



E-ISSN: 2320-7078

P-ISSN: 2349-6800

www.entomoljournal.com

JEZS 2021; 9(1): 2271-2274

© 2021 JEZS

Received: 19-11-2020

Accepted: 21-12-2020

Ashish Shrivastava

Department of Plant Pathology,
College of Agriculture,
Ganjbasoda, Madhya Pradesh,
India

SS Dhakad

RVSKVV, Krishi Vigyan
Kendra, Shajapur, Madhya
Pradesh, India

Studies on prevalence of chickpea wilt (*Fusarium oxysporum* f. sp. *ciceri*) disease in Vindhyan Plateau Zone of Madhya Pradesh

Ashish Shrivastava and SS Dhakad

Abstract

Chickpea (*Cicer arietinum* L) is one of the important *rabi* pulse crop grown in Vindhyan Plateau Zone of Madhya Pradesh. The productivity of chickpea is lowered due to high incidence of wilt in Madhya Pradesh. *Fusarium oxysporum* f. sp. *ciceri* is one of the most destructive pathogen, causing wilt disease in chickpea and thereby inflicting accountable quantitative as well as qualitative losses. The survey studies indicated that, overall wilt incidence was comparatively higher in *rabi* (2018-2019) grown chickpea crop, as compared to that of *rabi* (2019-2020) grown crop. In all the six districts of vindhyan plateau zone surveyed, the disease was found to be widely distributed and regular occurrence with moderate to severe incidence and its average incidence was found maximum in the district of Sehore (17.87%) followed by Rajgarh (17.00%) and Bhopal (15.20%) districts in the years 2018-2019 and 2019-2020. The average incidence of wilt disease was found more in 2018-2019 (15.63%) as compared to 2019-2020 (14.99%). Present study showed that chickpea wilt is highly distributed in all the surveyed areas of Vindhyan Plateau zone of Madhya Pradesh. Variety wise incidence were recorded in Vindhyan Plateau zone where the average mean incidence was more on local cultivar (21.50% and 20.75%) without any proven resistance were found to suffer severely with the disease, during both the years. The most popularly grown WR 315 was found to suffer more with about 17.50 and 16.75 per cent (wilt) disease incidence during *rabi* (2018-2019) and *rabi* (2019-2020), respectively. However, the cultivars *viz.*, JG 74, JG 218, JG 130 and JG 63 were found to suffer comparatively minimum with the wilt disease.

Keywords: chickpea, wilt, *Fusarium oxysporum*, disease, prevalence

Introduction

Chickpea (*Cicer arietinum* L) commonly known as “chana” in Hindi belongs to family Leguminosae and is believed to have originated from south west Asia (Singh, 1993). It is an important pulse crop and grown in temperate as well as subtropical regions of the world. It accounts for 70 per cent to the cultivated *rabi* pulses in India. The major chickpea growing states in India are Madhya Pradesh, Rajasthan, Andhra Pradesh, Bihar, Uttar Pradesh, Maharashtra, Haryana and Karnataka. India is largest producer of chickpea in world sharing 65.25 per cent in area and 65.49 per cent in production. In India, chickpea is grown on 10.23 million ha area with production 9.88 million tones and productivity 967 kg/ha. Madhya Pradesh is leading state in terms of area and production as it contributes around 34 and 41 per cent share to the total area and production of gram in the country (Annual Report 2017-18, Directorate of Pulses Development). During the last three decades, the area, production and productivity have registered positive growth rate, with the area increasing from 19.17 to 25.61 lakh ha and production doubling from 12.26 to 23.71 lakh tones. Productivity has increased from 640 to 925 kg/ha during the period. The major limiting factor in chickpea production is chickpea wilt which is caused by *F. oxysporum* Schlechtend. Fr. f. sp. *ciceri* (Padwick) Matuo and K. Sato. (Jalali and Chand, 1992; Haware, 1990 and Nene and Reddy, 1987)^[7, 8, 11]. It was first reported in Indo-Pak sub-continent (Butler, 1918)^[4]. McRae (1932)^[10] as well as Prasad and Padwick (1939)^[13] reported *F. oxysporum* f. sp. *ciceri* pathogenic to chickpea crop which is now accepted worldwide as the causal agent of *ciceri* spp. In general, the disease is wide spread in the chickpea growing areas of the world and reported from at least 33 countries (Nene *et al.*, 1996)^[12]. In India, it has been reported from all the chickpea growing states and causes an annual loss of 10% (Singh and Dahiya, 1973)^[16]. The disease can affect the crop at any stage of growth. Early wilting causes 77-94% losses while late wilting causes 24-65% loss (Haware and Nene, 1980)^[6].

Corresponding Author:

Ashish Shrivastava
Department of Plant Pathology,
College of Agriculture,
Ganjbasoda, Madhya Pradesh,
India

The disease causes substantial yield losses which may reach even 100 per cent under favourable weather conditions (Jalali and Chand, 1992) [8]. The chickpea is cultivated as a rain fed crop in Madhya Pradesh. The disease occurs to an extent of 10 to 20 percent in chickpea growing area of Vindhyan Plateau Zone.

Material and Methods

A survey was conducted during the *rabi* 2018-2019 and *rabi* 2019-2020 seasons in the chickpea growing areas of the six districts of Vindhyan Plateau zone to assess wilt disease incidence. The field visits were undertaken during flowering and pod formation stages of the crop.

The incidence of disease was recorded by random throwing of quadrant (1 m²) in five places of a field. The numbers of healthy and diseased plants were counted in a quadrant and per cent of disease incidence was estimated by following formula

$$\text{Disease incidence (\%)} = \frac{\text{Number of diseased plants in quadrant} \times 100}{\text{Total number of plants in the quadrant}}$$

Table 1: Average wilt incidence (%) of chickpea in Vindhyan Plateau Zone of the Madhya Pradesh during *Rabi* 2018-19

S. No.	Districts	Total no. of samples collected	No. of locations	Wilt incidence (%)
1	Bhopal	20	6	15.50
2	Raisen	25	4	14.20
3	Rajgarh	20	5	17.25
4	Sagar	15	4	13.50
5	Sehore	20	6	18.25
6	Vidisha	25	5	15.10
Total/Mean		125	30	15.63

During *rabi*, 2019-20 wilt incidence (Table 2) was found to be comparatively minimum to that of during *rabi*, 2018-19. The average incidence of wilt ranged from 12.65 (Sagar) to 17.50 (Sehore) per cent. However, the chickpea crop grown in the district of Sehore was found to suffer more with wilt incidence 17.50 per cent and; with overall average incidence

Results and Discussion

A total of 125 samples of farmers' fields of chickpea crop exhibiting symptom of wilt were collected from 30 locations of six districts (Bhopal, Raisen, Rajgarh, Sagar, Sehore and Vidisha) of Vindhyan Plateau zone of the Madhya Pradesh was carried out during *rabi* (2018-2019) and *rabi* (2019-2020).

Distribution and districts incidence of the disease

Results presented in Table 1 revealed that in the Six districts surveyed during *rabi* (2018-2019), the average incidence of wilt ranged from 13.50 (Sagar) to 18.25 (Sehore) per cent. However, the chickpea crop grown in the district of Sehore was found to suffer more with wilt incidence of 18.25 per cent; with overall average incidence of wilt (15.63%). The second highest average wilt incidence of 17.25 per cent was recorded from the Rajgarh district.

This was followed by the districts of Bhopal (15.50%), Vidisha (15.10%) and Raisen (14.20%) with average wilt incidence. Comparatively minimum average wilt incidence of 13.50 per cent was recorded in the district of Sagar.

of wilt (14.99%). The second highest average wilt incidence of 16.75 per cent was recorded from the Rajgarh district. This was followed by the districts of Bhopal (14.90), Vidisha (14.30%) and Raisen (13.85%) with average wilt incidence. Comparatively minimum average wilt incidence of 12.65 per cent was recorded in the district of Sagar.

Table 2: Average wilt incidence (%) of chickpea in Vindhyan Plateau Zone of the Madhya Pradesh during *Rabi* 2019-20

S. No.	Districts	Total no. of samples collected	No. of locations	Wilt incidence (%)
1	Bhopal	20	6	14.90
2	Raisen	25	4	13.85
3	Rajgarh	20	5	16.75
4	Sagar	15	4	12.65
5	Sehore	20	6	17.50
6	Vidisha	25	5	14.30
Total/Mean		125	30	14.99

Distribution and variety-wise seasonal disease incidence

In the Six districts of the Vindhyan Plateau zone surveyed for recording wilt disease incidence, a wide range of chickpea cultivars/varieties and local varieties were grown by the farmers. The results obtained on wilt disease incidence are presented in the Tables 3 and 4.

During *rabi* 2018-19, average incidence (Table 3) of wilt on chickpea cultivars/varieties ranged from 10.76 (JG 130) to 21.50 (Local) per cent. However, Local cultivar of chickpea

was found to suffer more with wilt incidence of 21.50 per cent; with overall highest average incidence of wilt (15.63%). The second highest average wilt incidence (17.50%) recorded on WR 315. This was followed by the cultivars *viz.*, JG 74 (15.80%), JG 218 (15.50%) and JG 130 (12.75%) with wilt average incidence. Comparatively minimum average wilt incidence of 10.76 per cent was recorded on the chickpea cv. JG 63.

Table 3: Verity wise average wilt incidence (%) of chickpea in Vindhyan Plateau Zone of the Madhya Pradesh during *Rabi* 2018-19

S. No.	Districts	Total no. of samples collected	No. of locations	Wilt incidence (%)
1	Local	25	6	21.50
2	JG 74	20	5	15.80
3	WR 315	30	6	17.50
4	JG 218	15	4	15.50
5	JG 130	15	5	12.75
6	JG 63	20	4	10.76
Total/Mean		125	30	15.63

During *rabi* 2019-20, average incidence (Table 4) of wilt on chickpea cultivars/varieties ranged from 10.25 (JG 63) to 20.75 (Local) per cent. However, Local cultivar of chickpea was found to suffer more with wilt incidence of 20.75 per cent; with overall highest average incidence of wilt (14.99%). The second highest average wilt incidence of 16.75 per cent

was recorded on cv. WR 315.

This was followed by the cultivars *viz.*, JG 74 (15.05%), JG 218 (14.80%) and JG 130 (12.35%) with wilt average incidence. Comparatively minimum average wilt incidence of 10.25 per cent was recorded on the chickpea cv. JG 63.

Table 4: Verity wise average wilt incidence (%) of chickpea in Vindhyan Plateau Zone of the Madhya Pradesh during *Rabi* 2019-20

S. No.	Districts	Total no. of samples collected	No. of locations	Wilt incidence (%)
1	Local	25	6	20.75
2	JG 74	20	5	15.05
3	WR 315	30	6	16.75
4	JG 218	15	4	14.80
5	JG 130	15	5	12.35
6	JG 63	20	4	10.25
Total/Mean		125	30	14.99

Thus, perusal of the data obtained during present survey study revealed that in the region of Vindhyan Plateau zone, the chickpea crop grown during *rabi* (2018-2019) season was severely affected with the wilt disease (*Fusarium oxysporum* f. sp. *ciceri*) than that of the crop grown during *rabi* (2019-2020) season. Results (Table 5) revealed that in the six districts surveyed during *rabi* (2018-2019) and *rabi* (2019-2020), the average incidence of wilt ranged from 13.07 (Sagar) to 17.87 (Sehore) per cent. However, the chickpea

crop grown in the district of Sehore was found to suffer more with wilt incidence of 17.87 per cent; with overall average incidence of wilt (15.31%).

The second highest average wilt incidence of 17.00 per cent was recorded from the Rajgarh district. This was followed by the districts of Bhopal (15.20%), Vidisha (14.70%) and Raisen (14.02%) with average wilt incidence. Comparatively minimum average wilt incidence of 13.07 per cent was recorded in the district of Sagar.

Table 5: Average wilt incidence (%) of chickpea in Vindhyan Plateau Zone of the Madhya Pradesh during *Rabi* 2018-19 and 2019-20

S. No.	Districts	Total no. of samples collected	No. of location	Wilt incidence (%)		Average wilt incidence (%)
				<i>Rabi</i> 2018-19	<i>Rabi</i> 2019-20	
1	Bhopal	20	6	15.50	14.90	15.20
2	Raisen	25	4	14.20	13.85	14.02
3	Rajgarh	20	5	17.25	16.75	17.00
4	Sagar	15	4	13.50	12.65	13.07
5	Sehore	20	6	18.25	17.50	17.87
6	Vidisha	25	5	15.10	14.30	14.70
Total/Mean		125	30	15.63	14.99	15.31

Further, of the chickpea cultivars grown by the farmers in this region, average maximum wilt incidence during *rabi* (2018-2019) and *rabi* (2019-2020) on chickpea Local cultivars (21.25%) followed by the WR 315 (17.12%), JG 74 (15.42%), JG 218 (15.15%), JG 130 (12.55%) and JG 63 (10.25%) were recorded to suffer more by wilt (*Fusarium oxysporum* f. sp. *ciceri*) disease (Table 6). The variation in the wilt incidence within a village of different districts of Vindhyan Plateau zone might be due to variation in soil type as the association and spread of wilt pathogen is more in heavy type of soils compared to lighter one. The magnitude of wilt incidence was higher under rainfed conditions this might be due to favorable conditions of low moisture with high temperature prevailed in crop growth period, as wilt pathogen favors dry conditions. The black cotton soil is characterized with higher vegetation

which leads to deposition of high organic amendments thereby increasing the carbon levels significantly. Rich carbon source available in black cotton soil also allows significantly high multiplication inoculums of *Fusarium* thereby giving higher incidence.

Sharma *et al.* (1983) ^[15] surveyed 30 villages in M.P. for occurrence of *Fusarium* wilt and observed that incidence of chickpea wilt caused by *F. oxysporum* was more in low moisture conditions as compared to higher moisture conditions (wet) year. Gupta Om *et al.* (1983) ^[5] reported that the wilt incidence 0-60 per cent from Jabalpur and central part of M.P. Reddy (2002) ^[14] surveyed chickpea fields under rainfed as well as irrigated conditions at 10 locations for variation in wilt incidence was 8.84 to 39.44 per cent of chickpea wilt.

Table 6: Variety wise average wilt incidence (%) of chickpea in Vindhyan Plateau Zone of the Madhya Pradesh during Rabi 2018-19 and 2019-20

S. No.	District	Total no. of samples collected	No. of locations	Wilt incidence (%)		Average wilt incidence (%)
				Rabi 2018-19	Rabi 2019-20	
1	Local	25	6	21.50	20.75	21.25
2	JG 74	20	5	15.80	15.05	15.42
3	WR 315	30	6	17.50	16.75	17.12
4	JG 218	15	4	15.50	14.80	15.15
5	JG 130	15	5	12.75	12.35	12.55
6	JG 63	20	4	10.76	10.25	10.25
Total/Mean		125	30	15.63	14.99	15.31

References

- Awachar MK. Studies on morphological variability of *Fusarium oxysporum* f. sp. *ciceri* causing wilt of chickpea. M.Sc. (Ag.) Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, Ahmednagar, M.S. India 2014.
- Annual Report. Government of India Ministry of Agriculture & Farmers welfare Department of Agriculture, cooperation and farmers welfare, Directorate of Pulses Development Bhopal 2017-18, 8.
- Aykoid WR, Doughty J. Legume in human nutrition. FAO nutritional studies 1964, 9.
- Butler EJ. Fungi and diseases of plants. Book published. (M. C. Saxena, K. B. Singh, edi.), CABI Publishing, CAB Int. Wallingford, UK 1918, 233-270.
- Gupta Om, Kotashthane SR, Khare MN. Surveying Fusarium wilt of chickpea in Madhya Pradesh. International Chickpea Newsletter 1983;17:21-22.
- Haware MP, Nene YL. Influence of wilt at different growth stages and yield loss in chickpea. Tropic. Grain Legume Bull 1980;19:38-40.
- Haware MP. Fusarium wilt and other important diseases of chickpea in the Mediterranean area. Options Mediterr. Ser. Semin 1990;9:163-166.
- Jalali BL, Chand H. Diseases of cereals and pulses. (U. S. Singh, N. Mukhopadhyay, J. Kumar, and H. S. Chaube, edi.) Prentice Hall, Englewood Cliffs, NY 1992;1:429-444.
- Khilare VC, Ahmed R, Chavan SS, Kohire OD. Management of *Fusarium oxysporum* f. sp. *ciceri* by different fungicides. Bioinfolet 2009;6:41-43.
- McRae W. Report on imperial mycologists science Agriculture Research Institute, Pusa 1932, 31-78.
- Nene YL, Reddy MV. Chickpea diseases and their control. Phytopathology 1987;42:499-505.
- Nene YL, Sheila VK, Sharma SB. A World List of Chickpea and Pigeonpea Pathogens, ICRISAT, Patancheru, 5th edn., 1996, 27.
- Prasad N, Padwick GW. The genus *Fusarium* 11. A species of *Fusarium* as a cause of wilt of gram (*C. arietinum* L.). Indian J Agri. Sci 1939;9:371-380.
- Reddy YS. Studies on wilt complex of chickpea (*Cicer arietinum* L.). M.Sc. (Ag.) Thesis, I.G.N.U., Raipur (CG), India 2002.
- Sharma BL, Gupta RN, Gupta JS. Studies on survey of wilt and root rot incidence of *Cicer arietinum* in Northern region of Madhya Pradesh. Indian Phytopath 1983;36(1):82-84.
- Singh KB, Dahiya BS. Breeding for wilt resistance in chickpea. In: Symposium on Wilt Problem and Breeding for Wilt Resistance in Bengal Gram. Indian Agriculture Research Institute, New Delhi, India 1973, 13-14.