diameter appeared to be equal to or larger than the normal height hybrids, as the plants were maturing, but was actually slightly less. Fertility of the florets may have been somewhat less in the dwarf hybrid, which would result in less seed weight per head and a higher weight per 100 seed, which was recorded each year. Plant height was apparently influenced greatly by environment, as the 120.7 cm height for the dwarf hybrid in 1983 was 23% greater than the 93.3 cm recorded in 1984. This appeared to be the result of temperature differences in the growing seasons, as 1983 was much warmer than 1984, and significantly more degree days were recorded. Although newer dwarf hybrids have become available since this experiment was started, in general the genetic potential for yield needs to be improved in dwarf sunflower hybrids. Dwarf hybrids have definite advantages in regard to windstorm resistance, ease of cultivation, and efficiency of harvest, and may have some advantage in regard to an improved reproductive/vegetative ratio.