The low whole plant quality of the soybeans was not only a reflection of high stem fiber but also a reflection of high leaf fiber. The better quality of the wild soybean was due to the young growth which finally occurred at the end of the summer as rabbit pressure eased. Rabbits and deer selectively browsed the soybeans and neglected the protepeas in both 1974 and 1975. The apical, meristemic regions of the growing soybean plant are apparently quite acceptable even though the rest of the plant is highly fibrous.

Use of the leafy, small-vined G. soja in 1975 was an effort to improve protein while retaining the in vitro digestibility of Zea mays silage. Perhaps other soybean types, possibly the edible or non-pubescent types, may have less plant fiber.

Reference

Gupta, B. S., D. E. Johnson, F. C. Hinds and H. C. Minor. 1973. Forage potential of soybean straw. Agron. J. 65: 538-541.

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1) Determination of sugar content of individual soybean seeds.

In order to investigate the possibility of single seed selection for sugar content in soybeans, a technique has been developed for analysis of 20-40 mg samples of soybean meal. The method described by Hymowitz et al. (1972) has been modified to serve this purpose.

A portion of a soybean seed is ground for 5 min in a ball mill (Spex Industries, Inc.). A 40 mg sample of meal is weighed and wrapped in 7½ cm Whatman filter paper (No. 50). The package is then bound tightly with wire. Lipids are extracted by refluxing for 24 hr with petroleum ether (bp 30-60 C) in a Soxhlet extraction apparatus. The defatted meal is then transferred to a 16 x 125 mm screw-capped culture tube and .5 ml (2.5 mg) of gentiobiose solution is added as an internal standard. The volume is brought to 5 ml

with 80% ethanol and the tube is shaken on a Super Mixer (Matheson Scientific). The sample is heated in a 75 C water bath for 1 hr, being shaken every 10 min. The solution is then transferred to a 50 ml beaker. The meal is washed four times with 5 ml of 80% ethanol, the washings being combined with the original transfer. The sugar solution is evaporated to low volume (about 3 ml) and transferred to a clean culture tube. Protein is precipitated with 6 drops of lead acetate, and 6 mg of sodium bicarbonate is added to remove excess lead. The sample is then centrifuged at 2000 g for 15 min and decanted into a 15 x 45 mm shell vial. The pH is adjusted to 5.7-6.3 with 3.4 M acetic acid and the sample is then evaporated to complete dryness. Derivitization and GLC settings are as described by Hymowitz et al. (1972) with the following exceptions: carrier flow rate, 30 cc/min; carrier makeup, 90 cc/min; column temperature rise from 150-330 C over an 8 min rise time, preceded by a hold time of 2.4 min at 150 C.

Reference

Hymowitz, T., F. I. Collins, J. Panzner and W. M. Walker. 1972. Relationship between the content of oil, protein, and sugar in soybean seed. Agron. J. 64: 613-616.

S. J. Openshaw
T. Hymowitz
H. H. Hadley

2) Inheritance of a second SBTI-A_2 variant in seed protein of soybeans.*

The soybean trypsin inhibitor (SBTI-A_2) is a seed protein that exhibits different electrophoretic forms. Hymowitz and Hadley (1972) demonstrated that two different electrophoretic forms of SBTI-A_2 represent the expression of two codominant alleles at a single locus. They assigned the symbol Ti^1 to the allele controlling the most commonly occurring electrophoretic form Rf 0.79/10% (Rf = mobility relative to the dye front in a 10% polyacrylamide gel anodic system) and Ti^2 to the allele controlling the electrophoretic form found at Rf 0.75/10%. A third electrophoretic form of SBTI-A_2 Rf 0.83/10%

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was recently located in seed of PI 246.367 and PI 196.172 (Hymowitz, 1973). Data reported herein is concerned with the inheritance of Rf 0.83/10% electrophoretic form.

We crossed T245 (Rf 0.75, $\underline{Ti}^2$) with PI 246.367 (Rf 0.83). The F_1 seed had both electrophoretic forms. The pooled F_2 seed segregated 1 Rf 0.75 : 2 both forms : 1 Rf 0.83 (89:162:74, expected 81.5:163:81.5, χ^2P = .54). We crossed 'Harosoy' (Rf 0.79, $\underline{Ti}^1$) with PI 246.367 (Rf 0.83). The F_1 seed had both electrophoretic forms. The pooled F_2 seed segregated 1 Rf 0.79 : 2 both forms : 1 Rf 0.83 (42:101:57, expected 50:100:50, χ^2P = .33). In both crosses the data were pooled since the χ^2 analysis among families showed no heterogeneity.

From these data, we conclude that a gene, here designated $\underline{Ti}^3$, controls the electrophoretic form Rf 0.83/10% and that it has two codominant alleles $\underline{Ti}^1$ and $\underline{Ti}^2$ with which it forms a multiple allelic series controlling the three electrophoretic forms of SBTI-A_2.

References

Hymowitz, T. 1973. Electrophoretic analysis of SBTI-A_2 in the USDA soybean germplasm collection. Crop Sci. 13: 420-421.

Hymowitz, T. and H. H. Hadley. 1972. Inheritance of a trypsin inhibitor variant in seed protein of soybeans. Crop Sci. 12: 197-198.

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3) The gene symbols Sp_1^a and Sp_1^b assigned to Larsen and Caldwell's seed protein bands A and B.*

Larson (1967), using acrylamide gel electrophoresis, described two seed proteins in soybean seed and noted they were variety specific. The inheritance of these proteins (although the proteins were not characterized) was reported as being controlled by two codominant alleles at a single locus (Larsen and Caldwell, 1968); gene symbols were not assigned. The letters "A" and "B" were used to designate the two different seed protein bands.

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Our studies using polyacrylamide gel electrophoresis revealed that the seed protein band called "A" by Larsen and Caldwell (1968) occurs at Rf 0.36/10% (Rf = mobility relative to the dye front in a 10% polyacrylamide gel anodic system) and the seed protein band called "B" occurs at Rf 0.42/10%. We crossed 'Cloud' (Rf 0.42) with 'Amsoy' (Rf 0.36). The F_1 seed had both electrophoretic forms. The pooled F_2 seed segregated 1 Rf 0.36 : 2 both forms : 1 Rf 0.42 (35:77:30, expected 35.5:71:35.5, $\chi^2 P = .51$). We propose the gene symbol base Sp for seed protein with subscript numbers to designate different proteins and superscript letters for codominant alleles controlling different forms of a protein. Thus, we propose Sp_1^a for the electrophoretic form Rf 0.36 and Sp_1^b for the electrophoretic form Rf 0.42. Sp_1^a should be the same gene for the "A" protein band studied by Larsen and Caldwell in Amsoy, and Sp_1^b probably corresponds to their gene for the "B" protein band.

References

Larsen, A. L. 1967. Electrophoretic differences in seed proteins among varieties of soybean, Glycine max (L.) Merrill. Crop Sci. 7: 311-313.

Larsen, A. L. and B. E. Caldwell. 1968. Inheritance of certain proteins in soybean seed. Crop Sci. 8: 474-476.

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4) Glycine germplasm resources.

	Country	Curator	Address	Collection #	Comments
1)	U.S.A.	R. L. Bernard	U.S. Regional Soybean Laboratory Urbana, Illinois 61801	4700	Genetic types, varieties, Glycine species
2)	U.S.A.	E. E. Hartwig	Delta Branch Experiment Station Stoneville, Mississippi 38776	1400	Genetic types, varieties, Glycine spp. world-wide southern collection
3)	U.S.A.	T. Hymowitz	Department of Agronomy University of Illinois Urbana, Illinois 61801	----	Computer stored and data retrieval system for Glycine germplasm available in 1 and 2
4)	Taiwan	S. Shanmugasundarum	Asian Vegetable and Development Center, P.O. Box 42, Shanhua Tainan, Taiwan	9000	World-wide collection, many duplicates of the U.S. collection
5)	Taiwan	Chan Ko Leim	Taiwan Agricultural Research Inst. Taichung, Taiwan	2800	Mainly U.S. collection
6)	India	H. R. Bhatia	Plant Introduction Station Amravati, Maharashtra	1800	Nepal, Sikkim, India, and many other countries
7)	India	B. B. Singh	Department of Plant Breeding G. B. Pant University Pantnagar, Uttar Pradesh	4000	U.S.A., U.S.S.R., India, Japanese collection
8)	Sweden	S. A. Holmberg	Algot Holmberg and Soner AB Plant Breeding Station at Fiskeby 605 90 Norrkoping	1200	East and North Asia
9)	Nigeria	W. Steele	International Institute of Agriculture, Private Mail Bag 5320, Ibadan	2000	East Africa, Tanzania
10)	S. Korea	S. H. Kwon	Atomic Energy Research Institute P.O. Box 7, Cheong Kyang, Seoul	1300	Native land races
11)	S. Korea	K. Y. Park	Crop Experiment Station Office of Rural Development Suweon	300	Glycine species
12)	France	R. M. Ecochard	Ecole Nationale Superieure Agronomique, 145 Av. de Muret Toulouse	500	Bulgaria, Hungary, China, U.S.A.

	Country	Curator	Address	Collection #	Comments
13)	U.S.S.R.	N. I. Korsakov	Vavilov All Union Institute of Plant Industry, Gerzem 44 Leningrad	2500	East and North Asia
14)	Japan	T. Egawa	National Institute of Agricultural Sciences, Hiratsuka, Kanagawa Prefecture	2928	Mainly Japan
15)	Japan	J. Fukui	Plant Breeding Laboratory, Iwate University, Ueda, Morioka-city, Iwate Prefecture	200	*Glycine* species
16)	Peoples Republic of China	C. L. Wang	Northeast Agricultural College Harbin, Heilungkiang Province		Land races
17)	Peoples Republic of China	T. C. Chang	Institute of Crop Breeding Kirin Academy of Agriculture Sciences Kung-chu-ling City, Kirin Province		Land races
18)	Republic of South Africa	J. W. Snyman	Institute for Crops and Pastures Private Mail Bag 116 Pretoria	600	U.S. collection
19)	Rhodesia	R. Tattersfield	Ministry of Agriculture Causeway, Salisbury		

Additional Collections

Bulgaria, National Institute of Agriculture, Sofia

Romania, Agricultural Experiment Station, Fundulea

Indonesia, Institute Pertanian, Bogor

Philippines, College of Agriculture, University of the Philippines, College, Laguna

Hungary, Agricultural Experiment Station, Iregszemcse

Australia, CSIRO, Division of Plant Industry, P.O. Box 1600, Canberra City, A.C.T. 2601

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