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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 three years including 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 partial hydrogenation process results in the formation of trans fatty acids, that 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. New varieties with 1% linolenic acid are currently being produced in soybean breeding programs and will be available with improved plant characteristics and adapted to a wider geographical area for 2005. Premiums are designed to cover yield drag, identity preservation cost, and the higher value of food grade soybean products. Producers will need performance data to determine whether the premium offered for growing the new soybeans is adequate.

**Disciplines**
Agricultural Science | Agriculture

# 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 three years including 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 partial hydrogenation process results in the formation of trans fatty acids, that 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. New varieties with 1% linolenic acid are currently being produced in soybean breeding programs and will be available with improved plant characteristics and adapted to a wider geographical area for 2005. Premiums are designed to cover yield drag, identity preservation cost, and the higher value of food grade soybean products. Producers will need performance data to determine whether the premium offered for growing the new soybeans is adequate.

## Materials and Methods

The soil consisted of a Readlyn loam in all three years of the studies and pH, $P_2O_5$, and $K_2O$ levels were all in the optimum ranges. The experimental design was a completely randomized block with three replications and plots were 15 × 100 ft. 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, 2002 and 2004, and May 23, 2003, at 189,417 seeds/acre, in 30-in. rows. The 2004 plot was sprayed on July 2 with 14 oz/acre Select, 4.0 oz/acre Pursuit, 0.125 oz/acre Pinnacle, 3.0 oz/acre Cobra, 0.25% V/V Activator 90 (non-ionic surfactant), and 32 oz/acre 28% nitrogen. The 2002 and 2003 plots used multiple- row cultivations to control weeds without the use of herbicides. Plots were machine harvested for yield on October 16, 2002, September 27, 2003, and October 6, 2004.

## Results and Discussion

Table 1 shows the food grade soybean varieties tested and year evaluated at Nashua, Iowa. 2004 was a good year for soybean yields, especially when compared with the low yields experienced in 2003 due to the late-season drought and economically damaging soybean yields caused by aphid infestations. No appreciable damage was observed due to weather, disease, or insects in 2004. The two low linolenic soybean varieties performed differently. The late-maturing IA 3017, although high yielding, had significantly higher harvest moisture when compared with the plot average and would not be suitable for planting in northeast Iowa, unless very early planting dates and an optimal heat unit accumulation occurred. The 1% linolenic soybean varieties did not appear to carry any yield drag when compared with other comparable food grade varieties at Nashua. The HP 204 and Vinton 81 soybean varieties yielded 4–8 bushels/acre less when compared with other food grade soybean varieties tested from 2002 to 2004. Improved varieties are presently being grown in Argentina to replace both the IA 2064 and IA 3017. They have shown improved yields in separate plot tests. Weed control was excellent in all three years of testing, despite no herbicide application in 2002 and 2003. Average protein and oil percentages for all varieties combined were 39.3 and 17.0, respectively (Table 2). Protein levels were about 3.0% higher and oil levels about 1.0% lower for

this test compared with the average of the Roundup Ready® and conventional soybean varieties tested in the 2004 Iowa Crop Performance Test (northern Iowa district).

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**Table 1. Yields of food grade soybean varieties grown at Nashua, IA (2002–2004).**

| Variety | RM* | 2004 $\%H_2O$ | 2004 bu/ac | 2003 %H20 | 2003 bu/ac | 2002 $\%H_2O$ | 2002 bu/ac |
|---|---|---|---|---|---|---|---|
| IA 1010 | (1.9) | 11.9 | 57.6 | 13.5 | 32.3 | 13.8 | 46.6 |
| IA 1011 | (1.9) | 11.1 | 48.2 | 12.7 | 29.8 | 13.5 | 42.9 |
| IA 1013 | (1.9) | 11.4 | 47.3 | 12.6 | 33.5 | | |
| IA 1014 | (1.9) | 11.3 | 51.2 | 13.2 | 29.2 | | |
| IA 2053 | (2.6) | 11.2 | 54.3 | 12.9 | 29.9 | 13.4 | 45.9 |
| IA 2064 | (2.7) | 11.2 | 52.4 | | | | |
| IA 3017 | (3.1) | 18.3 | 57.0 | | | | |
| Pattison 7321 | (2.1) | 11.0 | 52.3 | | | | |
| Asgrow 2247 | (2.2) | 10.8 | 57.3 | 12.8 | 32.5 | | |
| HP 204 | (2.3) | 11.3 | 44.9 | 13.0 | 28.6 | 13.9 | 39.1 |
| Vinton 81 | (2.3) | 11.2 | 44.6 | 13.3 | 25.2 | 13.8 | 39.2 |

*Relative maturity zone

**Table 2. Grain composition of food grade soybean varieties grown at Nashua, IA (2004).**

| Variety | 2004 Protein (%) | 2004 Oil (%) | 2004 Fiber (%) | Soybean variety characteristics |
|---|---|---|---|---|
| IA 1010 | 38.0 | 16.5 | 4.9 | Large seed |
| IA 1011 | 37.8 | 16.8 | 4.9 | Large seed |
| IA 1013 | 40.3 | 17.3 | 4.5 | Large seed and high protein |
| IA 1014 | 41.0 | 17.6 | 4.5 | Large seed and high protein |
| IA 2053 | 40.2 | 16.3 | 4.6 | Large seed and high protein |
| IA 2064 | 38.9 | 17.6 | 4.7 | 1% low linolenic |
| IA 3017 | 37.7 | 17.2 | 4.8 | 1% low linolenic |
| Pattison 7321 | 40.8 | 16.5 | 4.5 | High protein |
| Asgrow 2247 | 37.3 | 17.8 | 4.7 | High yield and protein |
| HP 204 | 39.9 | 16.7 | 4.6 | Large seed and high protein |
| Vinton 81 | 40.4 | 16.4 | 4.6 | Large seed and high protein |
| Average | 39.3 | 17.0 | 4.7 | |