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Harshita

Department of Plant Pathology,
Chandra Shekhar Azad University
of Agriculture and Technology,
Kanpur, Uttar Pradesh, India

UK Tripathi

Department of Plant Pathology,
Chandra Shekhar Azad University
of Agriculture and Technology,
Kanpur, Uttar Pradesh, India

Udit Narain

Department of Plant Pathology,
Chandra Shekhar Azad University
of Agriculture and Technology,
Kanpur, Uttar Pradesh, India

Shubha Trivedi

AICRP- Rapeseed & Mustard,
RLB Central Agricultural
University, Jhansi, Uttar Pradesh,
India

Neetu Trivedi

Department of Plant Pathology,
Chandra Shekhar Azad University
of Agriculture and Technology,
Kanpur, Uttar Pradesh, India

YK Srivastava

Department of Plant Pathology,
Chandra Shekhar Azad University
of Agriculture and Technology,
Kanpur, Uttar Pradesh, India

Abhishek Mishra

Department of Plant Pathology,
Chandra Shekhar Azad University
of Agriculture and Technology,
Kanpur, Uttar Pradesh, India

Ankur Verma

Department of Plant Pathology,
Chandra Shekhar Azad University
of Agriculture and Technology,
Kanpur, Uttar Pradesh, India

Corresponding Author:

Harshita

Department of Plant Pathology,
Chandra Shekhar Azad University
of Agriculture and Technology,
Kanpur, Uttar Pradesh, India

Prevalence and severity of wilt complex in major chickpea growing districts of Uttar Pradesh, India

Harshita, UK Tripathi, Udit Narain, Shubha Trivedi, Neetu Trivedi, YK Srivastava, Abhishek Mishra and Ankur Verma

Abstract

Chickpea (*Cicer arietinum* L.), also referred to as Poor man's meat, is an important nutraceutical leguminous crop contributing nearly 42 to 47 per cent of the total pulse production in India. However, wilt complex is a major constraint to chickpea production worldwide. Keeping in view the importance of chickpea wilt complex, an extensive survey was conducted in purposively selected 200 farmer's fields covering 40 villages of 10 major chickpea growing districts of Uttar Pradesh viz. Banda, Chitrakoot, Hamirpur, Jalaun, Jhansi, Kanpur, Lalitpur, Mahoba, Pratapgarh and Unnao to assess severity of wilt complex in these areas during the year 2017-18.

During the survey, it was discovered that wilt complex disease occurred in all the major chickpea growing districts of Uttar Pradesh where *Fusarium oxysporum* f. sp. *ciceri* was the most predominant pathogen and Fusarium wilt incidence was recorded to be maximum ranging from 12.8 percent (Malasa village in Kanpur Dehat) to 48 percent (Barua Kalijar village in Banda) followed by incidence of dry root rot caused by *Rhizoctonia bataticola* ranging from 3.2 percent (Jamar village in Unnao) to 17 percent (Shah Patan village in Banda) and incidence of collar rot disease caused by *Sclerotium rolfsii* ranging from 1.4 percent (Dholwa village in Unnao) to 12 percent (Poonch village in Jhansi) respectively. Highest average wilt complex incidence (69.25%) with maximum average Fusarium wilt incidence (43.05%) and maximum average dry root rot incidence (15.35%) was observed at Banda followed by Mahoba (62.7% Wilt complex, 39.3% Fusarium wilt, 14.5% Dry root rot), Jhansi (61.3% Wilt complex, 36.4% Fusarium wilt, 13.4% Dry root rot), Hamirpur (50.55% Wilt complex, 32.5% Fusarium wilt, 10.1% Dry root rot) and Chitrakoot (47.55% Wilt complex, 32.45% Fusarium wilt, 7.75% Dry root rot) respectively.

Keywords: Chickpea, wilt complex, survey, *Fusarium oxysporum* f. sp. *ciceri*, *Rhizoctonia bataticola*

1. Introduction

Chickpea (*Cicer arietinum* L.), also referred to as Poor man's meat, is a premier nutraceutical pulse crop contributing nearly 42 to 47 per cent of the total pulse production in India. However, chickpea cultivation is often subjected to significant yield losses due to various pests and diseases ranging from 5-10% in temperate and 50-100% in tropical regions (Van Emden *et al.*, 1988) [13]. Maximum number of pathogens infecting chickpea (89) had been reported from India while in other countries, it varied from 1 to 40. The most widely distributed pathogens are *Ascochyta rabiei*, *Fusarium oxysporum* f.sp. *ciceri*, *Uromyces ciceris arietini*, bean leaf roll virus, *Rhizoctonia bataticola*, *Botrytis cinerea*, *Sclerotinia sclerotiorum* and cucumber mosaic virus (Nene *et al.*, 1996) [7]. Among the diseases of chickpea, Fusarium wilt, caused by *Fusarium oxysporum* f.sp. *ciceri*, is a major constraint to chickpea production worldwide (Jalali and Chand, 1992) [4]. Whereas, Dry root rot (*Rhizoctonia bataticola*) of chickpea is emerging as a potential threat to chickpea cultivation in semi-arid regions because of moisture stress and high temperatures during flowering to pod filling stage (Sharma *et al.*, 2010) [9]. Keeping in view the importance of chickpea wilt complex, an extensive survey was conducted during the year 2017-18 in ten major chickpea growing districts of Uttar Pradesh in order to assess severity of wilt complex in these areas.

2. Materials and Methods

Survey was conducted during the year 2017-18 in the farmer's fields of ten major chickpea growing districts of Uttar Pradesh viz. Banda, Chitrakoot, Hamirpur, Jalaun, Jhansi, Kanpur, Lalitpur, Mahoba, Pratapgarh and Unnao. From each field, information was collected through the application of participatory research appraisal tools and techniques, such as direct

observation, group discussions, individual interviews, and field visits using a questionnaire. A total of 200 fields covering 40 villages of 10 districts were surveyed. The incidence of disease was recorded by random throwing of quadrat (i.e. 1 m²) in the farmer's fields of each village. The number of healthy and diseased plants (wilt/root rot) was counted in the quadrat and percent disease incidence of each location was determined by using Eq. (1).

$$\text{Disease Incidence}(\%) = \frac{\text{Number of diseased plants (Wilt or Root rot) in a quadrat}}{\text{Total number of plants assessed}} \times 100 \quad (1)$$

Chickpea plants showing typical symptoms were accrued from surveyed localities, packed in paper bags, labeled properly and taken to laboratory for isolation of the pathogen. The co-ordinates of surveyed fields had been additionally recorded with the assist of GPS.

3. Result and Discussion

During the survey it was found that wilt complex disease occurred at all the selected locations where wilt incidence occurring due to *Fusarium oxysporum* f. sp. *ciceri* was recorded to be maximum ranging from 12.8 percent (Malasa village in Kanpur Dehat) to 48 percent (Barua Kalijar village in Banda) followed by incidence of dry root rot caused by *Rhizoctonia bataticola* ranging from 3.2 percent (Jamar village in Unnao) to 17 percent (Shah Patan village in Banda)

and incidence of collar rot disease caused by *Sclerotium rolfsii* ranging from 1.4 percent (Dholwa village in Unnao) to 12 percent (Poonch village in Jhansi) respectively (Table 1 and Fig. 1-2). Highest average wilt complex incidence (69.25%) with maximum average Fusarium wilt incidence (43.05%) and maximum average dry root rot incidence (15.35%) was observed at Banda whereas least average wilt complex incidence (31.4%) with minimum average Fusarium wilt incidence (20.35%) was observed at Kanpur and minimum average dry root rot (5.45%) incidence with lowest average collar rot incidence (2%) was observed at Unnao.

The present findings are supported by Padwick (1940) [8]; Gupta *et al.* (1987b) [3]; Kapoor *et al.* (1991) [5]; Nene *et al.* (1996) [7]; Garrett *et al.* (2006) [1]; Kaur *et al.* (2012) [6] and Sharma *et al.* (2016) [10] who reported occurrence of Fusarium wilt and dry root rot in almost all the chickpea growing areas in India. Similarly, the prevalence of wilt disease on chickpea was also recorded by Sattar *et al.* (1953) [9] and Grewal *et al.* (1974) [2]. Kumar (2004) noticed highest incidence of 12.24 per cent dry root rot of chickpea in Chittapur of Gulbarga and least incidence in one of the locations of Raichur (3.21%). Similarly, Srinivas (2016) [12] reported through survey that percent disease incidence of dry root rot of chickpea ranged from 6.67 to 15.33 per cent in Karnataka and 0.67 to 3.33 per cent in Andhra Pradesh at different locations.

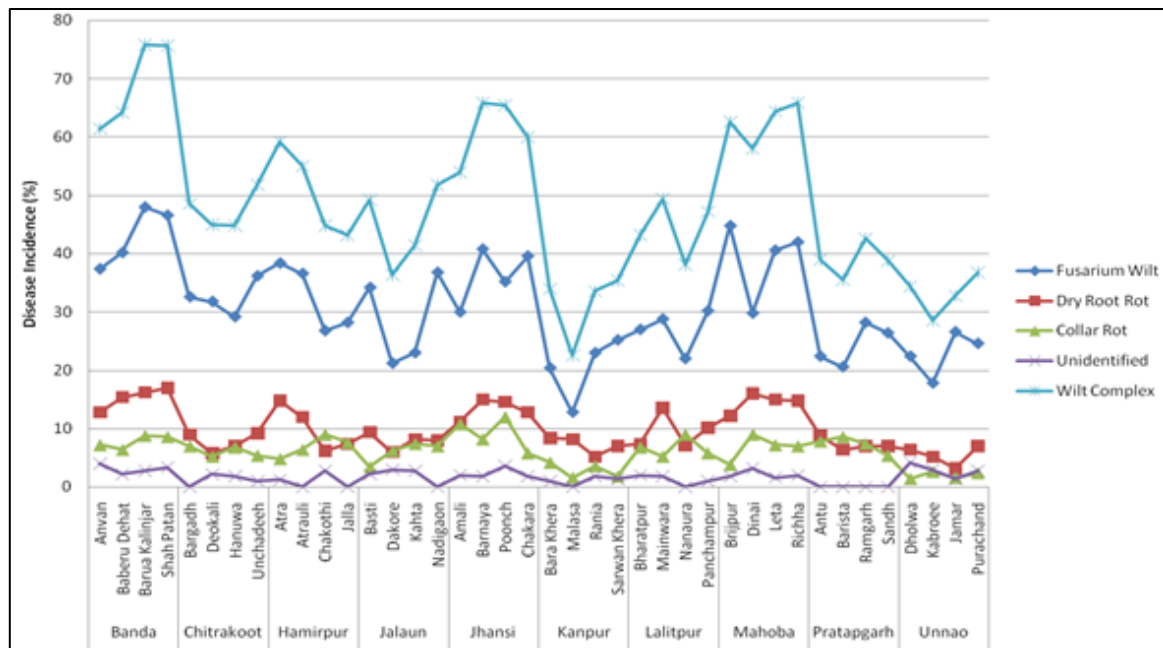
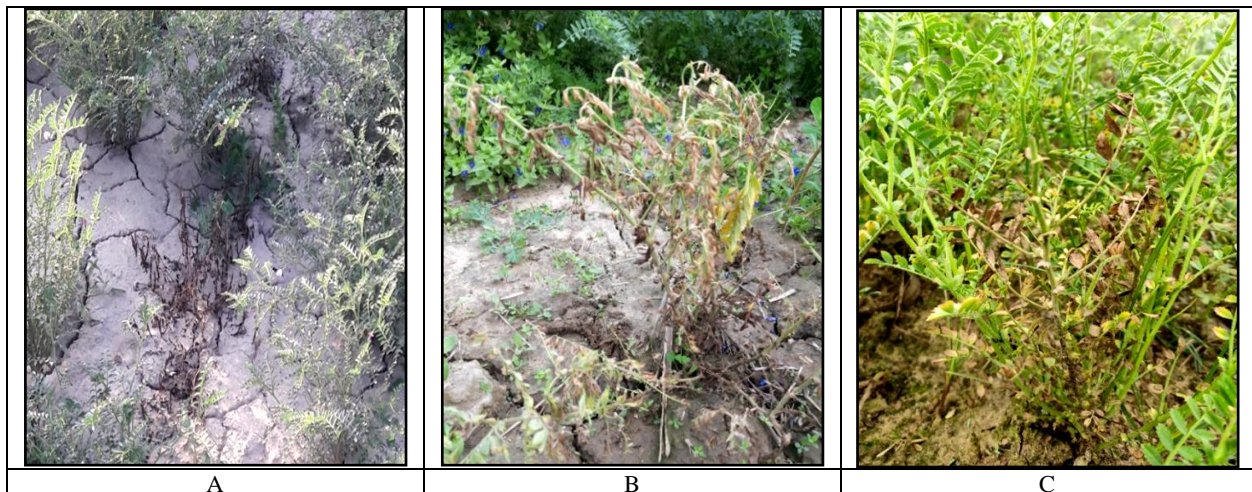


Fig 1: Percent Disease Incidence due to various wilt complex pathogens at different locations of Uttar Pradesh during 2017-18

Table 1: Percent Incidence of Wilt complex at different locations of Uttar Pradesh during 2017-18

S. No.	Disease Incidence (%)					
	Location	Fusarium Wilt	Dry root rot	Collar Rot	Unidentified	Wilt Complex
I. District- Banda						
1.	Anvan	37.4	12.8	7.2	4	61.4
2.	Baberu Dehat	40.2	15.4	6.4	2.2	64.2
3.	Barua Kalinjar	48	16.2	8.8	2.8	75.8
4.	Shah Patan	46.6	17	8.6	3.4	75.6
	Average	43.05	15.35	7.75	3.1	69.25
II. District- Chitrakoot						
5.	Bargadh	32.6	9	7	0	48.6
6.	Deokali	31.8	5.8	5.2	2.2	45
7.	Hanuwa	29.2	7	6.8	1.8	44.8
8.	Unchadeeh	36.2	9.2	5.4	1	51.8

	Average	32.45	7.75	6.1	1.25	47.55
III.	District- Hamirpur					
9.	Atra	38.4	14.8	4.8	1.2	59.2
10.	Atrauli	36.6	12	6.4	0	55
11.	Chakothi	26.8	6.2	9	2.8	44.8
12.	Jalla	28.2	7.4	7.6	0	43.2
	Average	32.5	10.1	6.95	1	50.55
IV.	District- Jalaun					
13.	Basti	34.2	9.4	3.4	2.2	49.2
14.	Dakore	21.2	6	6.2	3	36.4
15.	Kahta	23	8.2	7.4	2.8	41.4
16.	Nadigaon	36.8	8	7	0	51.8
	Average	28.8	7.9	6	2	44.7
V.	District- Jhansi					
17.	Amali	30	11.2	10.8	2	54
18.	Barnaya	40.8	15	8.2	1.8	65.8
19.	Poonch	35.2	14.6	12	3.6	65.4
20.	Chakara	39.6	12.8	5.8	1.8	60
	Average	36.4	13.4	9.2	2.3	61.3
VI.	District- Kanpur					
21.	Bara Khera	20.4	8.4	4.2	1	34
22.	Malasa	12.8	8.2	1.6	0	22.6
23.	Rania	23	5.2	3.6	1.8	33.6
24.	Sarwan Khera	25.2	7	1.8	1.4	35.4
	Average	20.35	7.2	2.8	1.05	31.4
VII.	District- Lalitpur					
25.	Bharatpur	27	7.4	6.8	2	43.2
26.	Mainwara	28.8	13.6	5.2	1.8	49.4
27.	Nanaura	22	7.2	9	0	38.2
28.	Panchampur	30.2	10.2	5.8	1	47.2
	Average	27	9.6	6.7	1.2	44.5
VIII.	District- Mahoba					
29.	Brijpur	44.8	12.2	3.8	1.8	62.6
30.	Dinai	29.8	16.0	9	3.2	58
31.	Leta	40.6	15.0	7.2	1.6	64.4
32.	Richha	42	14.8	7	2	65.8
	Average	39.3	14.5	6.75	2.15	62.7
IX.	District- Pratapgarh					
33.	Antu	22.4	8.8	7.8	0	39
34.	Barista	20.6	6.4	8.6	0	35.6
35.	Ramgarh	28.2	7	7.4	0	42.6
36.	Sandh	26.4	7	5.4	0	38.8
	Average	24.4	7.3	7.3	0	39
X.	District- Unnao					
37.	Dholwa	22.4	6.4	1.4	4.2	34.4
38.	Kabroee	17.8	5.2	2.6	3	28.6
39.	Jamar	26.6	3.2	1.6	1.4	32.8
40.	Purachand	24.6	7	2.4	2.8	36.8
	Average	22.85	5.45	2	2.85	33.15
	Grand Mean	30.68	9.86	6.16	1.69	48.38



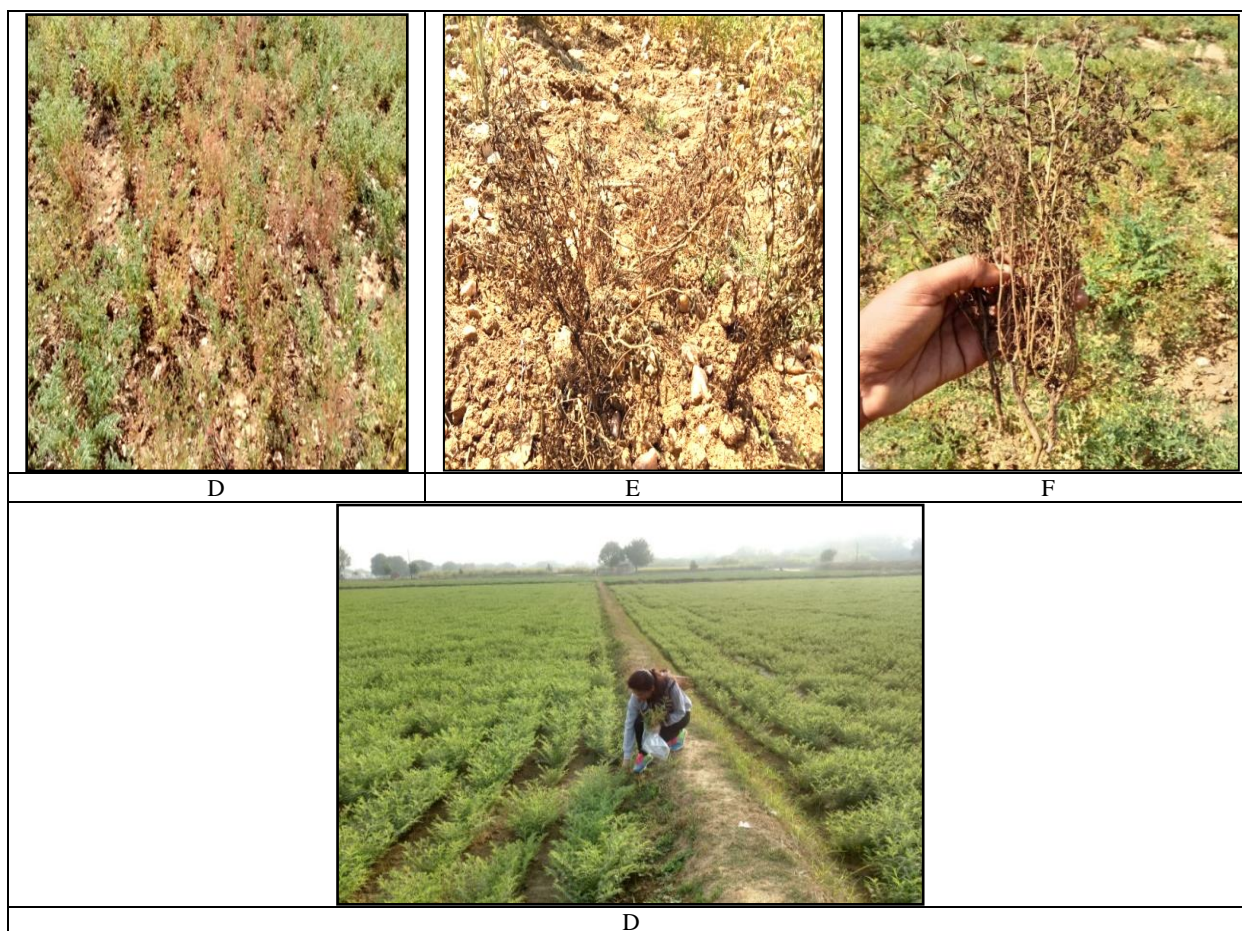


Fig 2 : Survey of wilt complex prevalence at major chickpea growing districts of U.P.
(A-C : Fusarium Wilt Symptoms, D-F : Dry Root Rot Symptoms, G: Collection of diseased plant samples)

4. Conclusion

From the survey, it can be concluded that among all the major chickpea growing districts of Uttar Pradesh, highest average wilt complex, Fusarium wilt and Dry root rot incidence was observed at Banda whereas maximum average incidence of Collar rot was observed at Jhansi during the year 2017-18. However minimum average Fusarium wilt incidence was observed at Kanpur and minimum average dry root rot incidence with lowest average collar rot incidence was observed at Unnao.

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