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Survey on occurrence and distribution of chickpea collar rot disease in Kurnool region of Andhra Pradesh

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Abstract

Chickpea is one of the major grain legume grown worldwide ranking third after dry beans and dry peas in the global farming. A survey was conducted in 2018-2019 *Rabi* cropping season to assess the incidence of chickpea collar rot disease around Kurnool region of Andhra Pradesh. Highest disease incidence of 18.0% was recorded in Alluru village of Uyyalawada mandal. Lowest incidence 3.6% was recorded in Badiatmakur village. Therefore, possible management options are vital to alleviate the problem.

Keywords: Survey, chickpea, collar rot, disease

Introduction

Chickpea (*Cicer arietinum* L.) forms an important component of cropping system of subsistence farming in the Indian sub-continent. Chickpea is the second most important pulse crop globally covering about 14.6 mha with production of 14.80 mt and productivity 1014 kg/ha. In India it is grown on 9.54 mha with an annual production of 9.07 mt and productivity of 951.4 kg/ha (FAOSTAT, 2017). In India the major producing states are Madhya Pradesh, Rajasthan, Maharashtra, Uttar Pradesh, Karnataka and Andhra Pradesh together contributing to 90 per cent of the area and 91 per cent of the production in the country (Singh, 2010) [14]. In Andhra Pradesh it is grown on 5.21 lakh ha with an annual production of 6.76 lakh tonnes and productivity of 1132 kg/ha. Chickpea production in Kurnool district of Andhra Pradesh is 2.49 lakh tonnes from 1.95 lakh ha area with a productivity of 1279 kg/ha (DES, Ministry of Agriculture & Farmers welfare, Government of India, 2017-18). It is a crop of both tropical and temperate regions. Despite the high total production, yields of chickpea are low due to many biotic and abiotic constraints. Among the biotic constraints more than 50 diseases have been reported as today. But only few of these cause economically important diseases. Collar rot disease caused by *Sclerotium rolfsii* is a serious threat to chickpea that may cause 55 to 95% mortality (Shrivastava *et al.*, 1984) [13]. Diseases caused due to *S. rolfsii* requires warm climates, occurs more frequently at high moistures and high temperatures (Al-Askar *et al.*, 2013) [1]. Disease mostly appears in the early growth stage of the crop *i.e.* before pod formation. Damage is huge in periods with above average rainfall. Development of the disease depends upon both, the pathogen in the soil, and a period of inundation. The collar rot disease in Andhra Pradesh has become more important in recent years which is a soil borne plant pathogen, causes considerable damage to the crop and the disease intensity in the field ranged from 5 to 20%. Under climate change scenario a roving survey was taken up in order to assess the incidence of chickpea diseases with respect to Kurnool region of Andhra Pradesh.

Materials and Methods**Isolation of the pathogen**

During *Rabi* 2017-2018, collar rot infected chickpea plant samples were collected and washed in distilled water. The fungus was isolated by tissue segment method (Rangaswami and Mahadevan, 1999) [12] under aseptic conditions. The infected tissues were cut into small pieces of 1-2 mm size and surface sterilized with one per cent sodium hypo chlorite solution for one minute and washed repeatedly thrice in sterile distilled water. These pieces were transferred to sterile blotting paper to remove water adhered to sample and placed in Petri plates containing sterilized PDA and incubated at 28±2 °C.

Mass multiplication of *Sclerotium rolfsii*

Sorghum grains were soaked in 2% sucrose water solution for overnight. Then boiled, drained excess water, air dried. Two hundred gram sorghum grains were filled in 250 ml conical flasks and were sterilized in autoclave with 15 p.s.i at 121.6°C for 15 minutes. The sterilized flasks were inoculated with 2-3 mycelial discs (5 mm) taken from the periphery of the 4 days old culture of *S. rolfsii* previously grown on PDA. The inoculated flasks were incubated in BOD incubator at 25± 2 °C for 15 days.

Pathogenicity test

The pathogenicity test of *S. rolfsii* was conducted under glass house condition by soil inoculation method. Pathogenicity test was carried out to test the pathogenic potential of each *S. rolfsii* isolate on chickpea susceptible variety, L 550. The pathogen multiplied on sorghum grains was mixed with soil in pots. Control was maintained without adding any inoculum.

Survey for disease incidence

During *Rabi* 2018 a roving survey was carried out to assess the occurrence of chickpea collar rot disease incidence in 27 villages of 9 Mandals in 3 Revenue divisions of Kurnool district, Andhra Pradesh. Percent disease incidence was calculated by using the following formula,

$$\text{Percent disease incidence (PDI)} = \frac{\text{Number of plants infected}}{\text{Total number of plants}} \times 100$$

Results and Discussion

The results obtained from the present investigation are summarized below:

Isolation of the pathogen

A total of nineteen isolates of *S. rolfsii* were obtained from Kurnool (17 isolates) and Kadapa (2 isolates) which were designated as CSR (*Chickpea Sclerotium rolfsii*) 1 to CSR 19 (Table 1 & Plate 1). The similar method of isolation of mycelium from collar region using tissue segment method was also reported by Arunasri *et al.* (2011) [2], Kumar and Prasad (2010) [6, 10], Narasimha *et al.* (2004) [8] and Rajalakshmi (2002) [11].

Table 1: List of *Sclerotium rolfsii* isolates used in present study

S.No.	Isolate Name	Village Name	Mandal Name	District
1	CSR1	Thangadancha	Jupadu bungalow	Kurnool
2	CSR 2	Ayyalurimetta	Nandyal	Kurnool
3	CSR 3	Pandurangapuram	Jupadu bungalow	Kurnool
4	CSR 4	Gadivemula	Gadivemula	Kurnool
5	CSR 5	Breeding plot	RARS(Nandyal)	Kurnool
6	CSR 6	Pathology plot	RARS(Nandyal)	Kurnool
7	CSR 7	Govindapalle	Uyyalawada	Kurnool
8	CSR 8	Narsipadu	Uyyalawada	Kurnool
9	CSR 9	Kampamalle	Kovelakuntla	Kurnool
10	CSR 10	Kandukuru	Kurnool	Kurnool
11	CSR 11	Bojanam	Bandiatmakur	Kurnool
12	CSR 12	Paramaturu	Bandiatmakur	Kurnool
13	CSR 13	Balapanuru	Panyam	Kurnool
14	CSR 14	Suddapalle	Peddammudium	Kadapa
15	CSR 15	Gospadu	Gospadu	Kurnool
16	CSR 16	Ontelagala	Gospadu	Kurnool
17	CSR 17	Pesurupadu	Gospadu	Kurnool
18	CSR 18	Peddammudium	Peddammudium	Kadapa
19	CSR 19	Mayaluru	Uyyalawada	Kurnool

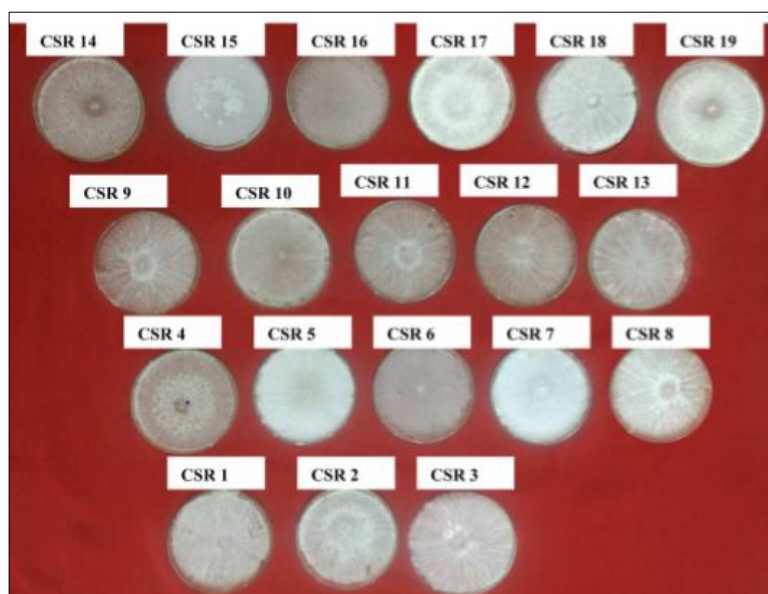


Plate 1: Pure cultures of *Sclerotium rolfsii* isolates

Pathogenicity test

Among the 19 different isolates tested, seeds were infected and not germinated in soil inoculated with *S. rolfsii* isolate CSR 10, which was proved to be highly virulent isolate. Similar method of proving pathogenicity by soil inoculation was also reported by Muthukumar and Venkatesh (2013) [7], Prasad *et al.* (2010) [6, 10], Awasthi *et al.* (2010) [3] and Padole *et al.* (2009).

Survey for disease incidence

Survey during 2018 *Rabi* revealed that incidence ranged from

3.6 to 18.00% (Table 2). Plants were assessed for disease based on their visual symptoms on plant and white mycelial growth at collar region (Plate 2) along with sclerotia (mustard like) were also observed. Highest disease incidence of 18.0% was recorded in Alluru village of Uyyalawada mandal (Plate 3) followed by 17.50% in Harivaram of Uyyalawada mandal. Lowest incidence 3.6% was recorded in Bandiatmakur village of Bandiatmakur mandal. The mean disease incidence was the highest (15.28%) in Kovelakuntla Revenue division followed by Nandyal (10.11%) and Allagadda (8.46) division.

Table 2: Survey on occurrence and distribution of collar rot incidence in Kurnool district of Andhra Pradesh

Sl.No.	Division	Mandal	Village	PDI (%)
1	Nandyal	Nandyal	Poluru	14.0
2			Pulimeddi	14.6
3			Bheemavaram	12.3
4		Gadivemula	Pesaravayi	11.5
5			Karimeddala	12.0
6			Koratameddi	10.0
7		Bandiatmakur	Paramatur	5.50
8			Bandiatmakur	3.60
9			Yerraguntla	7.50
		Mean		10.11
10	Kovelakuntla	Uyyalawada	Mayaluru	16.60
11			Alluru	18.0
12			Harivaram	17.5
13		Kovelakuntla	Gulladurthi	16.0
14			Amadala	14.0
15			Bheemunipadu	15.0
16		Sanjamala	Perusomala	13.0
17			Mukkanalla	12.5
18			Mudigedu	15.0
			Mean	
19	Allagadda	Gospadu	Gospadu	7.00
20			Tellapuri	5.50
21			Rayapadu	7.10
22		Allagadda	Pathakandukuru	9.50
23			Kotthakandukuru	11.0
24			Chinthakommanne	10.0
25		Chagalamarri	Rampalli	7.60
26			Nelampadu	8.50
27			Chinnabodhanam	10.0
			Mean	

**Plate 2:** Collar rot affected chickpea plant showing whitish mycelial growth**Plate 3:** Field view of collar rot affected chickpea plants in Alluru village**Acknowledgements**

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