

**University of Kentucky College of Agriculture
New Crop Opportunities Center**

Breeding Triple-null Lipoxygenase Soybean Cultivars

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Introduction

The objective of this project is to produce soybean cultivars lacking the three seed lipoxygenase enzymes. These cultivars are being designed for use in three different soyfood roles: processed soyfoods, green immature edible soybean, and black mature edible soybean. These cultivars will be of maturity group IV, suitable for production in Kentucky.

Materials and Methods

The cultivar ‘7499’, released by the Kentucky Agricultural Experiment Station, is a commodity soybean (yellow seed, yellow seed coat, and average seed size) released for yield potential and disease resistance. ‘7499’ was crossed to the Japanese soybean parent, donating the three lipoxygenase null alleles, and then backcrossed two times. As such about 88% of the genes should come from ‘7499’. After selfing, seeds were tested for the absence of the three lipoxygenase enzymes. In 2001, 34 second backcross lines were compared with the recurrent parent ‘7499’ in yield tests at two locations. Five lines were selected for advanced yield testing in five locations in 2002. These five lines performed similarly to ‘7499’ (Table 1). At harvest, 200 plants of each line were kept separate and tested for the absence of the three lipoxygenase enzymes. The triple-null plants of lines KY15-4 and KY10-126 will be grown in a seed increase in 2003 while the two lines are tested again in the novel soybean section of the Kentucky Soybean Performance Tests. The goal is to produce a commodity type soybean lacking seed lipoxygenases that will combine good yield and special characteristics for processed soyfoods.

7499	Oct. 12	28	36
KY15-4	Oct. 8	30	37
KY11-59	Oct. 3	28	34
KY11-83	Oct. 6	26	36
KY10-126	Oct. 9	30	35
KY23-76	Oct. 8	27	33

Edamame is the Japanese term for soybean consumed immature as green vegetable soybean. Emerald is a large-seeded soybean cultivar with green seed cotyledons and green seed coats. It was released in 1975 by the University of Delaware as a specialty food cultivar and is adapted to production in Kentucky. Emerald was crossed with KY10-146, a triple lipoxygenase null line from the ‘7499’ backcrossing program. Thirty-five first backcross plant families were tested for the presence of the

three lipoxygenase enzymes. Seeds from 17 families were grown in 2002 and 2003. Selection and yield testing will begin in 2004. The goal is to produce a soybean line with large green seeds suitable for green vegetable soybean consumption. A similar program has been started using ‘Gardensoy 41’, a soybean cultivar selected specifically for edamame production and released in 2000 by the University of Illinois.

Soybean with black seed coat and yellow seed cotyledons are often sold in home gardening catalogues for consumption as an edible mature black soybean. In cooperation with Kentucky Foundation Seeds, a black-seeded mutant of the cultivar ‘Stressland’ was selected. This mutant performs as well as ‘Stressland’ (Table 2). The black-seeded ‘Stressland’ was crossed with KY10-126, and the population was advanced to the F4 generation, at which time black-seeded triple lipoxygenase null seeds were selected. Individual plants from these seeds are growing in 2003, and yield tests will begin in 2004.

Table 2. Performance of Black Stressland compared to Stressland in eight environments in 2001 and 2002. Tested in the novel soybean plots of the Kentucky Soybean Performance Tests.

<u>Entry</u>	<u>Lodging</u> (1 poor – 5 good)	<u>Yield</u> (bu/a)
Stressland	2.6	44
Black Stressland	2.8	48