Genetic Analysis of a Root Fluorescence Mutant from Yunnan Province China

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Introduction

Fluorescence of soybean roots under ultraviolet light was used in Europe to distinguish cultivars (Chmelar 1934; Chmelar and Mostovoj 1934). Delannay and Palmer (1982) and Sawada and Palmer (1987) identified four recessive loci *fr1 fr2 fr4* and *fr5* and one dominant locus *Fr3* that condition nonfluorescent roots in soybean.

In 1992 500 soybean accessions were received from nine provinces in North China (Set 1). These accessions were classified into 734 accessions after agronomic descriptive evaluations were completed. Torkelson and Palmer (1997) identified 32 accessions with nonfluorescent roots among these 734 accessions. Genetic tests confirmed 14 *fr1 fr1* genotypes from 103 accessions from Gansu province 1 *fr1 fr1* genotype from 141 accessions from Shandong province 15 *fr1 fr1* genotypes and 2 *fr2 fr2* genotypes from Shanxi province.

Chinese soybean accessions from South China (Set 2) gave zero nonfluorescent mutants out of 799 accessions. Additional accessions from South China (Set 3) gave one nonfluorescent accession from 623 accessions. Our objective was to determine the genotype of the nonfluorescent accession PI 594.847.

Materials and Methods

About 10 seed from each of the 799 accessions (Set 2) and 623 accessions (Set 3) were germinated on paper and the 3-day-old seedlings were examined under an ultraviolet light. Cross-pollinations were made between the nonfluorescent accession PI 594.847 and near-isogenic lines Hark-*fr1* Hark-*fr2* Hark-*Fr3* Hark-*fr4* and Williams-*fr5*.

Several F1 seed from each cross combination were germinated and the seedlings examined with an ultraviolet light. These seedlings were discarded. Additional F1 seed were sent to the Iowa State University-University of Puerto Rico Soybean Nursery near Isabela for generation advance.

Results and Discussion

No nonfluorscent accessions were identified among the 799 accessions of Set 2. One accession out of 623 from Set 3 was identified as nonfluorescent root (Table 1). This accession PI 594.847 was from Yunnan province. The allelism tests F1 and F2 data with the five known nonfluorescent root mutants confirmed that PI 594.847 was *fr1 fr1* (Table 1).

Delannay and Palmer (1982) identified 59 accessions out of 572 accessions that were nonfluorescent roots. The majority (41) were *fr1 fr1*. Torkelson and Palmer (1997) reported that 30 out of 32 Chinese nonfluorescent accessions (Set 1) were *fr1 fr1*. From more southern Chinese germplasm Set 2 with 799 accessions and Set 3 with 623 accessions only one nonfluorescent root mutant was observed. This accession PI 594.847 was *fr1 fr1* and represents the most southern Chinese province with an accession with an identified nonfluorescent root mutant.

References

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Table 1. Allelism test of Chinese accession PI 594.847 (nonfluorescent root) with known nonfluorescent root genetic testers *fr1 fr2 Fr3 fr4* and *fr5* (F1 and F2 data).

	No. F1 plants		No. F2 plants			
PI 594.847	**F***	**NF***	**F***	**NF***	**χ^2 (9:7)**	**P**
X Hark-*fr1*	0	8	0	330		
X Hark-*fr2*	13	0	195	156	0.07	0.79
X Hark-*Fr3*	0	17	85	359	0.05**	0.83
X Hark-*fr4*	10	0	270	202	0.17	0.67

X Williams-*fr5*	16	0	243	203	0.56	0.45

*F means fluorescent roots under ultraviolet light and NF means nonfluorescent roots under ultraviolet light.
**χ^2 (3:13)