

Resistance in Mungbean to *Cercospora* Leaf Spot Disease

S.M. IQBAL, M. ZUBAIR AND A.M. HAQQANI

Pulses Programme, National Agricultural Research Centre, Islamabad, Pakistan

ABSTRACT

Fifty-eight mungbean genotypes were evaluated for resistance against *Cercospora* leaf spot disease under artificially inoculated disease condition in the field. The disease symptoms initiated on the lower side of the old leaves of susceptible genotypes and progressively spread all over the plant. There was a considerable variation among the genotypes with respect to disease reaction. Disease score of the genotypes ranged from "1-5". Twelve genotypes; NM-98, 98-cmg-003, C2/94-4-42, NM-1, NM-2, 98cmg-018, BRM-188, CO-3, Basanti, PDM-11, BARI Mung-2 and VC3960-88 with disease score "1" were found highly resistant and 15 with disease score "2" showed resistant reaction against the disease, while 17 revealed the moderately resistant (tolerance) reaction. Rests of the genotypes with disease rating "4-5" were either susceptible or highly susceptible.

Key Words: Mungbean; *Vigna radiata*; *Cercospora canescens*; Genotypes; Resistance

INTRODUCTION

Mungbean [*Vigna radiata* (L.) Wilczek] is one of the important pulse crops of Pakistan grown on area of 112,000 ha with an annual production of 50,000 metric tons (Anonymous, 2002). Average yield of the crop is very low mainly due to low inherent yield potential and susceptibility of the crop to diseases (Thakur *et al.*, 1977). Leaf spot disease caused by *Cercospora canescens* Ellis & Martin is a serious disease in the mungbean growing areas of the country where high humidity prevails during the growing season (Bashir & Zubair, 1985).

Cercospora leaf spot is one of the important diseases that cause serious losses to mungbean crop and 23% losses in yield have been reported (Quebral & Cagampang, 1970). Maximum loss of 61% was observed in case of grain yield (Iqbal *et al.*, 1995). The disease starts appearing about 30-40 days after planting. Depending upon the temperature and humidity, it spreads rapidly in susceptible varieties causing premature defoliation and reduction in size of pods and grains (Grewal *et al.*, 1980). Several workers had reported the effective control of the disease with the application of fungicides (Singh & Naik, 1977; Singh & Singh, 1978). The cheapest, practical and economical control of the disease can be achieved by the genetic stock resistant to the disease (Hossain *et al.*, 1981; Jadhav & Sharma, 1983; Iqbal *et al.*, 1990). However, availability of the genetic stock resistant to the disease is a prerequisite for planning systematic breeding programme.

A reasonable work has been conducted on the identification of resistant sources against the *Cercospora* leaf spot disease of mungbean (Hossain *et al.*, 1981; Bashir *et al.*, 1989; Iqbal *et al.*, 1992) but the latest information about the resistant sources is a need of the day. The present study was conducted at the National Agricultural Research Centre (NARC) Islamabad in order to assess the level of variation in the available mungbean germplasm for resistance against *Cercospora* leaf spot and to identify

reliable resistant sources to be utilized in the breeding programme.

MATERIALS AND METHODS

Fifty-eight mungbean germplasm lines of local origin and breeding materials (AARI, Faisalabad, NIAB, Faisalabad and NARC, Islamabad) were evaluated for resistance against *Cercospora* leaf spot during the Kharif season of 2003 at National Agricultural Research Centre (NARC), Islamabad under artificially inoculated disease conditions. Seeds of the test entries were planted in the month of July. The planting was done on 4 m long rows, with row to row and plant to plant distance of 30 and 10 cm, respectively. Each entry was replicated twice. One row of susceptible check (NHM-51) was also planted after every two test entries to spread the disease on the entries. This cultivar was confirmed to be highly susceptible to the disease during the previous seasons. In addition, the disease was also produced by the spray of spore suspension prepared by meshing the infected leaves collected from the diseased plants to ensure maximum disease infection and to avoid disease escape. Disease incidence was scored at fortnight intervals from mid September to mid October when the infector rows exhibited 100% disease. The severity of disease was recorded using an arbitrary scale 1-5 in terms of leaf coverage by the *Cercospora* leaf spot (Park 1978) where 1= highly resistant, 2= resistant, 3= moderately resistant, 4= susceptible and 5= highly susceptible.

RESULTS AND DISCUSSION

The results presented in Table I showed that there were considerable differences among the genotypes for the level of resistance against the disease. The disease score of the genotypes ranged from 1-5 (1 = highly resistant and 5 = highly susceptible). *Cercospora* leaf spot of mungbean is a devastating disease that causes qualitative and quantitative losses to the crop (Sivaprakasam, 1983). The genetic based

Table I. Reaction of mungbean germplasm and breeding material against *Cercospora* Leaf Spot (CLS) under field conditions during 2003 at NARC, Islamabad

Disease grade	Disease reaction	Number of genotypes	Genotypes
1	Highly resistant	12	NM-98, 98-cmg-003, C2/94-4-42, NM-1, NM-2, 98cmg-018, BRM-188, CO-3, Basanti, PDM-11, BARIMung-2, VC3960-88
2	Resistant	15	ML-267, NCM 255-2, NCM 257-6, NCM 259-2, NCM 251-1, NCM 251-13, NCM 257-2, NCM 251-12, NM-92, NCM 257-10, NCM-209, VC-3960-A88, C1/94-4-19, VC 3960-A89, Mung-6
3	Moderately resistant	17	Mung-1, NM-98, Pusa-9072, VC-6173-B, Chakwal Mung-97, NCM 254-7, NCM 254-1, NCM 258-7, NCM 257-5, NCM 252-10, NCM 251-8, NCM 255-3, NCM 255-4, NCM 252-5, SM-1, NM-92, BRM-195
4	Susceptible	6	98cmg-016, SML-134, SML-32, PGM-54, NCM 254-3, NCM 251-16
5	Highly susceptible	8	NCM 255-8, NCM 253-1, NCM 252-1, NCM 258-1, NCM 257-8, LIP5/5/89, BRM-202, NCM 251-4

resistance against *Cercospora* leaf spot in mungbean could be the best possible solution to this problem (Mathure *et al.*, 1981). Raje and Rao (2002) screened 200 genotypes of mungbean against *Cercospora* leaf spot and reported 174 as resistant whereas out of 100 diverse stock of mungbean, 18 genotypes were identified as resistant to the disease (Basandra *et al.*, 1999). Similarly, Haque *et al.* (1997) reported that while screening against this disease, none of the mungbean cultivars was found resistant. In the present study, maximum ratio was observed as resistant which indicated the use of resistant genetic stock for breeding in mungbean to this disease. Twelve genotypes (NM-98, 98-cmg-003, C2/94-4-42, NM-1, NM-2, 98cmg-018, BRM-188, CO-3, Basanti, PDM-11, BARI Mung-2 and VC3960-88) with average disease score of "1", were found highly resistant during the study. The stability in the performance of these twelve genotypes under the disease conducive environments may be an indication of their resistance being genetically controlled. Fifteen genotypes with disease score "2" revealed resistant reaction against the disease while 17 with disease rating "3" were tolerant (moderately resistant). Rest of the genotypes appeared to be susceptible or highly susceptible with disease rating of 4-5 (Fig-1). This increase in the severity of disease may have been on account of favorable weather for the disease. It was observed that the disease symptoms appeared in the last week of September on the lower leaves and progressively spread to the terminal buds.

On the basis of these findings, it can be proposed that the 12 genotypes identified as resistant may be exploited in breeding programme aimed at the development of *Cercospora* leaf spot resistant varieties of mungbean. If agronomically good, these genotypes can even be directly utilized after adaptability studies and development of package of production technology.

REFERENCES

- Anonymous, 2002. *Agricultural Statistics of Pakistan*. Government of Pakistan. Ministry of Agriculture, Food and Livestock, Economic Wing, Pakistan
- Basandrai, A.K., S.L. Gartan, D. Basandrai and V. Kalia, 1999. Blackgram (*Phaseolus mungo*) germplasm evaluation against different diseases. *Indian J. Agric. Sci.*, 7: 506-8
- Bashir, M. and M. Zubair, 1985. Survey Report of Kharif Pulses in Islamabad, Rawalpindi and Sialkot Districts during 1985. Pulses Programme, Tech Report. *Nat. Agric. Res. Centre*, Islamabad
- Bashir, M., S.S. Alam and B.A. Malik, 1989. Mungbean resistance to *Cercospora* leaf spot. *Pakistan J. Phytopathol.*, 1: 45-7
- Grewal, J.S., P. Machendra, P. and D.P. Kulshrestha, 1980. Control of *Cercospora* leaf spot of green gram by spraying Bavistin. *Indian J. Agric. Sci.*, 50: 707-11
- Haque, M.F., A.K. Mukherjee, R.N. Mahto, D.K. Jha, M. Chakraborty, G.P. Srivastava and D. Prasad, 1997. Birsu Urid-1 – a new variety for Chotanagpur region of Bihar. *J. Res.*, 9: 177-8
- Hossain, I., M.A.Q. Sheikh and A.A. Khan, 1981. Field screening of mungbean (*Vigna radiata* L.) germplasm for resistance to *Cercospora* leaf spot in Bangladesh. *SABRAO J.*, 13: 180-2
- Iqbal, S.M., M.R. Malik and B.A. Malik, 1990. Economics of foliar fungicides against *Cercospora* leaf spot disease of Mungbean. *Sarhad J. Agric.*, 6: 485-9
- Iqbal, S.M., S. Hussain, M. Zubair and B.A. Malik, 1992. Field evaluation of mungbean genotypes to *Cercospora* leaf spot. *Pakistan J. Phytopathol.*, 4: 28-1
- Iqbal, S.M., A. Ghafoor, M. Bashir and B.A. Malik, 1995. Estimation of losses in yield components of mugbean due to *Cercospora* leaf spot. *Pakistan J. Phytopathol.*, 7: 80-1
- Islam, M.S., R.T. Opena and A.K. Chowdhury, 1999. Comparative performance of mungbean varieties under post-rice lowland and upland production. *Thai J. Agric. Sci.*, 32: 327-33
- Jadhav, V.M.R. and B.L. Sharma, 1983. Field reaction of mungbean (*Vigna radiata* L.) Wilczek varieties to *Cercospora* leaf spot in north Madhya Pradesh. *Legume Res.*, 6: 99-100
- Mathure, A.K., R.N.S. Tyagi and L.G. Bhatnagar, 1981. Evaluation of urd varieties for susceptibility to *Cercospora* leaf spot. *Pulse Crops Newsletter*, 1: 59
- Park, H.G., 1978. Procedures for mungbean trials. *Int. Cooperator's Guide*. Publ. AVRDC, Taiwan, pp: 4
- Quebral, F.C. and I.C. Cagampang, 1970. Influence of *Cercospora* leaf spot control on yield of mungbean. *Agriculture at Los Banos*, 10: 7-12
- Raje, R.S. and S.K. Rao, 2002. Screening of mungbean (*Vigna radiata* L. Wilczek) germplasm for yellow mosaic virus and *Cercospora* leaf spot. *Legume Res.*, 25: 99-104
- Singh, S.D. and S.M.P. Naik, 1977. Field control of *Cercospora* leaf spot of urd by fungicides. *Indian J. Mycol. Pl. Pathol.*, 6: 99
- Singh, D.V. and R.R. Singh, 1978. Field evaluation of fungicides for the control of *Cercospora* leaf spot of green gram. *Pesticides*, 12: 28-9
- Sivaprakasam, K., 1983. Efficacy of some chemicals in the control of blackgram (*Vigna mungo* (L.) Hepper) *Cercospora* leaf spot (*Erysiphe polygoni* DC.). *Madras Agric. J.*, 70: 95-6
- Thakur P.R., P.N. Patel and J.P. Verma, 1977. Genetic relationship between reactions to bacterial leaf spot, yellow mosaic and *Cercospora* leaf spot diseases of mungbean (*Vigna radiata* L.). *Euphytica*, 26: 765-74

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