Food-Grade Soybean Variety Evaluation Studies

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Introduction

The ISU Northeast Research Farm has been evaluating food-grade soybean varieties for the last four years. The last two years has included the new Iowa State low-linolenic soybean varieties. The "low lin" soybeans have lower levels of linolenic acid, which reduces or eliminates the need for partial hydrogenation, a process used to extend freshness of food products and the frying life of conventional cooking oils. The level of linolenic acid determines whether it will reduce or eliminate the need for hydrogenation. The partial hydrogenation process results in the formation of trans fatty acids, which are linked to heart disease because they elevate LDL (bad) cholesterol while lowering HDL (good) cholesterol. In 2004, only two new low-linolenic soybean varieties were available in the 2.7 and 3.1 maturity range. In 2005 two new ISU late group II varieties were added to the trial and the group III varieties were dropped. Last year it was felt that the group III varieties are too late for this farm and cause the soybeans to be too wet at harvest. New varieties with low saturated fat were added to the study this year. An Asgrow variety with 3% linolenic acid was also added to the plots in 2005 (compared with the ISU varieties at 1% linolenic acid). Additional varieties from the ISU soybean breeding programs will be available with improved plant characteristics and adapted to a wider geographical area for 2006. Producers will need performance data to determine whether the premium offered for growing the new soybeans is adequate. Premiums are designed to cover yield drag as well as identity preservation cost and the higher value of food-grade soybean products.

Materials and Methods

The soils were Readlyn and Kenyon loams for 2004 and 2005, respectively. The pH, P_2O_5 and K_2O levels were all in the optimum ranges for both years. The experimental design for both years was a randomized complete block with three replications. Plots were 15 ft × 100 ft in 2004 and 15 ft × 50 ft in 2005. The previous crops were corn. The studies were all in a conventional tillage system (fall chisel plowed and spring field cultivated prior to planting). Soybean varieties were planted 1.5 in. deep on May 17, 2004 and 2005. The 2004 plot was sprayed with 14 oz/acre Select, 4.0 oz/acre Pursuit, 0.125 oz/ac Pinnacle, 3.0 oz/acre Cobra, 0.25% V/V Activator 90 (nonionic surfactant), and 32 oz/acre 28% nitrogen on July 2. The 2005 plots were sprayed with 2.0 oz Pursuit, 0.125 oz Pinnacle, 6.0 oz of Cobra, 14 oz of Select, and 0.25% V/V Activator 90 (nonionic surfactant) on July 2. On July 30, 2005, the plots were sprayed with 3.5 oz of Mustang Max insecticide for aphid control. The 2004 and 2005 plots were machine harvested for yield on October 6 and October 2, respectively.

Results and Discussion

Table 1 shows the food-grade soybean varieties tested, soybean characteristics, and years evaluated at Nashua, Iowa. The year 2004 was good for soybean yields, especially when compared with the low yields experienced in 2003 due to the late-season drought and economically significant yield-damaging soybean aphid infestations. No appreciable damage was observed due to weather, disease, or insects in 2004. 2005 was also a good year for soybeans. The linolenic soybean varieties did not appear to carry any yield drag when compared with other comparable food-grade varieties at Nashua in 2004 or 2005. The low saturate varieties appear to carry a small yield drag. Weed control was excellent in both years of testing. The seed characteristics varied by the type of breeding that went into the varieties, but generally the low-linolenic and low-saturated varieties were lower in protein and higher in oil than the other food-grade varieties tested. This is consistent with how they were designed.

Table 1. Yields of food-grade soybean varieties grown at Nashua in 2004–2005.

2005 Results							
Variety	RM	Bu/acre	% H_2O	Protein	Oil	Fiber	Variety characteristics
IA1010	1.9	63.8	13.7	38.5	17.1	4.7	Large seed
IA1013	1.9	61.2	13.3	40.2	17.7	4.4	Large seeded, high protein
IA1017	1.7	59.3	12.9	39.1	17.2	4.6	Large seeded, high protein
IA2074	2.7	61.9	13.6	41.1	16.5	4.5	Large seeded, high protein
IA2068	1.9	65.1	13.7	35.7	17.7	4.9	SCN resistant
IA2053	2.6	61.6	13.5	40.7	16.6	4.5	Large seeded, high protein
IA2072	2.6	63.8	13.4	36.6	17.6	4.8	1% linolenic
IA2073	2.6	62.0	13.5	36.7	17.5	4.8	1% linolenic
IA2069	2.4	62.6	13.2	37.0	17.8	4.8	Low saturate
IA2070	2.4	60.2	13.0	38.3	17.3	4.7	Low saturate
ASG2421V	2.4	65.1	14.2	36.7	17.9	4.8	3% linolenic
PAT7321	2.1	63.2	13.7	40.3	17.2	4.5	Large seed, High protein
PAT7319	1.9	61.3	13.4	40.5	16.7	4.5	Large seed, High protein
PAT7588	2.2	61.9	13.9	39.0	17.1	4.6	High protein
HP204	2.2	55.8	13.5	40.0	16.7	4.5	Large seeded, high protein
Vinton 81	2.1	51.4	13.5	40.0	16.4	4.6	Large seeded, high protein
2004 Results							
IA1010	1.9	57.6	11.9	38.0	16.5	4.9	Large seed
IA1011	1.9	48.2	11.1	37.8	16.8	4.9	Large seed
IA1013	1.9	47.3	11.4	40.3	17.3	4.5	Large seeded, high protein
IA1014	1.9	51.2	11.3	41.0	17.6	4.5	Large seeded, high protein
IA2053	2.6	54.3	11.2	40.2	16.3	4.6	Large seeded, high protein
IA2064	2.7	52.4	11.2	38.9	17.6	4.7	1% linolenic
IA3017	3.1	57.0	18.3	37.7	17.2	4.8	1% linolenic
PAT7321	2.1	52.3	11.0	40.8	16.5	4.5	Large seeded, High protein
ASG2247	2.3	57.3	10.8	37.3	17.8	4.7	High protein
HP204	2.2	44.9	11.3	39.9	16.7	4.6	Large seeded, high protein
Vinton 81	2.1	44.6	11.2	40.4	16.4	4.6	Large seeded, high protein