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 abdicite 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 hectares 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 (Munjal 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) [3]. The disease causes qualitative and quantitative losses up to 96 per cent under natural epiphytotic conditions (Kasno, 1990; Iqbal et al., 1995; Kaur, 2007) [3].

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 amphiogenous, sometimes present on leaf, stem, cotyledons and drying pod in effuse black to grey patches observed (Vasudeva. 1963) [10]. 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 Ehreshaft, 2000) [4] and Vakili (1977) while distinguishing symptoms of C. canescens and C. curanta on cowpea, described symptoms of the former as, amphiogenous 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) [35]. 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, 54, 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) [3]. 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 below 10°C then no conidia are formed (Windels et al., 1998) [30].

Most Important Genotype of mungbean

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 botanical and use of resistant variety are being practiced. Evaluation of some systemic fungicides against *Cercospora canescens* was reported by J.P. Khunti et al. (2005) [19], in Gujarat, India. For the evaluation, a field trial was conducted and ten different fungicides namely hexaconazole, penconazole, triadimephene, sulphur, triadimephene, 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 triadimephene. M.N. Uddin et al. (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 triadimephene 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 Kotaasthane, 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 spraying 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) [8]

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

<table>
<thead>
<tr>
<th>Disease reaction</th>
<th>Genotype</th>
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<tr>
<td>Resistant</td>
<td>AC 5, AKM 9911, ATTAMIPALYAM, BL 849, CC 192, CO 4, CO 6, DHOLL DM 2, DPHI 701, GM 122(D), GA 8810, GM 8413, KANGAYAM, KG 52, KK 3, KLM 4, KM 1883, KM 2191, 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, MDU 3404/1, MG 221, MG 341, MG 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, MRG 355, N DM 1, NEELAMBER, NIGERIAN VIRATY, NP 36, OBBG 11, P 9371, PANT M1, PANT M103, PANT M2,</td>
</tr>
<tr>
<td>Moderately</td>
<td>ADTI, AGASTHALINGAPUR, AKM 880, BBS-1-TCHINAMUNG, GANGA 5, GM 8426, IIG 1, IHA 91, HUM 6, K 851, K PUDUR 1, KALAIKALA, KAVILPATTI, LAW 2, LGG 410, LGG 461, LGG460, MDU 1948, MIVT 854, MIVT 863, MIVT 866, ML 1670, MS 9384, PS 16, RMG 62, SOBOURCUTE, SM29, ONAMUNG, VBNNG2, VELLAMAPTTI, VELLATIKULAM, VS 191, WBM 4-31-1-11,</td>
</tr>
<tr>
<td>Moderately</td>
<td>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, MH 991/2, MS 9727, MUM 2,</td>
</tr>
<tr>
<td>Susceptible</td>
<td>BODI 1, HUM 12, IPM 99125, MAVT 836, MDU 1942, PDM 84-178, PDM 87229, TAP 7, PUSA 9531,</td>
</tr>
<tr>
<td>Highly Susceptible</td>
<td>HYB 2, ILONGAI 1, PDM-91242, PLS 326,</td>
</tr>
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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.

References