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Food-Grade Soybean Variety Evaluation Studies

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Abstract
The ISU Northeast Research Farm has been evaluating food-grade soybean varieties for the last five years, and for the last three 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. Producers need performance data to determine whether the premium offered for growing the new soybeans is adequate. Premiums are designed to cover yield drag, identity preservation cost, and the higher value of food-grade soybean products.

Disciplines
Agricultural Science | Agriculture

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Introduction

The ISU Northeast Research Farm has been evaluating food-grade soybean varieties for the last five years, and for the last three 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. Producers need performance data to determine whether the premium offered for growing the new soybeans is adequate. Premiums are designed to cover yield drag, identity preservation cost, and the higher value of food-grade soybean products.

Materials and Methods

In 2006, four ISU low linolenic varieties (licensed to Asoyia), two low linolenic Asgrow varieties, and one Stine low linolenic variety were compared with one Asgrow, three PBB, and one HP non-low linolenic varieties. Varieties for the non-low linolenic food-grade soybeans are from ISU, Pattison Brothers, and Asgrow. The soil in the plot area for the 2006 study consisted of Kenyon loam on 2–5% slopes and Readlyn loam on 0–2% slopes. Soil fertility for the 2006 plot area was 23.0 ppm P_2O_5 (High by Bray P) and 180.5 ppm K_2O (High) with 6.83 pH and 3.35% organic matter. The experimental design was a randomized complete block with three replications and plots were 15 ft × 67 ft. The previous crop was corn. The studies were in a conventional tillage system (fall chisel plowed and two spring field cultivations prior to planting). Soybean varieties were planted 1.5 in. deep on May 15, 2006. The plot was sprayed on June 23 with 14 oz/acre Select, 2.0 oz/acre Pursuit, 0.125 oz/acre Pinnacle, 6.0 oz/acre Cobra, and 0.25% V/V Activator 90 (non-ionic surfactant). On August 2 the plots were sprayed with 3.2 oz of Warrior insecticide for aphid control. No appreciable damage was observed due to weather, disease, or insects in 2006. The plots were machine harvested on October 5.

Results and Discussion

Table 1 shows the food-grade soybean varieties and the low linolenic varieties tested, soybean characteristics, yield, and bean properties. The average yield for the total plot was 53.46 bushels/acre with LSD (5% level) of 2.1 bushels/acre. The average yield of the low linolenic varieties was 55.31 bushels/acre compared with the 51.70 bushels/acre for the food-grade varieties without the HP 204 variety, a popular variety but well known for low yields. The conventional non-GMO variety acts as a check plot and was not included in the plot averages. The 1% linolenic soybean varieties do not seem to have yield drag and are slightly better when compared with other comparable food-grade varieties at Nashua since 2004. There was also variation within the low linolenic varieties. From the limited number of varieties in this study, the low linolenic varieties performed better than the food-grade soybean varieties with some variation among the low linolenic varieties. The conventional variety with SCN resistance had a similar yield as the best low linolenic variety, and was better than the average of the low linolenic varieties. Typical low linolenic soybean yields are probably less than the better soybean varieties planted in the area, but better than the food-

grade varieties. Seed characteristics varied, but generally the low linolenic varieties were lower in protein and higher in oil than the other food-grade varieties tested. These traits are consistent with how the varieties were designed and may pose a problem for marketing the soymeal. For the low linolenic varieties to compete in the soy protein market, they will need to maintain at least a 35% protein level in the soymeal. This report is one year's data and needs to be reviewed in that context.

Table 1. Yields of food grade and low lin soybean varieties grown at Nashua, 2006.

Variety	RM	Bu/A	%H2O	Protein	Oil	Fiber	Variety characteristics
Asoyia 2505LL	2.5	52.5	12.37	33.90	18.37	14.30	1% linolenic
Asoyia 2525LL	2.5	52.4	12.27	33.57	18.50	14.60	1% linolenic
Asoyia 2704LL	2.7	52.8	13.10	35.53	19.27	13.67	1% linolenic, non GMO
Asoyia 3005LL	3.0	61.4	13.40	32.23	18.87	15.23	1% linolenic, non GMO
Asgrow 2421LL	2.4	57.6	12.17	33.57	18.90	15.00	3% linolenic, RR
Asgrow 3521LL	3.5	54.9	15.36	33.30	18.10	14.77	3% linolenic, RR/SCN
Stine 2406-94LL	2.4	55.4	12.4	33.57	18.97	15.10	3% linolenic, RR
LL Variety avg.		**55.3**	**13.01**	**33.67**	**18.71**	**14.67**	**Low linolenic**
Asgrow 2442	2.4	62.70	12.60	34.93	18.90	15.67	Conventional, SCN
PBB 7319	1.9	51.31	12.47	37.67	17.93	14.80	High protein, large seeded
PBB 7321	2.1	51.66	12.37	38.07	18.43	13.13	High protein, large seeded
PBB 7588	2.2	52.14	12.30	35.63	18.27	15.53	High protein
HP 204	2.2	45.86	12.60	37.53	18.10	13.43	High protein, large seeded,
Non-LL avg.*		**50.24**	**12.47**	**36.77**	**18.33**	**14.51**	**Non-low linolenic food grade**

*Does not include the conventional variety.