

CIAT selection nurseries for climbing beans are carried out from F<sub>2</sub> onwards in one or other, or both, of the above cropping systems with maize. The reason for this is the large genotype by cropping system interaction consistently found for climbing beans, as well as the convenience of using maize rather than artificial supports for large breeding nurseries. Single plant selections are taken only in F<sub>2</sub>; from there on mass selection is used for disease resistance and grain characteristics, the objective being not to obtain a pure line but make a sufficiently homogeneous and yet variable finished product. Major gene disease resistance to bean common mosaic virus and anthracnose is being incorporated routinely into all materials and separate screening for resistance to Empoasca leafhoppers is also carried out.

The selection methodology is based on early generation yield testing, selecting on a family basis in the F<sub>3</sub> generation. Replicated yield trials in relay and associated cropping are carried out at two locations in Colombia. In association with a single maize genotype, a negative relationship between bean and maize yields is consistently found. The negative relationship between bean and maize yields largely explains why farmers use the associated cropping system, greater stability of production of the cropping system as a whole being achieved. The objective of selection is to identify bean genotypes which permit both a satisfactory yield of maize as well as a satisfactory yield of beans. In maize the most important characteristics for association are plant height and lodging resistance. In beans a close relationship between branching pattern and response to association has been found, excessive vigor and branching at the top of the plant tending to cause lodging of the maize

Materials emerging from the early generation yield testing and selection procedure enter a multilocation yield trial within Colombia, also unprotected against diseases and planted in relay or association with maize. Entries are inoculated with Rhizobium and are simultaneously evaluated for their reaction to a range of diseases not previously covered. A network of international trials for climbing beans in relay or association with maize has been established and the first selected lines to emerge from the breeding program (11 lines) five been entered this year together with varieties from collaborating countries.

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Development Of Processing Type Beans (Phaseolus vulgaris)

Resistance To Bacterial Brown Spot (Pseudomonas syringae)

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Bacterial brown spot (Pseudomonas syringae) is one of the most important diseases of bean (Phaseolus vulgaris) in the midwest. Our research efforts toward control have emphasized the development of disease resistance. Hybridizations were made between the highly

resistant selection WIS 133 and susceptible commercial cultivars Cascade, Slimgreen and Tenderwhite. Backcrosses were to Slimegreen. The F<sub>2</sub>, F<sub>3</sub> and sometimes F<sub>4</sub> generations were studied for disease reaction in the greenhouse<sup>4</sup> after artificial inoculation of young leaves with an air-gun at ca 10<sup>7</sup> cells per ml. Advanced generations were tested in field plots where selection for good plant and pod characters could be made under heavy disease pressure.

Excellent disease reaction data has been obtained in 1976, 1977 and 1978. In those seasons, respectively the susceptible control developed 47,400, 56,800 and 48,750 lesions per 50 plants, while such readings for our best bean breeding lines were 50, 23, and 12. WIS 133 showed no lesions per 50 plants in any of the trial years. The new beans have proper maturity, good bush habit and generally have pods of good length and shape, although their color is not dark green. Two of these beans have recently been released as elite germplasm to all bean breeders; another was released earlier. These are the first bush beans developed for resistance to *P. syringae*. WIS (BBSR) 17 and 28 are pointed out by asterisks in the following table.

Reaction of 10 Wisconsin bean breeding lines resistant to bacterial brown spot - 1976.

Bean Line	Number of Lesions
52	150 <sup>a</sup>
61	50
85	150
106	200
110	75
127	150
128	0
130	100
158	100
187	50
W 133 (resistant)	0
Eagle (susceptible)	47,000

Pedigree	No. of lesions	
	1977	1978
SXSX 133-1-6-97	256 <sup>a</sup>	156
SXSX 133-1-6-28-11	228	18
SXSX 133-6-28-13	363	51
SXSX 133-1-28-20	273	176
SXSX 133-1-6-28-28	271	12
SXSX 133-1-8-120	40	352
*SXSX 133-1-8-121 (WIS 17)	95	193
*SXSX 133-1-7-11 (WIS 28)	23	28
SXSX 133-1-7-11	83	133
SX 133-4-2-1-8-1	68	12
W 133 (resistant)	0	0
Eagle (susceptible)	56,800	48,750

<sup>a</sup> estimated number of lesions per 50 plants

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