

The Origin and Development of

Nemagold Sweet Potato



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Nemagold is a root-knot nematode resistant sweet potato developed by the Oklahoma Agricultural Experiment Station. It is a gold-skinned, high-carotene sweet potato, similar to Allgold. The roots resemble those of the yellow Jersey strains in shape and external characteristics.

The Nemagold variety is widely adapted in the region where the Jersey varieties are grown. In Oklahoma it appears to be best adapted to the western areas where sweet potatoes are grown with irrigation. It is acceptable on wholesale and retail markets and is preferred by some growers because of the smoothness and uniformity of size of its roots. Resistance to root-knot gives this variety an important advantage in areas where nematodes are abundant.

Origin and History

Nemagold originated as a direct result of special emphasis by the Oklahoma Agricultural Experiment Station on developing a nematode-resistant variety. Jersey varieties were used as parent lines to take advantage of the nematode resistance which had been reported for these varieties (6, 10, 14). The use of Jersey varieties posed some problems, however, because of the non-blooming characteristic of members of this group. Flowering in Jersey varieties has seldom, if ever, been observed in field plantings in the United States (12).

Unsuccessful attempts to induce blooming in Jersey varieties have been reported by Hartman (3), Mikell (8), and Bothwick (in an oral report to sweet potato cooperators in 1948). Mikell, Miller, and Edmond (7) reported flowering in Maryland Golden plant, although no seeds were obtained.

Successful attempts to produce blooming have been reported by Mullin (9) and by Howell and Wittwer (5).

Bailey (1) and Warmke and Cruzado (13) reported flowering and seed production in the Jersey varieties and strains of both the Big Stem and Little Stem types were found to flower in field plantings in Puerto Rico.

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The Jersey variety, Orlis, was obtained by the Oklahoma Station in 1947 when plants grown in a special study of flower induction in sweet potatoes (11) produced flowers. Flowers were available for cross-pollinating in December and again in March and April of 1948. Crosses were made at this time with breeding material including the Oklahoma 29 breeding line. The Oklahoma 29 is a seedling of L37 and Oklahoma parent No. 10 breeding line. The L37 breeding line, obtained from the Louisiana Experiment Station, is a cross of 47442 with Nancy Hall. Orlis is a high-carotene mutation in the variety Little Stem Jersey selected in Kansas in 1937 (2). Seeds originating in these crosses were planted in the greenhouse in the spring and the seedlings grown to maturity in the field during the 1948 growing season.

The original seedling hill of Nemagold was selected in the fall of 1948 at the Vegetable Research Station at Bixby. With some increase in propagating material during the winter months, it was possible to plant a fairly extensive area to this breeding line in 1949. Preliminary observations on the reaction of this line to root-knot were obtained during this season. In the three-year period 1951 to 1953, this line, as Oklahoma 46, was tested in the "Jersey Variety Trials" conducted by the sweet potato cooperators in several states where the Jersey varieties are commercially important.

Yield

The average yield of Nemagold is equal to that of other Jersey varieties, and in some localities is better. Results of a three-year test at Idabel are summarized in Table I.

In Oklahoma, where the acreage of Jersey potatoes is limited, the yields of Nemagold should be compared with those of Allgold, Redgold, and Porto Rico. Table II gives comparison for three widely separated locations in the state, on land with little or no nematode infestation. The best yields of the Nemagold variety were obtained from irrigated fields in the southwestern part of the state (Fig. 1).

Table I.—Yields for the Nemagold Sweet Potato in Comparison with Certain Other Jersey Varieties; Idabel, Oklahoma.*
(Bushels per acre)

Test Year	Nemagold		Orlis		Yellow Jersey		Orange I.S.		Md. Golden		Big Stem	
	No. 1	Total	No. 1	Total	No. 1	Total	No. 1	Total	No. 1	Total	No. 1	Total
1951	60	168	88	228	59	190	70	171	40	100	62	180
1952	166	280	--	---	75	148	156	309	--	--	80	157
1953	105	181	22	46	81	174	113	190	41	80	86	183
Average	110	210	55	137	108	171	113	223	41	90	76	173

*Yields are for plantings made in early May and harvested in October at the Kiamichi Field Station near Idabel.

Table II.—Yields for the Nemagold Sweet Potato in Comparison with Three other Varieties at Three Locations in Okla.

Variety	Bixby					Blair					Wes. ville		Avg. for all tests	
	1953	1954	1955	1956	Avg.	1952	1955	1956	1957	Avg.	1955	1956		Avg.
No. 1 Roots; Bu./A														
Nemagold	85	143	133	100	115	264	290	182	309	261	110	223	167	184
Allgold	180	296	208	83	194	234	---	195	88	172	109	265	187	178
Redgold	254	222	227	156	215	355	337	258	184	283	300	264	282	256
Porto Rico	156	157	164	80	139	313	246	151	179	222	98	89	94	163
Total Roots; Bu./A														
Nemagold	150	215	188	161	179	382	386	365	547	420	281	409	345	308
Allgold	330	406	313	154	301	403	---	367	566	334	202	411	307	350
Redgold	414	357	340	250	340	470	---	367	405	424	526	283	405	386
Porto Rico	266	240	244	130	220	540	315	297	506	415	227	170	199	294

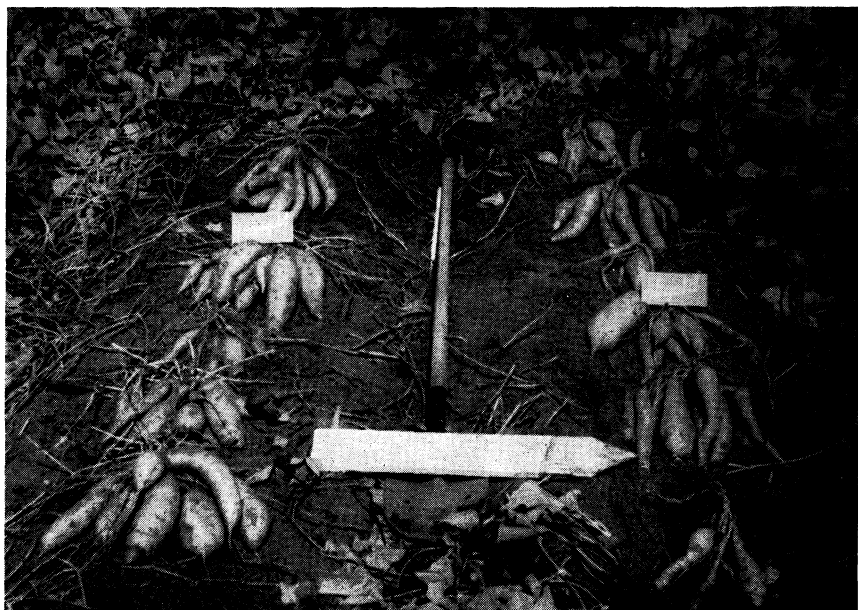


Figure 1.—Nemagold does well under irrigation. These potatoes were irrigated in August and September. Nemagold are shown at left and Allgold at right.

When these tests are averaged, it appears that Nemagold, in the absence of root-knot nematode, yielded approximately as well as Porto Rico and slightly less than Allgold.

In soils infested with root-knot nematode, Nemagold has yielded normal crops when other varieties produce few, if any, marketable roots. (Fig. 2).

The current commercial acreage of this variety in Oklahoma is in the western part of the state near Hollis, Thomas, and Mooreland.

Vitamin Content and Table Quality

Although the Nemagold variety resembles the Jersey parent Orliis in vine and external root characteristics, the qualities of the baked roots are more typical of the moist-flesh varieties. Table III indicates that the ascorbic acid (vitamin C) content of the roots is high and about equal to that of the Allgold variety. The provitamin A or carotene content is medium between the varieties Allgold and Redgold.



Figure 2.—Nemagold produces satisfactory crops in soils heavily infested with root-knot nematode, where the varieties Redgold (upper left) and Allgold (right) fail. Nemagold roots are shown on the ground.

Table III.—Moisture, Ascorbic Acid and Carotene Contents of Roots of Four Varieties of Sweet Potatoes; 1952 crop.*

Variety	Percent Moisture	Ascorbic Acid (mg/100 gm)		Carotene (mg/100 gm)	
		Fresh	Dry	Fresh	Dry
Nemagold	71.7	26.2	92.3	9.8	34.6
Allgold	73.8	24.9	95.3	11.6	44.4
Redgold	77.3	17.0	74.9	6.8	29.8
Porto Rico	71.0	16.3	56.0	4.1	14.1

* Roots were harvested in October of 1952 at the Kiamichi Field Station at Idabel, Oklahoma.

Storage Losses

Roots of Nemagold at times have shown more shrinkage in storage than roots of varieties such as Redgold and Allgold. It is probable that the Nemagold roots are affected to some degree with "stem-end-shrink" as described by Hollar and Haber (4).

As indicated by data in Table IV, the shrinkage (weight loss) in Nemagold roots is about the same as that for other varieties until mid-January (about 110 days in storage). At the end of 153 days (March) greater shrinkage in Nemagold roots was noted. Because of this, it appears advisable to sell marketable roots of this variety during the mid-winter period.

Table IV.—Shrinkage (Weight Loss) in Roots of Four Varieties of Sweet Potatoes During Curing and Storage.*
(Percent of original weight)

	Curing (85° F.)		Storage (55° F.)			
	6	12	Days from Harvest 61	104	107	153
Nemagold						
1953 crop	6.7	9.0	10.6		11.2	
1954 crop	5.0			13.1		20.2
Allgold						
1953 crop	8.9	9.3	9.6		12.4	
1954 crop	3.3			11.4		14.1
Redgold						
1953 crop	5.3	6.5	7.0		10.2	
1954 crop	3.0			7.3		10.9
Porto Rico						
1953 crop	5.6	9.9	10.2		11.6	
1954 crop	2.8			9.3		13.9

* The roots were cured 12 days for the 1953 crop and only 6 days for the 1954 crop. Temperature and relative humidity were automatically controlled.

Reaction to Diseases

As indicated earlier, Nemagold is resistant to the common root-knot nematode (*Meloidogyne incognita acrita*) as it occurs in Oklahoma. The reaction of Nemagold to other species of the root-knot nematode has not been determined. Experiments have demonstrated that root-knot nematodes enter roots of Nemagold as readily as they enter roots of susceptible sweet potato varieties; however, the nematodes in Nemagold roots usually fail to develop, and eventually die. Over a period of several years, tests have shown that an average of fewer than one nematode per 100 grams of root tissue is recovered from mature Nemagold roots. This

compares with an average of about 50 nematodes per 100 grams of root tissue from the root-knot susceptible variety Allgold.

Root-knot resistance in the variety Nemagold was first discovered in 1949 when by chance it was planted in soil heavily infested with root-knot nematodes. Since then the variety has been tested repeatedly in soil known to be infested with the root-knot nematode. In commercial production, Nemagold has produced a satisfactory crop in heavily infested soil, where a susceptible variety such as Allgold would be a complete failure.

The reaction to several diseases of Nemagold as compared with some other sweet potato varieties is noted in Table V. All ratings indicated in this table are relative, and the varieties listed might behave differently under conditions other than those in which the determinations were made. There is evidence, for example, that Allgold is susceptible to a strain of the black rot fungus from Louisiana. Nemagold is indicated in Table V as being susceptible to stem rot, but it might be pointed out that it is not as susceptible as is Unit #1 Porto Rico. Nemagold, along with Redgold and Allgold, is indicated as resistant to internal cork, a virus induced disease, because the roots of these varieties show little or no evidence of injury from the disease. All three of the varieties, however, can and do carry the virus.

Table V.—Disease reaction of Nemagold as Compared with other Important Sweet Potato Varieties.*

Variety	Reaction** of each variety to indicated disease					
	Root Knot	Stem Rot	Soil Rot	Internal Cork	Black Rot	Scurf
Nemagold	R	S	R	R	S	S
Allgold	S	T	T	R	R	S
Redgold	S	T	T	R	—	S
Unit #1 Porto Rico	S	S	S	S	S	S

* This information on disease reaction is compiled from work done in several states including Oklahoma.
 **Reaction of variety indicated as R=resistant, T=tolerant, or S=susceptible.

Description

Nemagold is a gold-skinned high carotene sweet potato like the Allgold. The roots resemble those of the yellow Jersey strains to some extent in shape and external characteristics, but not in baking properties.

The vines are small, or slender, and long (6 to 12 feet). The stems are numerous, green, have long internodes, and are smooth except at the terminals. They produce abundant rootlets when in contact with moist soil. The leaves are green, small, and distinctly shouldered. (This

leaf-shape serves to distinguish this variety from Orlist and other Jersey varieties.) The petioles are of medium length, slender, and green with purple summit. The foliage is usually sparse to moderately dense.

The roots are yellow to salmon-russet with some carotene immediately beneath the skin. The russet pattern is different from that of the Allgold roots, but this difference does not constitute a ready means of separating roots of these varieties. The flesh is orange, and in the raw roots is mottled to some extent. Some fiber is found at the proximal end of the roots, which causes them to adhere rather firmly to the plant. Roots cured and stored for a short time are sweet, soft, and moist when baked. There is a tendency for stored roots of this variety to shrink or shrivel at the proximal end, as is true of some of the Jersey varieties.

When grown in sandy soils, the roots at harvest time may be quite chunky, and in heavier soils, they may be quite long (See Fig. 3)). They are generally smooth, but not as uniformly so as those of Orlist or Yellow Jersey.



Figure 3.—The roots of Nemagold vary in shape with the type of soil in which they are grown. The chunky roots at the top were grown in a light-textured soil. Those in center were grown in a fine textured soil and those at right were grown in a medium soil.



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