IOWA STATE UNIVERSITY
Department of Agronomy
and
UNITED STATES DEPARTMENT OF AGRICULTURE
Ames, IA

1) Segregation patterns of some simply inherited traits in Glycine max x G. soja crosses.

As part of a genetic study of the relationships within the genus Glycine subgenus Soja we wish to report some observations on the inheritance of traits in crosses of G. max x G. soja and G. max x semi-wild ("gracilis") lines. The data to be discussed are contained in Table 1; the discussion will proceed on a locus by locus basis.

Fr locus: Segregation of non-fluorescing root phenotypes was observed in two crosses: 'Hark' (Fr) x PI 153,292 (a non-fluorescent semi-wild line) and 'Minsoy' (fr) x PI 342,622B (a fluorescent G. soja). All F_1 plants had fluorescent roots; F_2 segregation ratios were not significantly different from 3:1, fluorescent : non-fluorescent phenotypes.

The G. soja germplasm collection includes about 20% non-fluorescent root phenotypes (n = 370 examined). All F_1 plants and F_2 progeny of a reciprocal cross Minsoy (fr) x PI 407,294 (a non-fluorescent G. soja) displayed non-fluorescent roots indicating that the non-fluorescent factors occurring in these two lines are functionally allelic.

Pb locus: Pubescence tip shape segregated 3:1, sharp : blunt in two crosses: Hark (blunt) x PI 153,292 (sharp) and PI 407,292 (sharp) x Hark. All F_1 plants bore sharp pubescence. These data agree with the findings of Ting (1946). Blunt pubescent tip is rare in G. soja (ca. 2%). A blunt phenotype found in G. soja (PI 342,434) proved to be functionally allelic with pb in 'Wells' in the F_1 and reciprocal backcrosses.

Ep locus: The segregation of high and low seedcoat peroxidase levels was observed in a cross of Minsoy (ep) x PI 342,622B (G. soja, high). F_1 plant bore seeds with high levels of peroxidase in the seedcoats; the F_2 generation segregated 3:1, high : low. Low seedcoat peroxidase levels occur in less than 1% of the accessions in the G. soja collection. Low peroxidase levels found in PI 342,434 proved to be functionally allelic with ep as found in Wells in F_1 and reciprocal backcrosses.

Table 1

Segregation patterns of some simply inherited traits in *Glycine max* x *G. soja* crosses

Cross	Segregating alleles	F_1 phenotype	F_2 phenotypes	χ^2	n
Hark x PI 153,292 (gracilis)	Fr/fr	RF (+)	54 RF(+) 20 RF(-)	0.162	74
	Pb/pb	sharp	20 sharp 5 blunt	0.333	25
Minsoy x PI 342,622B (soja)	Fr/fr	RF (+)	36 RF(+) 12 RF(-)	1.000	48
	Ep/ep	high	27 high 9 low	0.000	36
Hark x PI 342,622B (soja)	T_1/t_1	tawny	20 tawny 6 grey	0.051	26
PI 407,292 x Hark (soja)	Pb/pb	sharp	16 sharp 5 blunt	0.016	21
	T_1/t_1	tawny	20 tawny 6 gray	0.051	26
	Fg_1/fg_1	1T (Fg_1)	9 Fg_1[a] 12 fg_1	11.57**	21
	Fg_2/fg_2	1T (Fg_2)	19 Fg_2[a] 2 fg_2	2.68	21
	Fg_3/fg_3	1T (Fg_3)	18 Fg_3[a] 3 fg_3	1.29	21

[a]Actual phenotypes: 6 = 1T, 3 = 2T, 3 = 4T, 7 = 4t, and 2 = 7t.

**$p > 0.05$.

T_1 locus: The inheritance of tawny and gray pubescence was observed in two *G. max* x *G. soja* crosses: Hark (t) x PI 342,622B (T) and PI 407,292 x Hark. F_1 plants of both crosses had tawny pubescence; segregation ratios of F_2 progeny were not significantly different from 3:1, tawny : gray. Gray pubescence does not occur in *G. soja*.

$\underline{Fg_1}$, $\underline{Fg_2}$ and $\underline{Fg_3}$ loci: The inheritance of flavonol glycoside compounds was observed in one cross: PI 407,292 (G. soja, flavonol glycoside group 2T) x Hark (group 7t). F_1 plants were classified as group 1T; a small (n = 21) sample of F_2 progeny segregated 6-1T : 3-2T : 3-4T : 7-4t : 2-7t. Chi-square tests indicate that the segregation of $\underline{Fg_2}$ and $\underline{Fg_3}$ were not significantly different from 3:1; however, the segregation pattern of Fg_1 tested significantly different from the expected 3:1 ratio. This might simply be attributed to the small sample. However, Buttery and Buzzell (1976) have demonstrated that individuals containing both $\underline{Fg_1}$ and $\underline{Fg_3}$ (i.e., groups 1T, 1t, 3T and 3t) have significantly lower photosynthetic rates than individuals of other genotypes. The plants examined in this study were grown in the field and no attempt was made to insure the survival and adequate sampling of possible subvital individuals. This significant Chi-square may be the result of inadequate sampling measures. Additional crosses of G. max x G. soja have been made and inheritance of traits will be established.

References

Buttery, B. R. and R. I. Buzzell. 1976. Flavonol glycoside genes and photosynthesis in soybeans. Crop Sci. 16: 547-550.

Ting, C. L. 1946. Genetic studies on the wild and cultivated soybeans. J. Am. Soc. Agron. 38: 381-393.

Steven L. Broich
Reid G. Palmer—USDA

UNIVERSITA DI PADOVA
Instituto di Agronomia
Padova, Italy

1) The monogenic and digenic control of hypocotyl and flower color in soybeans.

The pigmentation of seedling hypocotyl is important in the knowledge, at a very early stage, of success in the cross of plants differing in this aspect.

Several genes, among which are $\underline{W_1}$, $\underline{W_2}$, $\underline{W_3}$, $\underline{W_4}$, and wm, have been recognized as controlling flower pigmentation, and many studies indicate that flower and hypocotyl colors are closely associated. Hartwig and Hinson (1962) put in evidence that hypocotyl of $\underline{W_1}\underline{W_3}\underline{W_4}$ genotypes is darker than that of $\underline{W_1}\underline{w_3}\underline{W_4}$ ones. Bernard and Weiss (1973) reported that purple hypocotyl is controlled by the $\underline{W_1}$ gene having a pleiotropic effect.