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RELEASE OF THREE NEW GUATEMALAN BEAN VARIETIES TOLERANT TO GOLDEN MOSAIC VIRUS

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A collaborative project between CIAT (Centro Internacional de Agricultura Tropical, Cali, Colombia) and ICTA (Instituto de Ciencia y Tecnologia Agricola, Guatemala, Guatemala) to develop bean varieties resistant to the bean golden mosaic virus (BGMC) was initiated in 1977. The disease, an important limitation to the production of Phaseolus vulgaris L. in the tropics, is not only endemic in Guatemala, but also causes epiphytotics in the September planting season. A screening system was developed to guarantee heavy virus infection throughout the year and thereby advance selection procedures rapidly. Spreader rows of tomato, tobacco, soybeans or cotton were planted 15-20 days in advance of the progenies to attract and increase populations of the whitefly vector (Bemisia tabaci Gen.), along with Phaseolus lunatus Benth (Van Eselt.) as the virus source.

Crosses among tolerant germplasm accessions were made at CIAT in 1976, and F_2/F_3 populations were evaluated under field conditions in Eastern Guatemala in 1977. A number of families from selected plants were progeny tested under heavy disease pressure in 1978, and lines from crosses DR 1006, DR 1012, DR 2152, and DR 2175 were significantly superior to both Pecho Amarillo and Rabia de Gato, widely grown local varieties. In 1979 outstanding F_7 and F_8 lines were tested in regional trials (50 locations) in the first season, and in farm trials in the second season. The three most consistent performers were named as new varieties for Guatemala:

1. ICTA Quetzal, a selection from the cross of Porrillo Sintetico x ICA Pijao
2. ICTA Jutiapan, from the cross of ICA Pijao x Turrialba 1
3. ICTA Tamazulapa, also from the cross of ICA Pijao x Turrialba 1

These black-seeded varieties have shown not only a high tolerance to BGMV, but also a reasonably wide adaptation, and tolerance or field resistance to other diseases (including BCMV and rust) and insects (Empoasca kraemeri). Both Quetzal and Jutiapan show promise for mechanization. Data from the visual score for BGMV reaction, and yields (Table 1) suggest that transgressive segregation has been obtained in the hybrid lines, in comparison with the three tolerant lines used as parents.

In farm trials, the tolerant variety ICTA Jutiapan yielded 2133 kg/ha with no protection and 3443 kg/ha with full protection against the whitefly vector, a reduction of 38% attributable to BGMV (Table 2). Yields for the same treatments of the most tolerant parent (ICA Pijao) were 3535 and 1678 kg/ha respectively (a 53% reduction), and of the local variety Rabia de Gato 1960 and

Table 1. Yields (kg/ha) of BGMV - tolerant lines, parents, and the local (susceptible) variety, under heavy virus pressure (Monjas) and in the absence of BGMV (San Jerónimo, Guatemala)

Line or Variety	Yield	
	Monjas	San Jerónimo
D-83 (ICTA Tamazulapa)	1,486	2,106
D-11	1,386	2,039
D-34	1,314	1,954
D-30 (ICTA Quetzal)	1,300	2,478
D-82	1,288	2,309
D-35 (ICTA Jutiapan)	1,233	2,420
D-33	1,217	2,640
D-37	1,207	2,688
D-52	1,184	2,421
D-51	1,177	2,841
D-38	1,106	2,284
D-50	1,050	1,885
D-6	1.020	1,846
D-55	989	1,894
D-45	956	3,078
D-29	932	2,336
ICA Pijao	1,111	2,462
Turrialba 1	651	2,196
Pecho Amarillo	546	2,540

Table 2. Results of farm trials in Eastern Guatemala, demonstrating the effect of tolerant varieties and varying levels of chemical protection, on the incidence of diseased plants and yield reduction caused by bean golden mosaic virus.

Treatment	Incidence (diseased plants/m^2)			Yield (kg/ha)		
	Jutiapan	ICA Pijao	Rabia de Gato	Jutiapan	ICA Pijao	Rabia de Gato
Tamarón plus 20 kg/ha Furadán	1.75	1.77	3.23	3443 (100%)	3535 (100%)	1960 (100%)
Furadán (40 kg/ha)	3.75	3.10	9.55	2910 (85%)	2672 (76%)	971 (50%)
Furadán (seed treatment)	4.19	3.64	8.94	2402 (70%)	2466 (70%)	583 (30%)
Furadán (20 kg/ha)	5.52	7.39	10.40	2318 (67%)	2195 (62%)	576 (29%)
Unprotected check	5.29	5.93	13.12	2133 (62%)	1678 (47%)	280 (14%)

280 kg/ha respectively (an 86% reduction).

The three new varieties and other advanced selections tolerant to BGMV, are being tested in Mexico, El Salvador, Honduras, Costa Rica, Brazil, Haiti, Cuba, Jamaica, and the Dominican Republic, where the virus disease is of great economic importance. These varieties could markedly increase bean production in tropical areas where small-seeded black beans are grown. Breeding efforts are currently focused on obtaining black-seeded lines even more tolerant to BGMV, and in transferring identified resistance into genotypes with other grain color characteristics.

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RELEASE OF WIS. (RRR) 46 BUSH BEAN BREEDING LINE

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This is to report the development and release of a third bush bean (Phaseolus vulgaris) with resistance to the important Wisconsin bean root rot disease complex (Fusarium solani f. sp. phaseoli, Pythium spp., Rhizoctonia solani)! The new bean has been designated Wis. (RRR) 46, it was not named because it is intended only for use as parental material in bean breeding programs.

Wis. (RRR) 46 was derived from a 1972 cross between resistant single plant selections WH 71-2 and WH 71-27. These had been chosen from bean lines from the Oregon and New York State Expt. Stations tested in our bean root rot disease nursery at the University of Wisconsin Hancock Experimental Farm in 1971. Following rigorous field selection in 1973, the best single plant selection was crossed with another resistant bean line (#3) which was similar genetically to WH 71-2. Resistant progenies from this cross were hybridized with the cultivar State Half Runner, which had shown resistance to Wisconsin's bean root rot complex. Since then, superior plants were selected repeatedly and tested individually until 1975 when they were bulked.

The average root rot disease index for Wis. (RRR) 46 in the field for 1976 through 1978 was 23 compared to 78 for the susceptible control. The level of resistance is considerably and consistently higher than for our 1977 releases Wis. (RRR) 77 and 83. Calculated average yields for 1977 and 1978 were 22,737 lbs/A for our new bean versus 2,187 lbs/A for the susceptible control.

Wis. (RRR) 46 has a moderately sized, vigorous bush with many branches. The many pods are borne near the center of the plant and quite low. Maturity is later than typical Tendercrop types. Leaves are of moderate size. Foliage and pods are dark green in color. Pods are medium long, straight, smooth and oval. The plant has a green hypocotyl and white flowers. Seeds are white and of regular shape but are smaller than normal.

Wis. (RRR) 46 has not been tested for reaction to an array of bean dis-