

## NATURAL INCIDENCE OF *PHYTOPHTHORA PHASEOLI* IN DRY BEAN GROWN IN THE HIGHLANDS OF MEXICO

R. Navarrete-Maya<sup>1</sup>, J.A. Acosta-Gallegos<sup>2</sup>, E.I. Cuéllar-Robles<sup>3</sup>, J.A. Ocampo H.<sup>4</sup> and J. Navarrete-Maya<sup>1</sup>.

<sup>1</sup>UNIGRAS, FES-C, UNAM, km. 2.5 carr. Cuautitlán-Teoloyucan, México, 54700, Bean Program of INIFAP, Campo Experimental Bajío, Km 6.5 carretera Celaya-San Miguel de Allende, CP 34110, Celaya, Guanajuato, México <sup>3</sup>Campo Experimental Valle del Guadiana INIFAP, Durango, Dgo., CP 38000, Mexico, <sup>4</sup>Comite Estatal de Sanidad Vegetal (CESAVEG), V. Rodriguez S/N, Frac. La paz, Irapuato, Gto., Mexico. [rosa\\_navarrete@hotmail.com](mailto:rosa_navarrete@hotmail.com)

Downy mildew is induced by *Phytophthora phaseoli* or *Phytophthora parasitica* var. *nicotianae*; a disease that occurs in Central and South America and the West Indies, infecting lima bean (*Phaseolus lunatus*) (3) and has been classified as sporadic. The first notice of the disease in Mexico was in 1968, with posterior reports in 1973, 1975, 1978 and 1980, mainly at the central-western states of Jalisco, Michoacán and State of Mexico (the Neovolcanic axes region), a region of sub-humid temperate climate. In this region it has been observed infecting different cultivars of *P. vulgaris* and *P. coccineus* (1). In 1980 the damage rated on the cv. Bayomex (a type I) in the State of Mexico was 50% (1).

The disease is characterized by the white growth of the fungi at the tip of branches and main stem of the plants, turning down or bending the growing points including leaflets and petioles. After those plant parts wilt and bend, the lesion is then covered by white mycelia and sporangia until death. The fungi can grow on the pods and flowers, stops their development and causes its death; the death organs remain attached to the plant. The fungi can penetrate into the pods and seeds tissues (3). With low temperature (13-25°C) and high humidity the entire pod may be infected, shrivel and dried up (2).

In spite of the sporadic classification given to downy mildew, many of the cultivars in our nurseries grown at the Valle de Mexico Experimental Station (CEVAMEX) had shown damage by this disease, mainly when the weather has been cold and humid. CEVAMEX is located near Texcoco, State of Mexico at 2250 m.a.s.l. and has a total yearly rainfall of 640 mm, most of it occurring from June to September. In this site the disease was observed in 1998, 1999, 2000, 2001 and 2002 (after 2002 the authors have not work at this location). For example, in 1998 its occurrence was recorded on the CIAT's bush core collection that included 685 accessions; 19% of the accessions displayed some damage; sixty susceptible accessions were of the type III growth habit, 28 of the type II and only three from the type I. Most susceptible type III accessions originated in Mexico (38) and in South American countries (20). In 1999, 2000, 2001 and 2002 the disease damaged experimental genotypes of all sorts, particularly of indeterminate growth habit, types III and II, among those: San Cristobal 83, BAT 477, Bayo Mecentral, Bayo INIFAP, Flor de Junio criollo, ICA Palmar, Negro 8025, A193, Flor de Junio Marcela, Azufrado Pimono 78, FEB 190, Negro Cotaxtla 91, VAX 2 and Pinto Sierra.

In 2002 downy mildew was registered at the Bajío Experimental station near Celaya, Guanajuato a site located at 1765 m.a.s.l. causing damage on cultivars Bayo Madero, Negro Veracruz, 97RS326, Azufrado Namiquipa, B98311, TLP 19, MC6, 97RS110, G 1977, G 2846, G 6849, Flor de Mayo M38, Negro Jamapa and Azufrado Peruano 87. In this site the disease was observed again in 2006, as well as in Salvatierra, Guanajuato a site located at 1650 m.a.s.l. Yearly rainfall pattern at these locations is above 500 mm, concentrated from July to September. In both sites where the disease has been observed, the climatic conditions were suitable for its development (4). At those sites most years the same type of cultivars are grown season after season and the disease does not occur every year, on the contrary in these sites it does in a sporadic way. At the CEBAJ downy mildew was observed in 2006 attacking cultivars from different origin and type, including cultivars from the three races in the Mesoamerican pool. A nursery introduced from Michigan, USA, consisting of Pinto, Great Northern and Red Kidney cultivars was badly damaged. Also four *P. acutifolius* accessions showed a strong attack. Since we could not find references of downy mildew attacking this species (3, 4), this is the first time that this disease has been observed attacking tepary bean. In this location the disease was also scored on 100 plants of a segregating F<sub>2</sub> population derived from Pinto Saltillo X PS 99 and in a Bc<sub>2</sub> population of Pinto Zapata/(Pinto Zapata/BAT 477). The severity range was from 3.0 to 6.0 (1.0 to 9.0 scale, where 1.0 is free of disease), with an average of 3.7 and >20% of disease incidence. In the area of Salvatierra Guanajuato, where the disease has been occurring with more frequency than at the CEBAJ, the dominant cultivar during the last decade under irrigated and rainfed conditions has been Flor de Junio Marcela, which has shown susceptibility to downy mildew.

Also in 2006 the disease was observed in commercial fields at Pánuco de Coronado, Durango (> 2000 m.a.s.l.) in plots of cultivars Flor de Junio Marcela, Flor de Mayo Anita, Pinto Saltillo, Pinto Zapata and Pinto Villa showing symptoms of the disease with a high level of severity, particularly on the Pinto seeded cultivars. Same cultivars showed similar severity level at the CEBAJ. The damage of the disease was not quantified but the incidence was detected in cultivars from the R6 to R8 phenological stages; therefore is highly probable that losses due to downy mildew might have been considerable, mainly due to the death of blossoms, pods, petioles and young stems. This is the first time that downy mildew has been observed in the semiarid region in the state of Durango.

Due to the potential damage of the disease, it must be observed and studied in order to prevent it, while resistant cultivars in preferred commercial classes are being developed.

#### REFERENCES

- 1) Campos, A. J. 1987. Enfermedades del frijol. Editorial Trillas. México. 132 p.
- 2) Crispín-Medina, A., Sifuentes, A.J.A. y Campos, A.J. 1976. Folleto de divulgación Núm. 39. INIA, SAG.
- 3) Hall, R. 1991. Compendium of bean diseases. A.P.S. St. Paul, Minn. U.S.A. 73 p.
- 4) <http://phytophthora.ucr.edu/default.html>