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**BDS Nathawat**Agricultural Research Station,  
Bikaner, Rajasthan, India**OP Sharma**College of Agriculture, Bikaner,  
Rajasthan, India**AL Yadav**S. K. Rajasthan Agriculture  
University, Bikaner, Rajasthan,  
India

## Studies on the incidence of wilt disease in major chickpea growing areas

**BDS Nathawat, OP Sharma and AL Yadav**

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**Abstract**

Wilt disease of chickpea (*Cicer arietinum*) induced by *Fusarium oxysporum* f. sp. *ciceri* (Padwick) was found to be prevalent in all districts of Rajasthan surveyed. The disease varied from mild to severe from. In Sikar, it was maximum (30.80 and 31.90 per cent) followed by Hanumangarh, Sriganganagar and Jaipur in 2014-15 and 2015-16. Least wilt disease incidence was observed 19.05 and 19.75 per cent in Tonk district.

**Keywords:** Wilt, *Fusarium oxysporum* f. sp. *ciceri*, chickpea, Rajasthan

**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. The total area under chickpea cultivation in India is about 9.93 million hectare with annual production of 9.53 million tonnes. The average productivity of chickpea is 960 kg/ha (Anonymous, 2015)<sup>[2]</sup>.

In Rajasthan, the major chickpea growing districts are Churu, Jhunjhunu, Sikar, Jaipur Shriganganagar, Tonk, Alwar and Hanumangarh. The total area and production of chickpea in Rajasthan is 1.06 million hectares and 0.998 million tonnes, respectively, having productivity of 937 kg/ha (Anonymous, 2015)<sup>[2]</sup>.

More than 50 pathogens have been reported to infect chickpea crop but only few cause economically important diseases. Among them, *Fusarium* wilt (*Fusarium oxysporum* f. sp. *ciceri* (Padwick) Snyd. & Hans), black root rot (*Fusarium solani* (Mart.) Sacc.), wet root rot (*Rhizoctonia solani*) and dry root (*R. bataticola*) and collar rot (*Sclerotium rolfsii*) are of considerable importance (Nene *et al.*, 1981)<sup>[10]</sup>. *Fusarium* wilt is one of the important limiting factors of chickpea production in India. Chickpea wilt caused by *Fusarium oxysporum* f. sp. *ciceri* was first reported from India by Butler (1918)<sup>[4]</sup>. Black root rot / Wilt caused by *Fusarium solani* (Mart.) Sacc. causes severe yield loss i.e. 60-70 per cent under favourable conditions (Tewari and Mukhopadhyay, 2003)<sup>[5]</sup>. The diseases caused by soil borne fungal pathogens viz., *Rhizoctonia solani* (root-rot), *Fusarium oxysporum* f. sp. *ciceri* (wilt) and *Sclerotium rolfsii* have been considered as most devastating for the production of chickpea (Singh *et al.*, 1986; Khan *et al.*, 2002)<sup>[13, 8]</sup>. The disease is wide spread in the chickpea growing areas of the world and reported from at least 33 countries (Nene *et al.*, 1996)<sup>[11]</sup>. In India, it has been reported from all the chickpea growing states and causes an annual loss of 10% (Singh and Dahiya, 1973)<sup>[14]</sup>. 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)<sup>[6]</sup>.

Among the fungal diseases, chickpea wilt caused by *Fusarium oxysporum* f. sp. *ciceri* is widespread in several countries of the world like India, Iran, Pakistan, Nepal, Burma, Spain, Mexico, Peru, Syria and USA (Nene *et al.*, 1989; Jalali and Chand, 1992)<sup>[12, 7]</sup>. It is one of the important limiting factors of chickpea production in India. The disease causes substantial yield losses which may reach even 100 per cent under favourable weather conditions (Nene, 1980 and Jalali and Chand, 1992)<sup>[9, 7]</sup>.

**Corresponding Author:****BDS Nathawat**Agricultural Research Station,  
Bikaner, Rajasthan, India

## Material and Method

Survey was undertaken to major chickpea growing districts of Rajasthan to know the prevalence of wilt disease. Observations on wilt disease incidence were recorded. The selection of village and fields was done randomly. To assess the disease incidence, five fields were observed in each village and average incidence of the disease in each village was calculated. In each field, marked randomly, diseased and healthy plants were counted in one square meter area, in a field, four such spots were randomly selected and average incidence of field was calculated. The per cent disease incidence was calculated as per formula given below

$$\text{Percentage disease incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants observed}} \times 100$$

Survey was carried out in Jaipur, Sikar, Alwar, Tonk, Jodhpur, Sriganganagar and Hanumangarh districts of Rajasthan.

## Results and Discussion

### Survey

Survey for the occurrence of chickpea wilt was undertaken in Jaipur, Sikar, Alwar, Tonk, Jodhpur, Sriganganagar and Hanumangarh districts of Rajasthan during 2014-15 and 2015-16. Extensive survey revealed that the disease was present in varying intensities in all the districts surveyed.

### Distribution and incidence of the disease

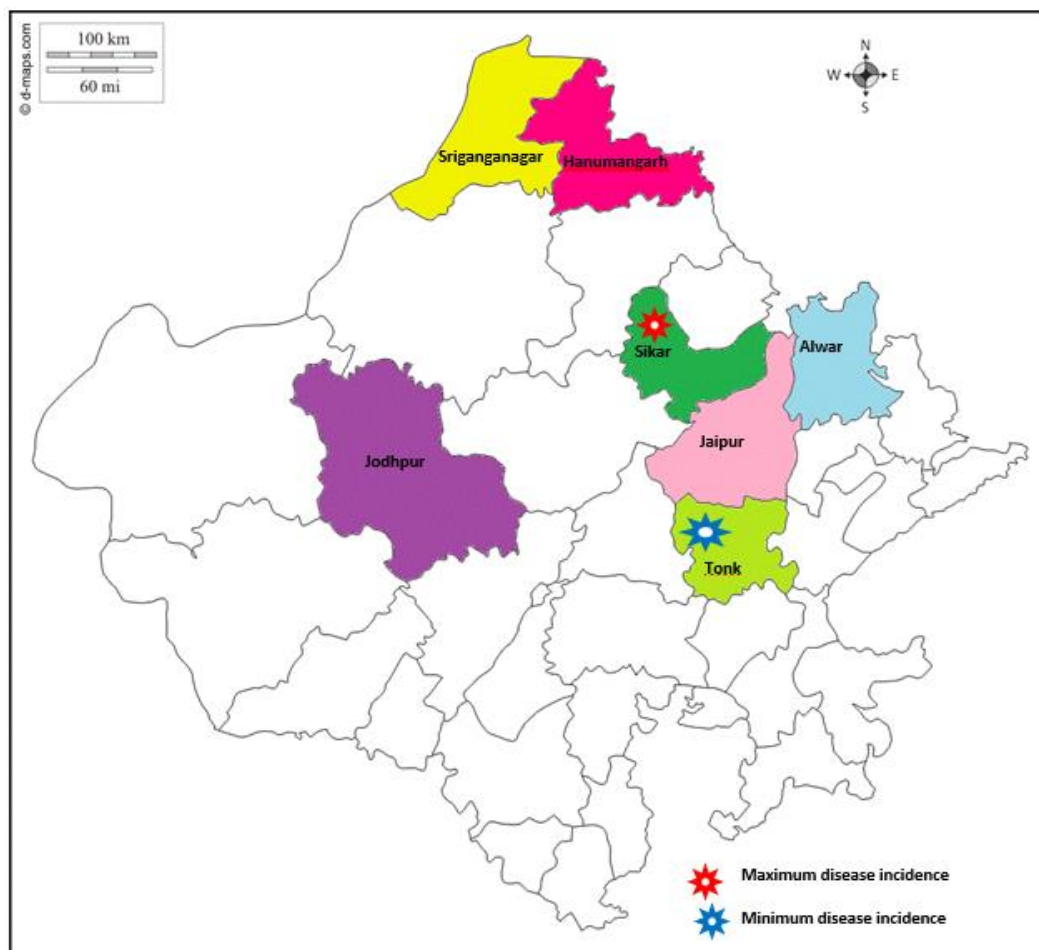
It is apparent from the data depicted in table-4.1 that the wilt

disease (*Fusarium oxysporum* f. sp. *ciceri*) incidence in different districts varied from 19.05 to 30.80 per cent in the year 2014-15. In Sikar, it was maximum (30.80) followed by Hanumangarh, Sriganganagar and Jaipur having incidence to the tune of 28.55, 28.20 and 26.10 per cent respectively in 2014-15. Least wilt disease incidence was observed 19.05 percent in Tonk district. In the crop year 2015-16 the wilt disease incidence in different districts ranged between 20.06 to 33.00 per cent. In Sikar, it was maximum (33.00 per cent) followed by Hanumangarh, Sriganganagar and Jaipur having incidence to the tune of 29.95, 28.90 and 26.27 per cent respectively in 2015-16. Least wilt disease incidence was observed 20.06 per cent in Alwar district (Table-1 and Fig.1). If we compare mean wilt incidence of both the years it ranged between 19.75-31.90 per cent. It was maximum 31.90 per cent in Sikar followed by Hanumangarh, Sriganganagar and Jaipur having disease incidence to the tune of 25.25, 28.55 and 26.18 per cent. The above result are accordance with the scientist . Gangwar *et al.*, (2014) [5] who observed the highest incidence (45.88 %) in Mohangarh area of district Jaisalmer and minimum (27.43%) in Ahore area of district Jalore. Division wise highest disease incidence (40.58%) was observed in Jaipur division followed by Jodhpur division (37.48%), Ajmer division (37.46%) and Bikaner division (34.31%). Several successful end had been made in survey of *Fusarium* wilt (Thaware *et al.* 2015 and Andrabi *et al.* 2008) [16, 1] who found that maximum in the district of Parbhani (15.73%) followed by Nanded (15.63%) and Hingoli (14.93%) districts in the years 2013-2014 and 2014-2015.

**Table 1:** Per cent disease incidence of wilt of chickpea induced by *F. oxysporum* f.sp. *ciceri* in different districts of Rajasthan

District / Block		Wilt disease incidence (2014-15)			Wilt disease incidence (2015-16)			Mean of total wilt*
Jaipur		Seedling stage	Maturity stage	Total	Seedling stage	Maturity stage	Total	
1	Bassi	14.60	10.30	24.90	14.50	10.20	24.70	24.80
2	Chomu	13.80	11.20	25.00	14.30	11.20	25.50	25.25
3	Dudu	14.30	12.30	26.60	14.60	12.30	26.90	26.75
4	Phagi	15.30	12.60	27.90	15.20	12.80	28.00	27.95
	Average	14.50	11.60	26.10	14.65	11.62	26.27	26.18
Sikar								
1	Reengus	16.00	11.00	27.00	19.60	11.00	30.60	28.80
2	Khandela	24.60	10.00	34.60	25.60	9.80	35.40	35.00
	Average	20.30	10.50	30.80	22.60	10.40	33.00	31.90
Tonk								
1	Diggi	10.80	8.60	19.40	11.30	9.20	20.50	19.95
2	Uniyara	10.90	7.80	18.70	10.80	9.60	20.40	19.55
	Average	10.80	8.20	19.05	11.05	9.40	20.45	19.75
Alwar								
1	Thanagaji	11.30	8.60	19.90	11.10	8.40	19.80	19.85
2	Nagaon	12.30	7.80	10.10	11.80	8.20	20.00	20.05
3	Rajgarh	10.30	9.11	19.41	10.80	9.60	20.40	19.90
	Average	11.30	8.50	19.80	11.33	8.73	20.06	19.93
Jodhpur								
1	Borunda	11.30	10.11	21.41	12.30	11.10	23.40	22.40
2	Osian	12.30	11.30	23.60	13.30	11.10	24.40	24.00
	Average	11.80	10.70	22.50	12.80	11.10	23.90	23.20
Sriganganagar								
1	Suratgarh	14.60	12.20	26.80	15.60	13.20	28.80	27.80
2	Vijay Nagar	15.80	13.80	29.60	16.20	12.80	29.00	29.30
3	Jetsar	15.20	13.00	28.20	15.90	13.00	28.90	28.55
	Average	15.20	13.00	28.20	15.90	13.00	28.90	28.55
Hanumangarh								
1	Nohar	16.60	11.80	28.40	17.60	12.20	29.80	29.10
2	Rawatsar	15.90	12.80	28.70	16.90	13.20	30.10	29.40
	Average	16.25	12.30	28.55	17.25	12.70	29.95	29.25

\*Mean of total wilt incidence of two year (2014-15 and 2015-16)



**Fig 1:** Per cent disease incidence of wilt of chickpea induced by *F. oxysporum* f.sp. *ciceri* in different districts of Rajasthan

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