Himachal Journal of Agricultural Research 40(1):87-90 (2014)

Short Note

Evaluation of frenchbean varieties for resistance to *Colletotrichum lindemuthianum* races causing bean anthracnose

P.N. Sharma, Ruby Nag and A. Katoch
Department of Plant Pathology
CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur-176 062, India.

Manuscript Received: 17.10.2013; Accepted: 11.02.2014

Abstract

Evaluation of twenty one French bean varieties against five pathogenic races of *Colletotrichum lindemuthianum* namely 1, 2, 17, 515, 615 identified as per Standard International differential set and representing different bean cultivation areas across five districts of Himachal Pradesh was undertaken. *In vivo* evaluation (using 0-5 point scale, CIAT) using seedling dip method, 12, 9 and 5 accessions of French beans were found resistant to race 515, 2 and 17, respectively. Whereas two genotypes each were found resistant to race 1 and 615. In particular, variety Surya and HABF-2 resistant against 4 races followed by MFB-3 and IVRF-3 resistant against 3 races each appeared to be excellent sources of resistance.

Key words: Bean anthracnose, resistance Frenchbean, races.

Frenchbean (*Phaseolus vulgaris*) also known as common bean is one of the important vegetable crops of Himachal Pradesh and is cultivated in the hilly areas of state during *kharif* season (Dev, 2010). French bean is grown in varied cropping patterns under mild climatic conditions throughout Himachal Pradesh. This crop suffers both qualitative and quantitative losses due to bean anthracnose disease (*Colletotrichum lindemuthianum)*, a highly variable and seed-borne pathogen (Sharma *et al.* 1999, Sharma *et al.* 2007). The disease is more prevalent in the hilly regions of the state which experiences frequent rains and have cool climate during the *kharif* season (Sharma *et al.* 1994). In favorable conditions, it may lead to an epidemic and may result in 100% yield losses (Schwartz, 1991; Sharma *et al.* 2008). Being highly variable pathogen, frequent breakdown of resistance limits development and deployment of resistant varieties over time and space. Despite the availability of management practices like chemical treatment (fungicides), crop rotation, use of certified seeds, the disease frequently occurs in the hilly areas. Thus the best way to manage this disease is use of resistant cultivars which is not only cost effective but also a biologically safe management strategy. This study was conducted to find out sources of resistance among the vegetable types of beans to different races.

Twenty one varieties of frenchbean (*Phaseolus vulgaris* L.) procured from Department of Vegetable Sciences and Floriculture, CSK HPKV, Palampur were evaluated against bean anthracnose disease under laboratory conditions. Isolates of five races of *Colletotrichum lindemuthianum* viz. 1 (Kinnaur, Ponda), 2 (Sirmour, Goanta), 17 (Chamba,

Nayagram), 515 (Kangra, Lohardi), 615 (Kullu, Kamand) prevalent in different districts of Himachal Pradesh (Sharma *et al.,* 2007) available in the Deptt. of Plant Pathology, CSKHPKV, Palampur were used. The race cultures maintained on infected diseased tissues at 4°C, were revived by fresh isolation on Mathur's medium. Small bits of infected tissues were surface sterilized with 0.1% mercuric chloride followed by two washings with sterilized water, dried on sterilized blotting paper then transferred to slants containing Mathur's medium under sterilized condition in laminar airflow and incubated at 23±1^{0}C in BOD incubator. Inoculum of each race was prepared by harvesting conidia from 10-12 days old culture in sterilized water. Concentration of conidia was adjusted to 1×10^6 conidia per ml. using haemocytometer. Germinated seed dip method (Champion *et al.* 1973) was used for inoculation of test varieties. Seeds of each variety were germinated in germination sheet after surface sterilization with 0.1% mercuric chloride followed by two washings with sterilized water for 3-4 days. For inoculation, the seed coat of the germinating seeds was removed after 3 days of germination and each seed was given one minute dip in spore suspension. Then these seeds were sown in virgin/sterilized sand trays and kept in plant growth chamber at 22±1^{0}C with 90% relative humidity (Saveer Biotech Ltd., India) for the appearance of disease symptoms. The disease reaction was recorded after 8 days of inoculation by using 0-5 point scale (CIAT) where 0: no disease; 1: small pin point necrotic lesions <1mm in diameter; 2: small necrotic lesions < 3mm in diameter; 3: necrotic lesions >3mm in diameter, not sunken, may or may not sporulate; 4: large necrotic lesions, sunken, sporulation; and 5: large necrotic sunken lesions with seedling death. Plants showing disease reaction 0, 1, and 2 or either of these were considered resistant whereas plants showing reaction type 3, 4, and 5 or either of these were rated as susceptible.

Majority of the varieties were susceptible to the test races with maximum susceptibility to race 1 and minimum to race 515 (Table 1). Only two varieties were found resistant to race 1 and nine varieties to race 2 prevalent in district Kinnaur and Sirmour, whereas maximum resistance was recorded against race 515. Two varieties Surya and HABF-2 were found resistant to 4 races followed by MFB-3 and IVRF-3 showing resistance for 3 races. Race 1 prevalent in Kinnaur, was most virulent on different varieties, whereas Race 515 from Kangra was least virulent.

Resistance to different races of bean anthracnose in common bean germplasm (dry bean) has been reported in India and abroad by many workers (Schwartz *et al.,* 1982; Pathania *et al.,* 2006), however, no information is available about the resistance behavior in frenchbean germplasm grown in India and Himachal Pradesh in particular except some reports (Kumar e*t al*., 1997). Breakdown of resistance in beans to anthracnose is common due to high pathogenic variability in this pathogen across the world (Mahuku *et al.,* 2002; Mahuku and Riascos 2004; Sharma, *et al*., 2007). The sources of resistance identified in this study can be used in breeding for resistance and the further deployment of these varieties in the production area of the state where the test races are present.

Table 1. Reaction of french bean accessions to different races of *Colletotrichum lindemuthianum

Variety/accession	Race-1	Race-2	Race-17	Race-515	Race-615
Aparna	-	R(0)	-	-	-
Anoop (white)	S(5)	R(0)	S(3)	-	S(4)
Falguni	S(5)	-	-	-	-
Arka Suvidha (IIHR-909)	-	-	S(4)	R(1)	S(3)
Surya	R(0)	R(0)	R(0)	R(1)	-
A.Komol	-	S(3)	S(3)	R(1)	-
IVBF-1	S(4)#	S(3)	S(3)	R(1)	S(3)
B-sel	-	-	S(3)	R(1)	-
IVFB-3	-	R(1)	R(2)	S(3)	-
MFB-3	-	R(0)	S(3)	R(0)	R(0)
MFB-4	-	S(4)	S(4)	S(4)	R(1)
IVFB-4	S(4)	S(3)	S(3)	-	S(3)
KPV-2	R(0)	S(3)	R(0)	S(3)	S(3)
VLF-2003	S(3)	R(0)	S(3)	R(0)	-
VLFB-130	S(4)	-	R(1)	S(4)	S(3)
IVFB-2	S(4)	S(3)	S(3)	R(0)	S(3)
HABF-2	S(3)	R(0)	R(1)	R(1)	-
MBF-2	S(5)	S(3)	-	R(1)	S(3)
IVRF-3	-	R(0)	S(3)	R(0)	R(2)
HAFB-4	-	R(0)	R(1)	R(0)	-

*R: Resistant; S: Susceptible; -: Not tested; #: disease score in parenthesis

References

Champion MR, Brunet D, Maudalt ML and Ilami R 1973. Methode de contrBle de la resistance des varietes de haricots I I'anthracnose (*Colletotrichum lindemuthianum* [Sacc. & Magn.] Briosi & Cav.) C.R. Hebd. Seances Acad. Agric. France **12**: 951-58.

Dev H 2010. Standardization of planting time and spacing in french bean *cv.* Lakshmi as autumn crop for lower hills of Northern India. Asian J. Hort. **5** (2): 318-20.

Kumar A, Sharma P N and Sharma OP 1997. Resistance to *Colletotrichum lindemuthianum* (bean anthracnose) in kidney bean accessions of diverse origin in Himachal Pradesh. Indian Phytopath. **50** (1): 59-64.

Mahuku SG and Riascos JJ 2004. Virulence and molecular diversity with in *Colletotrichum lindemuthianum* isolates from Andean and Mesoamerican bean varieties and regions. Eur. J. Plant Patho. **110** (3): 253–63.

Mahuku SG, Jara CE, Cajiao C and Beebe S 2002. Sources of resistance to *Colletotrichum lindemuthianum* in the secondary gene pool of *Phaseolus vulgaris* and in crosses of primary and secondary gene pools. Plant Dis. **86** (12): 1383–87.

Pathania A, Sharma PN, Sharma OP, Chahota RK, Ahmad B and Sharma P 2006. Evaluation of resistance sources and genetics of resistance in kidney bean to Indian virulences of *Colletotrichum lindemuthianum*. Euphytica **149** (1-2): 97-103.

Schwartz HF 1991. Anthracnose. In: Anthracnose in *Compendium of Bean Diseases*, eds. Hall R. APS Press, St Paul, MN, pp. 16-17.

Schwartz HF, Pastor- Corrales MA and Singh SP 1982. New sources of resistance to anthracnose and angular leaf spot of beans (*Phaseolus vulgaris* L.) Euphytica **31** (3): 741-45.

Sharma PN, Ahmad B, Sharma OP, Pathania A and Sharma P 2007. Pathological and molecular diversity in *Colletotrichum lindemuthianum* (bean anthracnose) across Himachal Pradesh- A north-western Himalayan state of India. Aust. J. Plant Physiol. **36** (2):191-97.

Sharma PN, Kumar A, Sharma OP, Sud D and Tyagi PD 1999. Pathogenic variability in *Colletotrichum lindemuthianum* and evaluation of resistance in *Phaseolus vulgaris* in the North Western Himalayan Region of India**.** J. Phytopath**. 147** (1): 41-45.

Sharma PN, Sharma OP and Tyagi PD 1994. Status and distribution of bean anthracnose in Himachal Pradesh. Him. J. Agric. Res. **20**: 91-96.

Sharma PN, Sharma OP, Padder BA and Kapil R. 2008. Yield loss assessment in kidney bean due to bean anthracnose (*Colletotrichum lindemuthianum*) under sub temperate conditions of north-western Himalayas. Indian Phytopath. **61**(3): 323-30.