Distribution Pattern of Collar Rot of Chickpea in Bundelkhand of Madhya Pradesh

D. S., Tomar, M. K., Nayak, and Shraddha, Karcho
JNKVV, College of Agriculture, Tikamgarh (M.P.) 472001
Email:- tomar_sd@rediffmail.com

Abstracts

Chickpea (Cicer arietinum L.) is one of the most important and essential legumes crops for semi-arid tropical area. India is the largest producer of chickpea, accounts 70.9% of the world cultivated area and produces 67.1% of the total world production. Collar rot is an emerging soil-borne disease of chickpea that may incite 55–95% mortality of chickpea seedlings under favourable environmental conditions like heavy rainfall and high soil temperature. Rowing survey was carried out during 2019-20 in Rabi season. The results revealed that incidence of the disease was prevalent in all the areas of surveyed in Tikamgarh and Niwari districts. In Tikamgarh and Niwari districts, overall collar rot incidence was ranged between 12.8 to 21.2 in October sowing crop and 7.3 to 12.6 per cent in November sowing crop. Over all mean of both districts exhibited maximum disease incidence of collar rot found in early sowing crop (17.5%) and lowest disease incidence (9.3%) occurred in late sowing crop.
Key words: Occurrence, Collar rot, chickpea, Incidence

Introduction

Pulses historically have been one of the most important constituents of the Indian cropping and consumption patterns and long considered "the poor man's meat" as it is one of the less expensive sources of protein[4]. Among pulses, *chick pea* (*Cicer arietinum*) is preferred to food legumes because of its multiple uses for growing population across the world. During 2017-18, globally it was grown on 149.66 lakh ha area, with the total production of 162.25 lakh tonnes (FAOSTAT, 2019) and average productivity of 1252 kg/ha. Out of which, 71 per cent of global area with 70 per cent of global production of *chick pea* is contributed by India as it ranks 1st in area and production. The *chick pea* production in India has gone up from 38.55 to 112.29 lakh tonnes during 2000-01 to 2017-18, while the area has also gone up from 51.85 to 105.61 lakh ha, whereas, the yield has steadily increased from 744 kg/ha to 1063kg/ha during the same period.

Madhya Pradesh is leading state in terms of area and production as it contributes around 34 and 40 per cent share to the total area and production of gram in the country.

Chickpea is susceptible to terminal drought stress due to decreased rainfall and depletion of stored soil moisture towards maturation, and experiences up to 50% yield loss[1]. Chickpea is also known to be susceptible to 172 pathogens. Chickpea growing fields are vulnerable to both drought and pathogen stress. For instance, drought-prone areas in central and south India are prone to DRR, collar rot (CR, *Sclerotium rolfsii*), black root rot (BRR, *Fusarium solani*) and Ascochyta blight disease as well. In Madhya Pradesh, three diseases namely Fusarium wilt, Collar rot and Dry root rot were predominant.

Collar rot (*Sclerotium rolfsii*) of chickpea (*Cicer arietinum*) is one of the devastating soil-borne diseases of fungal

origin, due to which 10–30% yield loss is recorded annually according to severity of the disease[3]. Lack of sufficient information regarding the factors affecting collar rot development have made its control quite difficult[7,8].

Collar rot is a major disease causing 55-95% mortality of the seedlings

Material and Methods

A random roving survey was made in four blocks of Tikamgarh district and two blocks of Niwari district under Bundelkhand agro-climatic condition of Madhya Pradesh and observed for incidence of collar rot of chickpea in *Rabi* 2019-20. Chickpea fields were carefully observed for the prevalence of disease and the factors which may be predisposing for incidence of the disease. The location included in four of block Tikamgarh (village- Alampura and College farm) block- Baldevgarh (village- Badghat and Banyani)) block- Jatara (village- Antpura and Aparwal) block-Palera (village- Bari and Sunrai) block-Niwari (village- Orchha

of the chickpeaduring conducive environment[7]. The present study was therefore aimed to understand the present status of collar rot incidence in different chickpea growing blocks of Tikamgarh and Niwari districts.

and Rajpur) block-Prithivipur (village-Atrra and Bamroliduring November and December 2019.

The field surveys were conducted after 20-30 days of sowing at different farmer's field. The surveys were made in all six blocks of both districts, from each block, two villages are surveyed, five fields in each village randomly selected for observations. All the specimens were examined in the laboratory for the presence of causal organism. The data obtained on collar rot incidence was evaluated for assessment of the disease incidence by the applying following formulas.

$$\text{Disease incidence (\%)} = \frac{\text{No. of plants showing disease symptoms}}{\text{Total number of plants observed}} \times 100$$

Each sample was kept in paper bag and tied with a rubber band and labeled immediately. Information pertaining to the locality, crop history was also obtained about the samples. Samples were brought in the laboratory and analyzed after collection. The roots of affected plant showing the symptoms of collar rot were incised and isolation were made to confirm the presence or absence of the causal agent.

Results and Discussion

The survey of chickpea fields from four blocks of Tikamgarh and two blocks of Niwari district, Bundelkhand region of the Madhya Pradesh state were

Procedure for recording disease intensity

Five placesquadrium were applied in each field and then counted the total number of plants and diseased plants. Based on number of infected plants from each field, per cent disease incidence of collar rot was calculated for each location.

carried out during *Rabi*, 2019-20 and disease incidence of collar rot were recorded. The results obtained are presented in the (Table 1).

Table 1 Disease incidence of collar rot of chickpea in various blocks of Tikamgarh and Niwari districts during *Rabi* 2019-20 (in October and November sowing crop)

Blocks	Villages	Incidence (%) in October sowing crop	Incidence (%) in November sowing crop
Tikamgarh	Alampura	17.5	10.3
	College farm	18.7	12.6
	Mean	**18.1**	**11.4**
Baldeogarh	Badghat	19.5	9.8
	Banyani	16.4	9.9
	Mean	**17.9**	**9.8**
Jatara	Antpura	16.4	8.8
	Aparwal	18.6	10.4
	Mean	**17.5**	**9.6**
Palera	Bari	12.8	8.8
	Sunrai	15.5	7.3
	Mean	**14.2**	**8.1**
Mean of Tikamgarh district		**16.9**	**9.7**
Niwari	Orchha	19.2	7.6
	Rajpur	14.6	9.0
	Mean	**16.9**	**8.3**
Prithivipur	Atrra	21.2	9.4
	Bamroli	17.8	9.8
	Mean	**19.5**	**9.6**
Mean of Niwari district		**18.2**	**8.9**
Over all mean of both districts		**17.5**	**9.3**

The results (Table 1and Plate1& 2) revealed that the disease was prevalent in all the surveyed blocks showing its wide spread occurrence during *Rabi* season 2019-20.

Roving survey was conducted for collar rot disease of chickpea during R*abi* 2019-20. The data collected from different gram growers from four blocks of Tikamgarh and two blocks of Niwari districts.The average of two observations data pertaining to incidence of collar rot disease are presentedin Table 1. The results indicated that collar rot disease incidence was moderate to severe in various chickpea growing blocks of Tikamgarh and Niwari district.In Tikamgarh district, overall collar rot incidence was ranged between 12.8 to 19.5 per cent in October sowing crop while 7.3 to 12.6 per cent in November sowing crop. While in Niwari district, overall collar rot incidence was ranged between 14.6 to 21.2 per cent in October sowing crop while 7.6 to 9.8 per cent in November sowing crop respectively.

Collar rot incidence was more in Tikamgarh block, College farm (18.7 % and 12.6%), Alampura (17.5 % and 10.3%) followed by block Baldevgarh, Badghat village (19.5 % and 9.8%) and Banyani (16.4% and 9.9%). In Niwari district disease incidence was ranged between 7.6 to 21.2 per cent. The highest collar rot incidence was recorded in Prithivipur block village Atrra (21.2% and 9.4%) and village Bamroli (17.8% and 9.8%) followed by Niwari block village Ochha(19.2% and 7.6%) and Rajpur (14.6% and 9.0%) in October and November sown crop respectively.In Prithivipur block, incidence of collar rot was relatively higher in Atrra village (21.2%) followed by Badghat (19.5%) village of Baldeogarh block in October sowing crop while minimum collar rot disease incidence was observed in Sunrai village (7.3%) under Palera block followed by Ochha village block of Niwari (7.6%) in November sowing crop.

The distribution and incidence of collar rot diseases of chickpea varied in each block. In Tikamgarh district, average collar rot incidence was 16.9 per cent in October sowing crop and 9.7 per cent in November sowing crop while in Niwari district 18.2 and 8.9 collar rot disease incidence per cent was recorded in October and November sowing crop respectively. The overall average of disease incidence of both districts 17.5 per cent in October sown crop and 9.3 per cent was recorded in November sown chickpea field.

Collar rot of gram caused by *Sclerotium rolfsii* is producing considerable interest in terms of direct loss by the infection of root specially collar region and indirect loss by reducing plant vigour. To work on such a problem the extent of the destruction properly supported by data is an obligatory. So that a rowing survey was conducted to validate the distribution of collar rot disease during the *Rabi* 2019-20 in four blocks of Tikamgarh and two blocks of Niwari district, Bhundelkhand region of the Madhya Pradesh state*i.e.,* Tikamgarh, Baldevgarh, Jatara, Palera, Niwari and Pruthvipur, where disease incidence was expressed in per cent.

This is the first report on systematic assessment of the collar rot (*Sclerotium rolfsii*) disease of gram in Tikamgarh and Niwari districts which is very essential for any further study on the disease. The variation in incidence between blocks was due to different soil texture and crop varieties grown by the farmers at different locations. Maximum disease incidence was observed in October sown crop as compare in November sown crop. This may be due to high soil temperature.Sclerotial diseases caused by *sclerotium* occur primarily inwarm climates, specially at high moistures and high temperatures[2].

The maximum Incidence of *S. rolfsii*was recorded in varietyJG-62 (46.66%) and minimum on JG-130 (31.92%) showed low disease Incidence (30.95%) and the maximum disease Incidence developed in 15th October (46.71%) sowing. Interaction of varieties and dates of sowing variety JG-62 (51.42%)has served the maximum disease Incidence 15th October sowing and minimum in JG-130 (23.73%) under 1st November sown crop[5].

The unpredictable moisture stress and higher temperatures in central and southern parts of India probably predisposed the chickpea crop to favorable conditions for soil borne disease development[6].
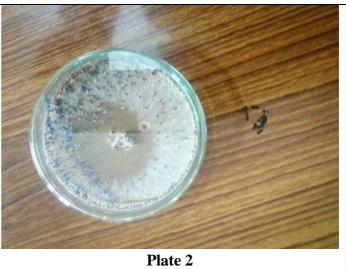
Pathogen and Disease Symptoms

Lower portion of stem of herbaceous plants decay with development of white mat of mycelium at the lesion site.

This often spreads out on to the nearby soil surface (Plate 1). Shortly after the mycelial mat develops, small (0.5-1mm), white round, fuzzy mycelial bodies begin to appear. The mustard grain sized light to dark brown sclerotia, serve as over wintering bodies and may be seen in the mycelium, on diseased tissues above or below ground, on soil surface, or in soil crevices.The fungus grew very rapidly on PDA. The whitemycelium usually formed many narrow mycelial strandsin the aerial mycelium. The pathogen also produces small dark brown colored sclerotia on Potato Dextrose Agar medium in laboratory (Plate 2 The fungus was identified based on mycelialand sclerotial characters.

Plate 1	Plate 2

Disease symptomson root of gram and sclerotia produced on PDA

Conclusion

Survey studies revealed that collar rot disease caused by *Sclerotium rolfsii* is widely distributed and common occurrence disease in all the blocks of Tikamgarh and Niwari districts of Bundhelkhand region of Madhya Pradesh. Among these, the maximum incidence was recorded in Prithivipur block (19.5%) of Niwari district in October sown crop while minimumincidence was observed in Palera block (7.3%) of Tikamgarh district in November sown crop.

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