SUNDAK . . .

A Rust-Resistant Sunflower Variety

D. E. Zimmer and G. N. Fick

A small admirer takes a close look at the new Sundak sunflower.

Sundak is a new confectionery sunflower variety developed jointly by the North Dakota Agricultural Experiment Station and the Agricultural Research Service, U.S. Department of Agriculture, and released on February 1, 1973.

This new variety, unlike the presently grown large-seeded varieties, possesses a high level of resistance to the predominant races of rust occurring in the Red River Valley of North Dakota and Minnesota. As a result of its high level of resistance, Sundak should provide protection against losses from rust. Rust of sunflowers occurs sporadically in the Red River Valley each season and has been responsible for yield losses of more than 50 per cent in some fields. Rust not only reduces yield but also adversely influences seed quality by reducing seed size, lowering test weight, and increasing hull percentage (Table 1).

The high degree of rust susceptibility of the presently grown confectionery varieties coupled with the field tolerance of the oilseed varieties have prompted some sunflower growers to consider confectionery sunflowers a high-risk crop. Although confectionery sunflower contracts are normally one to two cents per pound higher than those offered for oilseed sunflowers, growers in some cases have hesitated to grow confectionery varieties because of their increased susceptibility to rust. Sundak combines a high level of rust resistance with the large seed character, and thus provides the growers with a large-seeded variety that they can grow for the confectionery market without fear of loss from rust.

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Performance Trials

Sundak has been tested in small plot trials as experimental number ND721 and in increase fields at four locations in North Dakota and at one location in Minnesota. Data from comparative yield trials at all locations shows that Sundak on an average has yielded 108, 130 and 134 per cent of the standard large-seeded varieties Dahlgren 694, Mingren and Commander. A light to moderate level of rust was present on the standard varieties and may

Table 1. Effect of a moderate level of rust on seed size, seed weight, oil percentage, and hull percentage of the variety Commander grown in 1971.

Agronomic characteristic		Rust infected	Unrusted
Seed size			
percentage retained over round hole sieves of	20/64 in.	0	37
	18/64 in.	49	75
	16/64 in.	75	92
Seed weight		96 mg	128 mg
Oil content		21.0%	26.2%
Hull content		49.7%	46.4%

Table 2. Comparative performance of Sundak, Dahlgren 694, Mingren, and Commander grown in yield trials at three locations in North Dakota and Minnesota in 1972.

Agronomic characteristics		Sundak	Dahlgren 694	Mingren	Commander
Yield	lb/acre	1890	1751	1458	1412
Test weight	lb/bu	24.6	23.0	21.6	22.6
Seed size % over a 20/64 sieve		32	30	52	38
Height (inches)		67	63	65	64
Days to 50% bloom		72	70	69	67
Rust reading[1]		2R	24S	33S	30S

[1]R equals resistant, S equals susceptible. The number preceeding the reaction refers to the percentage of leaf area infected.

have attributed somewhat to Sundak's superior yield. Sundak varies in height like all open-pollinated varieties. Sundak outyielded both Mingren and Commander and produced seed slightly smaller in size than Commander. It appears to be somewhat later in maturity than Mingren or Commander which are frequently forced into maturity due to partial or complete defoliation by rust.

Disease Resistance

Sundak has been highly resistant to rust in all field trials, even under heavy rust attacks when the presently grown confectionery varieties were classed as 100 per cent rusted. Unlike the oilseed varieties which exhibit some field resistance to rust but are uniformly susceptible in seedling tests in the greenhouse, Sundak exhibits a high degree of resistance in greenhouse trials. Although Sundak is highly resistant to the races of rust which occur in North Dakota and Minnesota as indicated by its high resistance in field trials at five locations, it has been found to be susceptible to Race 3, a race known to attack the R_1 gene for resistance. Fortunately, Race 3 has not been identified from rust collections made from cultivated sunflowers grown in North Dakota and Minnesota. If Race 3 should become the predominant race in North Dakota and Minnesota, Sundak's resistance would be rendered ineffective.

Sundak, like the other confectionery varieties, does not possess resistance to Sclerotinia stalk rot, Verticillium wilt, and downy mildew. Losses from these diseases can, however, be minimized by management practices.

Botanical Description

Sundak is a large-seeded sunflower variety, **Helianthus annuus** L., suitable for the confectionery and birdfeed markets, and possesses the following botanical characteristics:

Stems — midtall, averaging 2 to 4 inches taller than Commander; single headed, except for less than one per cent of the plants, with branch heads arising from the leaf axils of the main stems. Branch heads are usually small and frequently do not set seeds.

Flower — yellow ray and yellow disc flowers.

Seed — broad black with narrow white stripes to nearly evenly black and white striped; seed predominantly shield shaped but varying from oblong to ovate; kernel free not adhering to the hull, hull midthick.

Disease reaction — under field conditions in North Dakota and Minnesota highly resistant to rust, containing less than three per cent susceptible plants. Susceptible to downy mildew, Verticillium wilt, and Sclerotinia stalk rot.

Developmental History

Sundak is an open-pollinated variety developed from a composite of 98 second-generation inbreds which trace to 22 individual plants selected from the confectionery variety, Commander, in 1970. During routine disease surveys in 1970 a field of badly rusted Commander was observed which contained a few rust-resistant plants. Progenies from 22 of these plants were grown, selfed for two generations, and selected for rust resistance. Ninety-eight presumably rust-resistant plants were composited and increased in Hawaii in the winter of 1971-72. Seed from this composite was yield tested and used to plant two increase fields in North Dakota in 1972. Approximately 16,000 pounds of planting seed was obtained from the increase fields.

Seed from the 1972 increase will be grown in 1973 by approved seed producers under contract with the County Crop Improvement Associations. Limited amounts of seed of the new variety were made available to other states with an interest in confectionery sunflowers for increase or testing in compliance with the policy of mutual sharing of new variety seed stocks.

The Agricultural Experiment Station will maintain purified seed stocks of Sundak sunflower for certified seed growers so long as the variety is in commercial demand. The seed classes will be Breeders, Foundation and Certified. No Registered class will be used. Reprints and further information regarding this variety can be obtained by writing D. E. Zimmer or G. N. Fick, Department of Plant Pathology or Department of Agronomy, NDSU, Fargo, North Dakota 58102.