



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2020; 9(1): 1574-1576
Received: 04-11-2019
Accepted: 06-12-2019

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Cercospora leaf spot disease of green gram and its management: A review

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Abstract

Green gram is one of the major pulse crops developed all over the world. *Cercospora* leaf spot disease is a critical annihilating disease of mungbean (*Vigna radiata* L.). It could be a broad disease caused by the organism *Cercospora canescens* with the decrease in trim abdicate up to 60 per cent. The disease was firstly detailed in Delhi, India and spread all over the environment. Field conditions and essential natural variables are dependable for the infection rate. Numerous of the botanical extricates and fungicides are detailed to be successful control of the disease.

Keywords: *Cercospora*, green gram, *Vigna radiata*

Introduction

History and Distribution

Green gram (*Vigna radiata*) is a short duration legume crop belongs to family Leguminosae (Wilczek, 1954; Verdcourt, 1970) [32]. Mungbean was originated from India (De Candole, 1886; Zhukovsky, 1950; Bailey, 1970) or the Indo-Burmese region (Vavilov, 1951; H.B. Singh *et al.*, 1970; Jain and Mehra, 1980) [29]. The crop is produced on a large scale in southern and eastern Asia. In Pakistan mungbean is grown on an area of 2,053,000 hectare with the production of 0.13 million tons. *Cercospora* leaf spot is an important foliar disease of green gram caused by *Cercospora canescens*. The disease was reported first time in Delhi, India (Munjaj *et al.*, 1960) [23] and can be occurred in all parts of the humid tropical areas of Asia and many other countries (Pandey *et al.*, 2009) and is prevalent in all parts of humid tropical areas of India, Bangladesh, Indonesia, Malaysia, Philippines, and Thailand (Pandey *et al.*, 2009). In Pakistan, maximum loss of 61 percent was observed in case of grain yield (Iqbal *et al.*, 1995) [8]. The disease causes qualitative and quantitative losses up to 96 per cent under natural epiphytotic conditions (Kasno, 1990; Iqbal *et al.*, 1995; Kaur, 2007) [8].

Symptomology and Histopathology

Cercospora canescens attacks the crop and the symptoms appear on leaves as water soaked spot with greyish borders. As the disease becomes severe cause death of the tissues of infected leaves. The petioles, stems and pods also get affected by the pathogen. During favorable condition the spots increase in size and at the time of flowering and pod formation lead to defoliation in case of severe attack of *Cercospora* premature defoliation is also observed. Sometimes the leaves may become unshaped and wrinkled. Poor pod formation, late maturity and immature seed formation is also reported (Poehlman, 1991) [25]. The symptoms of *C. canescens* on *V. catjang* as, brown leaf spots, later on grey to dirty white, sub-circular to irregular and confluent, 5-10 mm wide, fruiting amphigenous, sometimes present on leaf, stem, cotyledons and drying pod in effuse black to grey patches observed (Vasudeva, 1963) [30]. Depending upon the temperature and humidity, disease appeared 30-40 days after planting, which spreads rapidly in susceptible varieties causing premature defoliation and reduction in size of pods and grains (Grewal *et al.*, 1980) [7]. Fungus produced definite spots on leaves which were first brown, later turned grey to dirty grey with narrow reddish brown margin, sub circular to irregular and 5-10 mm wide (Jamadar, 1988) [11]. *Cercospora* spp. produce a perylenequinone toxin called cercosporin which is non selective affecting bacteria, plants, fungi and animals unless these produce protective antioxidants such as carotenoids (Daub and Ehrenshaft, 2000) [4] and Vakili (1977) while distinguishing symptoms of *C. canescens* and *C. cruenta* on cowpea, described symptoms of the former as, amphigenous lesions. On leaves, generally round, orange to light brown, silvery to grey when sporulating, generally 8 to 15 mm, and uniform light brown spindle shaped lesions on petiole, penduncle and stem.

Dispersal and Epidemiology of the Disease

These conidia play a role of primary inoculum in disease incidence. Rain splashes also play as a major role in dispersal of conidia (William, 1987) [33]. *Cercospora* leaf spot is considered as an important pathogen not only due to its widespread range but also due to the susceptibility of many commercial crops to this disease (Wang *et al.*, 1998; Windels *et al.*, 1998). Munjal *et al.* (1960) [31, 34, 23] described the symptoms of *C. canescens* on *V. radiata* as a fungus producing definite spots on leaves, which were at first brown, later turning grey or dirty grey with narrow reddish brown

margin bearing fructifications on both the surfaces. Warm wet conditions are favourable for *Cercospora* leaf diseases (Barbetti, 1985) [2]. Epidemiological conditions for the production of conidia require 90-100 percentage relative humidity and 20-26 °C temperature. For germination and to cause the infection the ideal temperature recorded is 25-30 °C. If the temperature is below than 10°C then no conidia are formed (Windels *et al.*, 1998) [34].

Most Important Genotype of mungbean

Table 1: Different Genotype Showed the Different Response against *Cercospora* Leaf Spot Disease of green gram.

Disease reaction	Genotype
Resistant	AC 5, AKM 9911, ATTAMPALYAM, BL 849, CC 192, CO 4, CO 6, DHOLI, DM 2, DPI 701, G 122(D), GA 8810, GM 8413, KANGAYAM, KG 52, KKM 3, KLM 4, KM 1883, KM 2194, KU 44, LM 182, LM 1900, LM 2023, LM 565, LM 567, M 986, MAVT 807, MAVT 817, MAVT 849, MDU 2010, MDU 2196, MDU 2268, MDU 3156, MDU 3312, MDU 3385, MDU 3404, MDU3404/1, MGG 221, MGG 341, MGG 355, MH -1, MH 90-1, MIVT 843, MIVT 845, MIVT 847, MIVT 850, MIVT 852, MIVT 856, MIVT 862, MIVT 867, ML 173, ML 347, ML 520, ML 561, ML 613, ML 627, MRG 335, N DM 1, NEELAMBER, NIGERIAN VARIETY, NP 36, OBG 11, P 9371, PANT M1, PANT M103, PANT M2,
Moderately Resistant	ADTI, AGASTHIALINGAPUR, AKM 880, BBS-1-1 CHINAMUNG, GANGA 5, GM 8426, HG 1 9A, HM 912, HUM 6, K 851, K PUDUR 1, KALIKALA, KAVILPATTI, LAM 2, LGG 410, LGG 461, LGG460, MDU 1948, MIVT 854, MIVT 863, MIVT 866, ML 1670, MS 9384, PS16, RMG 62, SOBOURCUTE, SM29, ONAMUNG, VBNGG2, VELLAMPATTI, VELLATIKULAM, VS 191, WBM 4-31-1-1
Moderately Susceptible	BAPATHLA, BG 1, BM 4, BPMR 145, HUM 1, LM 13, LM 1554, LM 159, LM 172, M 986(D), M 108, M-131, MAVT 805, MAVT 855, MDU 3465, MH 96-1, MH91/2, MS 9727, MUM 2
Susceptible	BODI 1, HUM 12, IPM 99125, MAVT 836, MDU 1942, PDM 84-178, PDM 87229, TAP 7, PUSA 9531
Highly Susceptible	HYB 2, ILONGAI 1, PDM-91242, PLS 326,

Management

To control *Cercospora* leaf spot of green gram different techniques and methodologies including use of chemical fungicides (Singh and Singh, 1978) [26] spray of different botanicals and use of resistant variety are being practiced. Evaluation of some systemic fungicides against *Cercospora canescens* was reported by J.P. Khunti (2005) [19], in Gujrat, India. For the evaluation, a field trial was conducted and ten different fungicides namely hexaconazole, penconazole, tridemorph, Sulphur, triadimephon, propiconazole, dinocap, thiophanate methyl, carbendazim and mancozeb against *Cercospora* leaf spot caused by *Cercospora canescens* in green gram. The minimum disease intensity and highest yield was reported by the application of hexaconazole closely followed by penconazole and tridemorph. M.N. Uddin (2013) [28], reported the evaluation of some botanical extracts to control leaf spot disease of green gram. Different concentrations of plant extracts were evaluated for disease control. Six domestic plant species; Neem leaves extract, Garlic cloves extract, Biskatali leaves extract, Alamanda leaves extract, Arjun leaves extract and Debdaru leaves extract were used in this experiment. Neem leaves extract showed the best results in minimization of *Cercospora* leaf spot of green gram. The disease index was only 6.32 percentage on the plants treated with Neem leaves extract. Yield was 2.28 tons per hectare and other yield effecting factors were also in better condition in the same treatment. The best of the all techniques is to apply suitable cultural practices before and during the cultivation of the crop and the use of non-host crops in crop rotation. Destruction of the plant debris is also an important recommendation to avoid the disease incidence. Two sprays of carbendazim were found effective against leaf spot of greengram, followed by tridemorph and mancozeb (Singh *et al.*, 1994). Minimum disease intensity and maximum yield was recorded in difenconazole against leaf spot of greengram (Kapadiya and Dhruj, 1999). Fungicides were tested against *C. canescens*

and chlorothalonil was found effective in control of leaf spot of greengram (Iqbal *et al.*, 1995) [8]. Amongst the different fungicides tested against *C. canescens*, the minimum disease intensity and higher yield was registered with the application of hexaconazole (0.1%) followed by penconazole (0.1%) (Khunti *et al.*, 2002) [18]. Minimum disease intensity (16.72) and maximum disease control (64.58%) was obtained with two sprays of topsin-m followed by bavistin against *Cercospora* leaf spot of mungbean (Kaur *et al.*, 2004) [12]. Khunti *et al.* (2005) [9] reported that hexaconazole was found to be highly effective in management of leaf spot of mungbean. Among five fungicides, carbendazim and benomyl was highly effective in reducing the disease severity of leaf spot of mungbean (Khan *et al.*, 2005) [14]. Spraying with Hexaconazole (0.1%) or Propiconazole (0.1%) or Carbendazim (0.05%) were found to be better in managing the frog-eye leaf spot of bidi tobacco in Karnataka (Hundekar *et al.*, 2005; Jahagirdar and Hundekar, 2010). Thiophanate methyl (0.05%) sprayed plots showed minimum disease severity (12.14%) of greengram leaf spot. Two foliar applications of carbendazim (0.1%) was effective against *Cercospora* leaf spot of mungbean (Saxena and Tripathi, 2006; Kaur *et al.*, 2004; Tiwari and Kotasthane, 1984) [12]. The three sprays of all the treatments were undertaken at intervals of 15 days, starting first spraying at 30 days after sowing of the crops. One plot/ replication was maintained as unsprayed control without receiving any plant extracts. Observations on foliage anthracnose disease were recorded after each sprayings and last observation on anthracnose was recorded at 15 days after last spraying. Disease severity of leaves was determined by the diagrammatic keys according to the scale described by (Singh, 2006). The works have been done by using tobacco, neem, and garlic. Antifungal activities of garlic, neem, allamanda have been reported by many researchers (Islam, 2005; Rahman *et al.*, 1999) [10] Faruq *et al.*, (2015) [6]

Conclusion

Green gram is an important pulse crop grown over a large area in Pakistan, India and many other countries. Cercospora leaf spot disease is a major fungal disease of green gram which causes a great loss of yield due to poor cultural practices and wrong choice of crop rotation system. The disease can be managed by the application of fungicides and botanicals, but the most appropriate recommendation is the use of resistant varieties of green gram. A lot of work is being done in this respect but the introduction of new strains of Cercospora is a hurdle in the control of the disease.

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