

ND-01, A HIGH OLEIC ACID SUNFLOWER SYNTHETIC

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French fries and other deep fried foods or snacks may soon be cooked in sunflower oil high in oleic acid. A new high oleic synthetic, from which high oleic hybrids can be derived, has been released cooperatively by the U.S. Department of Agriculture-Agriculture Research Service and North Dakota State University. Northern grown sunflower oil has only 19 percent oleic acid compared with 13 percent, 24 percent, 31 percent, 18 percent and 61 percent for safflower, soybean, corn, cotton, and peanut, respectively. However, the synthetic may provide northern grown hybrids with 80 percent oleic acid or more in hybrids that are grown in the southern United States.

The quality of sunflower oil is generally associated with the relative content of linoleic acid. Sunflower oil has been sold as a premium oil on world markets because of its high linoleic acid percentage and utilization in salad oil. Sunflower oil is distributed in the United States as bottled oil for cooking or salad oil use with a limited quantity utilized in margarine production. Sunflower oil popularity in European and East Asian countries is based on its polyunsaturated nature and absence of cholesterol.

Recently, sunflower oil has been used as an industrial cooking oil to fry snack foods. Sunflower oil extracted from southern-grown sunflower was utilized due to its higher oleic acid content. Because of the lower degree of saturation, sunflower oil with an increased oleic acid content is less susceptible to oxidative changes during refining, storage and frying. Advantages of a high oleic sunflower oil for frying purposes are: 1) the oil can be heated to a higher temperature without smoking so food is cooked faster and less food impurities enter the oil, and 2) the longevity of the oil is increased, both in storage and while heated. An additional use could be as a substitute for diesel fuel in engines. Incomplete combustion with a high oleic oil produces less varnish accumulation inside the engine than with a high linoleic oil.

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Development of germplasm materials

An announcement by the U.S.S.R. delegation that a high oleic open-pollinated variety had been developed was made during the 1978 International Sunflower Meetings, Minneapolis, Minnesota. Seed of the original Pervenets variety was obtained in March of 1982. Fatty acid composition was determined by capillary gas chromatography with an electronic integrator. The original seed averaged 69.9 percent (of the total fatty acids) oleic acid content. Analysis of self-pollinated plants grown in the greenhouse indicated that the original source was variable and heterogeneous for the oleic acid characteristic; 46 percent of the plants had above 80 percent and 21 percent had below 60 percent oleic acid content.

Plants with oleic acid percentage above 80 percent were grown in the field near Fargo, ND, and self-pollinated. Samples of the harvested seed were again tested for fatty acid composition. Seed from plants with more than 80 percent oleic acid was grown in the Hawaiian winter nursery and the resulting plants were self-pollinated. Seed from these plants was again tested for fatty acid composition. Forty-nine lines with more than 80 percent oleic acid were selected for random mating and planted in the field at Fargo, ND. Seed harvested from the random-mated plants was bulked and forms the ND-01 high oleic sunflower synthetic.

Agronomic and quality characteristics of ND-01 synthetic

ND-01 was field tested in the summer of 1983 near Fargo, North Dakota. The selection of plant types in all generations for particular agronomic or morphologic characteristics was limited. Plants that were photosensitive to daylength did not flower in the Hawaiian winter nursery and were not included for further study. In general, the morphologic variability existing in the original open-pollinated variety is still present. Flowering date of individual plants within the ND-01 synthetic was quite variable, with most plants flowering later than inbred HA 89 (Table 1). Height of individual plants was tall with several plants reaching 69-72 inches. Several plants had severe neck bending, or plants with heads that are close to the ground at harvest. Breeders that

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Table 1. Summary of yield and agronomic characteristics of ND-01 high oleic sunflower synthetic and the inbred line HA 89, 1983, Fargo, N.D.

Line	Yield	50% Flowering	Height	200 Seed Weight
	(lb/acre)	(days)	(in)	(g)
ND01				
Mean	1220	81	69	17.3
Range		77-85	54-72	11.4-23.6
HA 89	918	76	51	10.2

select plants from this synthetic would need to eliminate severe plant type extremes. Individual plants were also variable for 200 seed weight, although most plants had seed weights larger than HA 89.

Final selections of plants to be random-mated ranged from 81.1 percent to 90.6 percent for oleic acid content (Table 2). In the final group, 49 random-mated plants were selected. Fifteen plants were not selected, three having oleic percentages between 70-80 percent, six between 50-70 percent, and six lower than 50 percent. Linoleic acid content of ND-01 averaged 4.5 percent. Oil percentage of the original Pervenets was quite high and several of the final selections were 44-48 percent oil. The average of the ND-01 synthetic was 40.7 percent oil.

Table 2. Summary of oil quality characteristics of ND-01 high oleic sunflower synthetic and the inbred line HA 89, 1983, Fargo, N.D.

Line	Oleic acid	Linoleic acid	Oil
	(% of total fatty acids)	(% of total fatty acids)	(%)
ND01			
Mean	88.9	4.4	40.7
Range	81.1-90.6	2.3-9.5	37.8-48.4
HA 89	13.9	76.1	41.2

Seed Distribution

Germplasm seed quantities of the ND-01 high oleic acid synthetic will be maintained by the Seedstocks Project, Agronomy Department, North Dakota State University, Fargo, ND 58105. Seed of this synthetic will be distributed to researchers upon request. In addition, the North Central Regional Plant Introduction Station, USDA—ARS, Iowa State University, Ames, Iowa 50011, will maintain this synthetic as P.I. 483077. Plant materials are available for distribution from this station.