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RESEARCH PAPER

Studies on survey and surveillance for the management of *Sclerotium rolfsii* causing collar rot of chickpea

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Abstract : A survey was conducted in 2019-20 *Rabi* cropping season to obtain information on the distribution and incidence of chickpea diseases. The was investigation entitled Studies on Survey and surveillance for the management of *Sclerotiumrolfsii* causing collar rot of chickpea was conducted, Department of Plant pathology JNKVV, Jabalpur. Survey was conducted in the following six Block in Jabalpur – Jabalpur, Panagar, Sihora, Sahpura, Patan and Manjholi. Chickpea varieties were selected on the basis of disease susceptibility *viz*., JG – 12 and JG – 14 Variety. The disease was prevalent in all the blocks surveyed. The disease incidence recorded in six block was ranged between 7.5 to 34.5 per cent. The highest disease incidence (34.5%) collar rot was noticed in fields of Jamuwa village in Patan block. Whereas, least (7.5%) incidence of the disease was recorded at Bhedaghat village in Jabalpur block.

Key Words : Survey, Surveillance, *Sclerotiumrolfsii,* Causing collar rot of chickpea

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INTRODUCTION

Chickpea (*Cicerarietinum* L.) is the world's third most important pulse crop after dry beans and dry peas (VishwaDhar and Gurha, 1998). Chickpea is a vital source of plant derived edible protein in many countries. Chickpea also has advantages in the management of soil fertility, particularly in dry lands and the semiarid tropics. Indian subcontinent account for 90 per cent of the total world chickpea production.Chickpea is reported to occurworld wide in the countries *viz.,* South Asia, India, Nepal, Pakistan, Bangladesh and Myanmar. Chickpea is contributing nearly 42 to 47 per cent of total pulse production in India. In India, the major chickpea growing states are Madhya Pradesh, Rajasthan, Maharashtra, Utter Pradesh, Karnataka and Andhra Pradesh (Arunodhayam *et al*., 2014).

The crop contains proteins (21.1%), carbohydrates (61.5%) and fats (4.5%). Chickpea is mainly used for human consumption as well as for animal feeds. It is consumed as whole seed, dal, fried and boiled (Muehlbauer and Rajesh, 2008).

The total area under chickpea cultivation in India is

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about 95.39 lac hectare with a production of 90.75 lac tonnes. The average productivity of chickpea is 951kg/ha. Whereas, the total area and production of chickpea in MP is 35.90 lac hectare and 45.95 lac tonnes, respectively, having productivity of 1056kg/ha (Annual Report DPD, 2017-18).

The crop is prone to a number of fungal, bacterial, nematode and disease, which can significantly decrease crop yield and quality of product. The Major soil borne pathogens infecting chickpea are stem and root rot pathogen, *Fusariumoxysporum* f. sp*ciceri* (wilt), *Sclerotiumrolfsii* (collar rot) and *Rhizoctonia* sp. (root rot). These pathogens cause significant loss in yield and primarily responsible for wide gap in the yield levels in farmers field (Dahiya, 2003).

The collar rot of chickpea caused by *S. rolfsii*, can cause considerable loss to plant stand when soil moisture is high and temperature is warm (nearly 30°C) at sowing time. Drying of plants with foliage turned slightly yellow before death, scattered throughout the field is an indication of collar rot infection. The disease generally appear within two weeks of sowing and the younger plants collapse but older ones turn yellow and may dry without collapsing. The younger plants exhibit clear rotting at the collar region. The rotten portion is often covered with white mycelia strands of *S. rolfsii*.

The pathogen is facultative parasite and primarily survives in the soil. Once the disease occurs in the field, it multiplies rapidly resulting in increase of inoculums level. Repeated cultivation of chickpea every year increases the collar rot severity. Severity of collar rot in farmer's field is directly related to inoculums density. Considering the importance of disease in the problem of collar rot in past 5 to 6 years with heavy economic losses.

The increasing awareness of fungicide-related hazards has emphasized the need for adopting biological methods as an alternative disease control method, which is also eco-friendly (Khare *et al*., 2010).

However limited work has been done in management of collar rot (*Sclerotiumrolfsii*) of chickpea by use of organic amendment and antagonist in Madhya Pradesh.

MATERIAL AND METHODS

Experiment was conducted during *Rabi* season 2019-20 on Chickpea, Department of Plant pathology, Jawaharlal Nehru Krishi Vishwa Vidhyalaya (JNKVV), Jabalpur.The following materials and methods were used during the course of investigation.

Survey on the incidence of collar rot disease of chickpea :

Random surveys on the incidence of collar rot disease of chickpea were undertaken in the different fields and villages during *Rabi* 2019-20. Survey was conducted when the crop was at seedling stage. To record collar rot disease incidence minimum of 4-5 farmers field were selected per village.

The following formula was used to calculate disease incidence,

$$\text{Disease incidence} = \frac{\text{Number of diseased plants}}{\text{Total number of plants examined}} \times 100$$

Survey was conducted in the following Block in Jabalpur – Jabalpur, Panagar, Sihora, Sahpura, Patan and Manjholi.

Experimental materials

Glassware :

Corning and Borosilicate glassware's were used throughout the course of experimental studies. Glassware's were cleaned with chromic acid solution followed by washing with detergent and rinsed with tap water; glassware's were sterilized in hot air oven at 180 ± 2ºC for two hours.

Metallic equipment :

Metallic equipment's like needle, forceps and cork borer were sterilized by dipping in alcohol and heating to red hot over flame of a spirit lamp.

Equipment:

Equipment's were used during the course of investigation including hot air oven, Biological Oxygen Demand incubator, autoclave, laminar air flow, refrigerator, electric balance, research compound microscope, water bath, LPG gas burner and Inoculation needle, wash bath, forceps, enamel tray, scalpel, puller, knife, sauce pan, glass micro slides, cover slips, scissor, brush, dropper, teasing needle, spirit lamp were used during experimentation. Blotter paper sheets were also used for roll towel test.

Experimental tray :

Fresh sterilized experimental trays were used thought out experiment.

Plant parts and diseased materials :

Surface sterilization of plant parts and diseased materials were done by dipping them in 1% sodium hypochloride solution for 1-2 minutes and washed them in sterilized water with three changes.

Test pathogen :

Sclerotiumrolfsii, causal organism of collar rot of chickpea.

Seed source :

Two improved varieties of chickpea were selected for this study. Seeds were taken from Chickpea Breeding Unit, JNKVV Jabalpur. Chickpea varieties JG-12 and JG-14.

RESULTS AND DISCUSSION

Random survey was conducted on the disease incidence of collar rot of chickpea in the six block of Jabalpur district *viz.*, Panagar, Sihora, Jabalpur, Patan, Sahpura and Manjholi. Data on collar rot disease incidence was taken from each visited location in each block by considering the infected plants to the total number of plants. The data revealed that, among the 42 location surveyed, the overall disease incidence recorded was ranged from 7.5 to 34.5 per cent. The highest disease incidence (34.5%) of collar rot was noticed in fields of Jamuwa village in Patan block. Whereas, least (7.5%) incidence of the disease were recorded at Bhedaghat in Jabalpur block. The maximum mean disease incidence was recorded in Patan (29.83%), followed by Sihora block (25.71%), Manjoli (22.62%), Panagar (18.79%) and Sahpura (18.51%).The least mean disease incidence was recorded in Jabalpur block 14.87%. The incidence of this disease varied from locality to locality, variety grown, inoculum and environmental condition prevailing in different localities.

This study is the first to comprehensively examine the relative importance of fungal diseases of chickpea in block in Jabalpur (MP) of India compared to other chickpea diseases present in these states. Based on survey results, wilt incidence plants were assessed for disease based on their visual symptoms on plant and white mycelial growth at collar regionalong with sclerotia (mustard like) were also observed. The highest disease incidence (34.5%) of collar rot was noticed in fields of Jamuwa village in Patan block followed by Manjoli, Sihora, Panagar, Sahpura, Jabalpur. Thus, these diseases were found to be a relatively major disease of chickpea in block in Jabalpur (MP) parts of India during the survey. Distribution of Collar rot Incidence disease was only observed six block of Jabalpur (MP)of India. There are several possibilities to explain the low prevalence and incidence of Collar rot Incidence in Madhya Pradesh irrespective of chickpea cultivars during the survey, including resistance, unfavorable environmental conditions for infection and disease development, and the increased use of seed treatments with fungicide.The unpredictable moisture stress and higher temperatures in central and southern parts of India probably predisposed the chickpea crop to favorable conditions for Collar rot Incidence development. Based on the results of this survey, the economic importance of these diseases was substantially higher. The similar Collar rot survey of collar region reported by Arunasri*et al*. (2011), Kumar and Prasad (2010), Narasimha *et al*. (2004) and Rajalakshmi (2002).

Conclusion :

The disease was prevalent in all the blocks surveyed. The disease incidence recorded in six block. The highest disease incidence collar rot was noticed in fields of

Table 1: Average disease incidence in different block of Jabalpur district

Sr. No.	Block	Number of Village surveyed	Range of per cent Collar rot incidence	Mean of per cent Collar rot incidence
1.	Panagar	Maniyarikalan, Sarsawa, KandraKheda, Bijaura, Bijauri, Mudiya, Khajri	10.6-25.3	18.79
2.	Sihora	Gosalpur, Dhamki, Muskura, Binaika, Jujhari, kachhpura, Rithauri	19.3-32.0	25.71
3.	Jabalpur	Bhedaghat, Bargi, Jotpur, Mangali, Tewar, Tilhari, Mahgaon	7.5-20.2	14.87
4.	Patan	Jamuwa, Rahli, Seoni, Mohgaon, Katori, Ghoghri, Palari	24-34.5	29.83
5.	Manjoli	Badkheda, Poundi, Kisrod, Bhamki, Dighauri, Noni, Khamdehi	9.5-25.0	22.62
6.	Sahpura	Indrana, Amna, Budrai, Gurda, Simariya, Bisi, Luhari	15.3-28.4	18.51

Table 2 : Survey on collar rot of chickpea disease in Jabalpur regions

Sr. No.	Block	Village	Latitude	Longitude	Disease incidence (%)
		Maniyarikalan	23?16’12”N	79°55’31”E	25.3
		Sarsawa	23?16’09”N	79°55’53”E	10.6
		KandraKheda	23?15’47”N	79°58’07”E	21.3
1.	Panagar	Bijaura	23?16’25”N	79°57’53”E	14.2
		Bijauri	23?17’02”N	79°57’33”E	19.4
		Mudiya	23?17’37”N	79°57’42”E	17.2
		Khajri	23?14’14”N	79°56’48”E	23.5
		Gosalpur	23?24’48”N	80°03’33”E	29.3
		Dhamki	23?21’35”N	80°02’42”E	19.5
		Muskura	23?24’59”N	80°04’34”E	21.6
2.	Sihora	Binaika	23?21’11”N	80°02’59”E	30.7
		Jujhari	23?24’14”N	80°04’23”E	32.0
		Kachhpura	23?23’51”N	80°04’05”E	22.4
		Rithauri	23?25’59”N	80°05’25”E	24.4
		Bhedaghat	23?07’27”N	79°49’04”E	7.5
		Bargi	22?58’15”N	79°56’10”E	20.2
		Jotpur	23?05’55”N	79°52’13”E	17.6
3.	Jabalpur	Mangali	23?05’28”N	79°56’04”E	14.0
		Tewar	23?05’20”N	79°57’44”E	15.3
		Tilhari	23?07’23”N	79°58’07”E	13.1
		Mahgaon	23?05’08”N	79°56’55”E	16.4
		Jamuwa	22?33’48”N	79°26’27”E	34.5
		Rahli	22?34’14”N	79°28’20”E	28.1
		Seoni	22?34’20”N	79°28’07”E	33.0
4.	Patan	Mohgaon	22?33’30”N	79°27’23”E	30.2
		Katori	22?32’39”N	79°27’59”E	26.4
		Ghoghri	22?34’59”N	79°23’27”E	24.0
		Palari	22?35’55”N	79°25’54”E	32.6
		Badkheda	23?08’59”N	79°44’17”E	23.7
		Poundi	23?09’13”N	79°43’40”E	20.3
		Kisrod	23?09’00”N	79°42’51”E	13.4
5.	Sahpura	Bhamki	23?08’24”N	79°41’48”E	25.0
		Dighauri	23?09’52”N	79°42’25”E	22.2
		Noni	23?11’04”N	79°42’24”E	15.5
		Khamdehi	23?11’01”N	79°41’53”E	9.5
		Indrana	23?24’10”N	79°54’53”E	23.3
		Amna	23?25’14”N	79°53’27”E	28.4
		Budrai	23?25’49”N	79°55’22”E	27.1
6.	Manjholi	Gurda	23?25’35”N	79°54’48”E	15.3
		Simariya	23?25’59”N	79°54’05”E	24.6
		Bisi	23?26’54”N	79°55’53”E	23.2
		Luhari	23?24’49”N	79°52’45”E	16.5

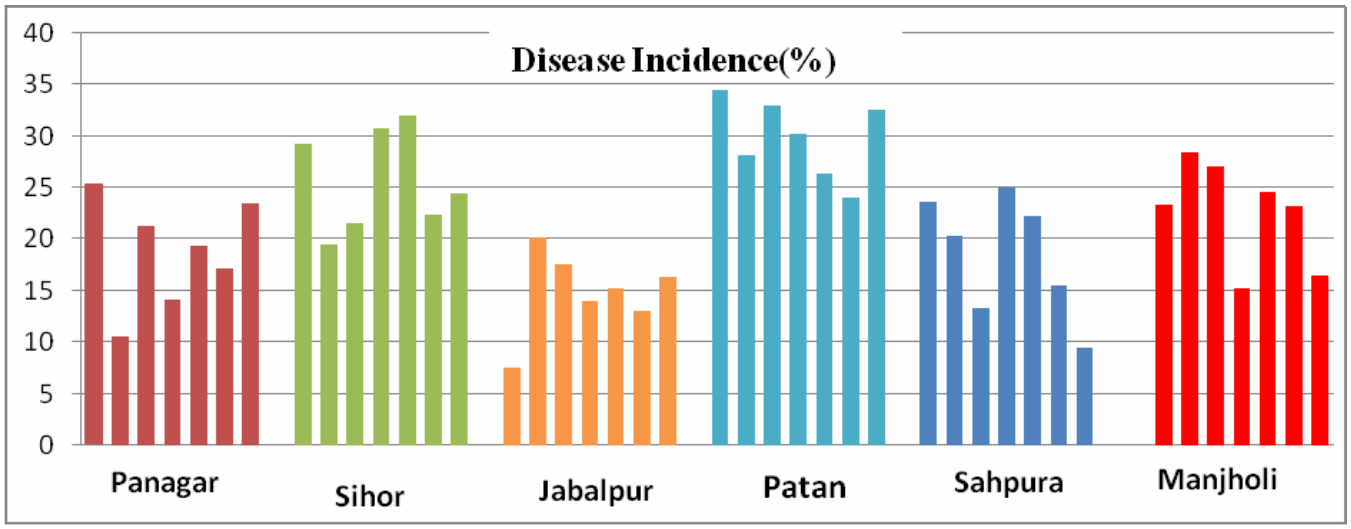

Fig. 1: Survey on collar rot of chickpea disease in Jabalpur regions

Jamuwa village in Patan block.

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