BEAN GERMPLASM WITH RESISTANCE TO FUNGAL AND NEMATODAL SOILBORNE PATHOGENS

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The ongoing cooperative research program was initiated in 1985 with the main objective to identify sources of resistance to the major root rot pathogens of beans prevalent in Latin America. To date, bean germplasm with resistance to Fusarium oxysporum f. sp. phaseoli (Fop), Macrophomina phaseolina (Mp), Thanatephorus cucumeris (Tc) and its anamorph Rhizoctonia solani (Rs), and Meloidogyne spp. (Root-Knot Nematodes, RKN) have been identified. Current efforts are dealing with the characterization of the resistance factors and the elucidation of their inheritance.

Root-knot nematodes: These nematodes are widely distributed and are especially damaging to beans grown on light-textured soils with good drainage such as the coastal areas of Peru. Several bean cultivars and breeding lines have been found resistant to RKN under artificial infestation in greenhouse tests (3). The latter included NemaSnap, A 211, A 252, A 445, G 2587, G 6278, G 12727, G 4823, BAT 477, BAT 1297, and RIZ 30. California Dark Red Kidney, Canario Divex and many other lines were highly susceptible. Recent results have suggested that the reaction of A 211 and BAT 1297 to M. incognita is temperature-dependent as root galling and egg production was shown to be significantly altered by soil temperature (2). Large number of bean cultivars and lines were evaluated in a commercial field heavily infested with a mixture of M. javanica and M. incognita near Cali, Colombia. NemaSnap, Manoa Wonder, Carioca, Royal Red, A211, and G2587 were found to be highly resistant as they exhibited low galling and low egg mass production as compared to the susceptible lines such as Calima, Jamapa or ICA Llanogrande (4).

Thanatephorus cucumeris (anamorph: Rhizoctonia solani): Web blight incited by Tc is an important disease in the humid tropical low land as well as many high altitude bean producing areas such as the coffee growing zones in Colombia. The reaction of 10 bean lines was evaluated under artificial inoculation conditions in a growth chamber and also under natural field infestations in four replicated trials near Bitaco and Darien, Colombia. A good correlation was found between the reaction of bean lines to Tc in the growth chamber and the field (1). Sangretoro Bitaco, BAT 1297, AFR 251, and PAT 6 were consistently resistant, whereas Calima, BAT 1155, and PAI 29 were highly susceptible. Porrillo 70, Talamanca, and PVA 800B were also considered resistant, but their reaction varied among individual tests.

Rhizoctonia- root and hypocotyl rot is widespread and causes severe losses on beans throughout the bean growing areas. A total of 113 and 65 germplasm were included in two consecutive tests established in a field with a history of severe incidence and damage by Rs at the CIAT Experiment Station near Popayan, Colombia. In both tests, the germplasm evaluated differed in emergence and stand counts, seed yield, disease severity ratings, and adaptation scores. BAT 477, BAT 332, BAT 1753, RIZ 30, EMP 81, A 300, and ICA
Pijao were among the least susceptible to Rs (7). An International Nursery is available from CIAT.

Macrophomina phaseolina: This pathogen causes charcoal rot on beans which is especially important in production areas with high temperature and drought stress conditions. The reaction of 53 bean cultivars and breeding lines to Mp was evaluated under field and greenhouse conditions. All materials with high level of resistance to Mp under field conditions were also resistant under artificial inoculation conditions in greenhouse tests (6). Among the highly resistant germplasm were A 300, BAT 85, BAT 332, BAT 477, BAT 1385, BAT 1651, IPA 1, San Cristobal 83, EMP 86, and G 5059. Rio Tijao, Tibagi, A 70, A 464, and A 294 were among the most susceptible. An International Nursery is available from CIAT.

Fusarium Oxysporum f. sp. Phaseoli: The pathogen causes Fusarium-wilt in beans which is a destructive disease especially in production areas where high temperature and drought conditions prevail. A total of 66 bean cultivars and breeding lines were evaluated for their reaction to a Brazilian isolate of Fop in the greenhouse. Forty bean lines were considered resistant including BAT 477, BAT 1400, A 300, EMP 81, XAN 112, AND 357, Calima, Ecuador 605, and Mortino (5). Among the susceptible lines were RIZ 30, BAT 1297, A 211, ABA 2, Carioca, Chiapas, ICA Pijao, IPA 1, and Rio Negro. An International Nursery is available from CIAT.

References


