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 Tecnología Agrícola, Guatemala, Guatemala) to develop bean varieties resistant to the bean golden mosaic virus (BGMV) 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

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in farm trials in the second season. The three most consistant performers were named as new varieties for Guatemala:

1. ICTA Quetzal, a selection from the cross of Porrillo Sintético 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 reasonable 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 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.

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%)