Tuscola Navy Beans

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by L. O. Copeland, M. W. Adams and A. W. Saettler[1]

Tuscola is the newest variety of navy (pea) bean released from the Michigan State University-U.S. Department of Agriculture variety improvement program. Released specifically for its superior resistance to mechanical injury, Tuscola maintains a yield equal to that of present commercial navy bean varieties. Tuscola possesses superior resistance to mechanical injury, and offers substantial advantages to Michigan bean growers in years when dry harvesting weather and low seed moisture content lead to excessive amounts of cracked and broken beans incurred during threshing. Even during normal years, mechanical damage can cause substantial quality loss and reduced profit to Michigan bean growers. Table 1 (see also Figure 1) illustrates Tuscola's superiority to Sanilac in its resistance to mechanical impact.

Table 1. Results of impact testing of Tuscola compared to Sanilac and Strain #0661.

Impact Velocity in feet/min	Percent Whole Beans After Impacting		
	Tuscola	Sanilac	Strain #0661 (hyper-sensitive)
1100	95	92	60
1450	90	76	42
1800	80	48	9
2200	57	22	7

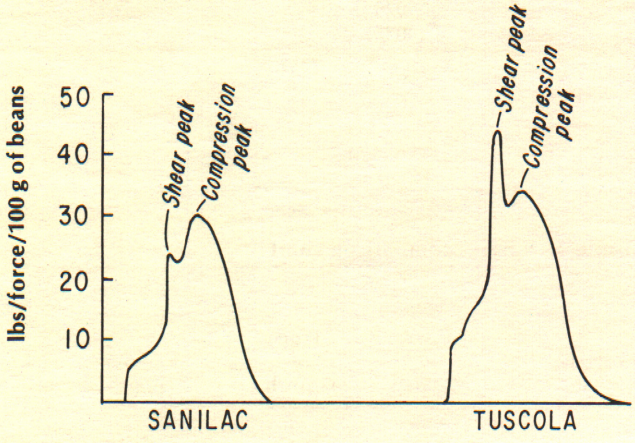

Figure 1. Shear-press tracings from Bean Quality Laboratory tests at Michigan State University. The shear-press curve for processed Sanilac beans shows a predominant compression force component whereas processed Tuscola beans have a predominant shear force component (left) peak in addition to a compression component (right) peak. The predominant compression peak for Sanilac occurs because a uniform rupturing (extrusion) of beans takes place when force is applied. The large shear force for Tuscola arises because of excessive pressure necessary to bring beans to the point of extrusion. The shear component of texture indicates the degree of seed coat cohesiveness. Tuscola has a slightly firmer texture than Sanilac and greater seed coat cohesiveness.

History and Pedigree

Formerly known as Michigan 8467, Tuscola is a pure line derivative from the 4th intercross generation of a 10 x 10 diallel cross involving two standard navy bean varieties and eight experimental navy bean selections as parents. The 4th intercross cycle was completed in 1962-1963 and the progeny of that generation was field tested in 1963. Selfing and plant selection was practiced annually until 1966.

Yield Performance

Extensive field testing since 1963 has shown that yields of Tuscola should equal or exceed those of other navy bean varieties, while giving the extra advantage of physical impact resistance. In fifteen separate location-year tests in Michigan, Tuscola averaged 2087 lbs/acre compared to 1941 lbs/acre for Sanilac. In four years of tests in Ontario, Canada, Tuscola yields exceeded those of Sanilac—2270 compared to 1755 lbs/acre. Further yield information is provided in Table 2.

Agronomic Description

Tuscola is a vigorous, dark-green, bush bean, somewhat more erect in profile than Sanilac. Unlike Sanilac, it does not have the tendency to produce "runners" from elongation of the terminal internodes of the main axis. It is slightly later than Sanilac, requiring about 90-94 days to reach maturity under

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Table 2. Yield (lbs/acre) for Tuscola compared to several check varieties

Variety	1970	1973	1974	1974	1975	1975 County Trials						
						Charlevoix	Delta	Leelanau	Alcona	Emmet	Antrim	1976
Tuscola	1124	2177	2452	2702	1867	3251	2812	1769	1690	2608	3056	1637
	1117	---	---	---	1793	---	---	---	---	---	---	---
	(1249)	---	---	---	---	---	---	---	---	---	---	---
Seafarer	---	2020	2614	2791	1590	---	---	1612	---	---	1984	1472
	---	---	---	2465	1505	---	---	---	---	---	---	1333
Sanilac	1381	2080	2634	2466	1911	2615	2025	1816	1953	(2763)	2101	1590
	975	---	---	2637	1777	---	---	---	---	---	---	1250
	(1017)	---	---	---	---	---	---	---	---	---	---	---
Aurora	---	2052	2030	---	1488	2889	2109	1588	1705	2253	1542	1706
Snowflake	---	---	2375	---	---	---	---	---	---	---	---	---
Upland	---	---	2273	---	---	---	---	---	---	---	---	---
Charity	---	---	2165	---	---	---	---	---	---	---	---	---
Kentwood	---	---	2253	---	1600	---	---	---	---	---	---	1494

Table 3. Variety comparison chart

Variety	Days to Maturity	Type of Growth	Canning Quality	DISEASE REACTIONS*							
				Bacterial Blight		Common Mosaic Resistance		Anthracnose			
				Common and Fuscous	Halo	V_1	V_{15}	Alpha	Beta	Gamma	Delta
Seafarer	80-90	Bush	Excellent	S	R	R	R	R	R	R	S
Sanilac	85-95	Bush	Good	S	R	R	S	R	R	R	S
Tuscola	85-95	Bush	Excellent	S	R	R	R	R	R	R	S
Fleetwood	85-90	Bush	Good	S	R	R	R	R	R	R	S

** S indicates susceptible; R indicates resistant.*

Michigan conditions. Pods are rather long for a navy bean, with 4-5 seeds per pod; the pod is tan to white at maturity and is rather thin-walled.

Disease Resistance

Tuscola is resistant to the alpha, beta and gamma strains of anthracnose and to both the type strain and New York 15 variant of bean common mosaic virus. Table 3 shows complete information on the agronomic charcteristics and disease resistance of Tuscola compared to that of Sanilac, Seafarer and Fleetwood.

Plant Variety Protection

An application has been filed for Plant Variety Protection for Tuscola. Sale of seed by variety name is restricted to certified seed. Sale of uncertified seed by variety name (Tuscola) will be in violation of provisions of the Federal Seed Act. Growers who buy certified seed may not legally sell the following generation as year-from-certified Tuscola. This provision is expected to maintain better varietal identity of Tuscola and help control serious seedborne diseases such as common bacterial blight.

Seed Availability

Certified seed of Tuscola is available throughout the bean area of Michigan from elevators and certified seed producers. Use of certified seed provides the best assurance of high-quality, disease-free seed of known genetic identity. The Michigan improved bean seed program is based on *breeder* seed production in dry, disease-free areas of Idaho and Colorado followed by *foundation* and *certified* seed production in Michigan. All three generations must pass rigid field and laboratory inspections for seedborne diseases. Only high-quality seed which is free of seedborne pathogens is certified.

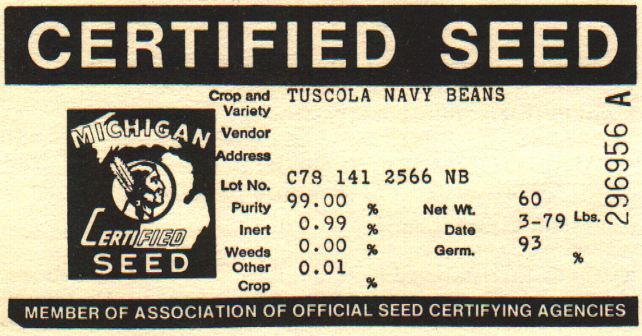

Fig. 2. A certified seed tag for Tuscola.

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