

RESEARCH PAPER

ADVANCE RESEARCH JOURNAL OF
C R P
IMPROVEMENT
Volume 6 | Issue 2 | December, 2015 | 134-138
..... e ISSN-2231-640X

DOI :
10.15740/HAS/ARJCI/6.2/134-138
Visit us: www.researchjournal.co.in

Survey of chickpea wilt (*Fusarium oxysporum* f.sp. *ciceri*) disease in Marathwada region of Maharashtra state

■ D.S. THAWARE, O.D. KOHIRE¹ AND V.M. GHOLVE¹

AUTHORS' INFO

Associated Co-author :

¹Department of Plant Pathology,
College of Agriculture, PARBHANI
(M.S.) INDIA

Author for correspondence:

D.S. THAWARE

Department of Plant Pathology,
College of Agriculture, PARBHANI
(M.S.) INDIA
Email : sanju.6771@rediffmail.com

ABSTRACT : *Fusarium oxysporum* f. sp. *ciceri* is one of the most destructive pathogen, causing wilt disease in chickpea and thereby inflicting accountable quantitative (48.29%) as well as qualitative losses. The survey studies indicated that, overall wilt incidence was comparatively higher in *Rabi* (2013-2014) grown chickpea crop, compared to that of *Rabi* (2014-2015) grown crop. In all the eight districts of Marathwada region surveyed, the disease was found to be widely distributed and regular occurrence with moderate to severe incidence and it's average incidence was found 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. The average incidence of wilt disease was found more in 2013-2014 (15.23%) as compared to 2014-2015 (14.53%). Of the various cultivars / varieties of chickpea grown in the Marathwada region, local cultivars (20.02% and 19.50%) without any proven resistance were found to suffer severely with the disease, during both the years. The most popularly grown Kabuli was found to suffer more with about 17.90 and 17.08 per cent (wilt) disease incidence during *Rabi* (2013-2014) and *Rabi* (2014-2015), respectively. However, the cultivars *viz.*, BDN-9-3, Vijay, BDNG-797 and Digvijay were found to suffer comparatively minimum with the wilt disease.

KEY WORDS : Chickpea, Survey, *Fusarium*, Disease incidence

How to cite this paper : Thaware D.S., Kohire, O.D. and Gholve, V.M. (2015). Survey of chickpea wilt (*Fusarium oxysporum* f. sp. *ciceri*) disease in Marathwada region of Maharashtra state. *Adv. Res. J. Crop Improv.*, 6 (2) : 134-138.

Paper History : Received : 03.07.2015; Revised : 04.10.2015; Accepted : 18.11.2015

Chickpea (*Cicer arietinum* L.) is an important pulse crop, which belongs to Leguminosae family, ranking third after dry beans (*Phaseolus vulgaris* L.) and dry peas (*Pisum sativum* L.) The centre of origin of chickpea is in Eastern Mediterranean (Aykoid and Doughty, 1964). The Kabuli and Desi chickpea is grown throughout the world with different names *i.e.* chickpea (UK), garbanzo (Latin America), bengal gram (India), hommes hamaz (Arab world), shimbra (Ethiopia) and nohud and loblebi (Turkey). 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 tonnes and productivity 967 kg/ha. The production of chickpea in Maharashtra is 1.62 million tonnes with productivity 891 kg/ha which covered nearly 1.82 million ha of area. Maharashtra contributes about 16.42 per cent share in total production of country (Anonymous, 2014).

Chickpea grows best as a post-monsoon cool season crop in semi-arid regions of the sub-continent. It takes 80 to 170 days to mature. Optimum conditions for growth include 21 to 29°C nights and 18 to 26°C day's

temperature with 600-1000 mm annual rainfall (Muehlbauer *et al.*, 1988 and Duke, 1981). In the dry land areas it fixes atmospheric nitrogen in the soil and helps in the management of soil fertility (Sharma and Jodha, 1984).

It plays a vital role in the diet of poor people which serves as a major source of vegetable protein for nutritionally balanced food. It has highest nutritional composition of dry edible grains containing vitamins, carbohydrates, proteins and minerals. It does not contain any anti-nutritional factor. It has considerable amount of fat contents ranging between 3.8-10.2 per cent in different cultivars. After dehulling chickpea seed is valued for its high nutritive value, with 25.3 to 28.9 per cent protein contents (Muehlbauer and Rajesh, 2008 and Hulse, 1991). In addition to source of proteins it has carbohydrate 38-59 per cent, fibre 3 per cent, oil 4.8-5.5 per cent, ash 3 per cent, calcium 0.2 per cent, and phosphorus 0.3 per cent. Its protein and carbohydrate digestibility varies from 76 to 78 per cent and from 57 to 60 per cent (Hulse, 1991; Huisman and Vanderpoel, 1994).

The major limiting factor in chickpea production is *Fusarium* wilt which is caused by *F. oxysporum* Schlechtend. Fr. f. sp. *ciceris* (Padwick) Matuo and K. Sato. (Jalali and Chand, 1992; Haware, 1990 and Nene and Reddy, 1987). It was first reported in Indo-Pak sub-continent (Butler, 1918). McRae (1932) as well as Prasad and Padwick (1939) reported *F. oxysporum* f. sp. *ciceris* pathogenic to chickpea crop which is now accepted worldwide as the causal agent of *ciceri* spp. In general, the disease causes substantial yield losses which may reach even 100 per cent under favourable weather conditions (Jalali and Chand, 1992). The chickpea is cultivated as a rain fed crop in Maharashtra state and yield losses amounted to 10 to 15 per cent (Khilare *et al.*, 2009).

RESEARCH PROCEDURE

A roving survey was conducted during the *Rabi* 2013-2014 and *Rabi* 2014-2015 seasons in the chickpea growing areas of the eight districts of Marathwada region to assess wilt disease incidence. Chickpea growing pockets / fields were identified from the records available at the office of Sub-Divisional Agriculture Officer of the districts to be surveyed.

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

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

RESEARCH ANALYSIS AND REASONING

The survey of 115 farmers fields of chickpea crop from eight districts (Aurangabad, Jalna, Beed, Osmanabad, Latur, Nanded, Parbhani and Hingoli) of Marathwada region of the Maharashtra state was carried out during *Rabi* (2013-2014) and *Rabi* (2014-2015) seasons to record seasonal incidence of wilt disease.

District-wise seasonal disease incidence :

Results (Table 1) revealed that in the eight districts surveyed during *Rabi* (2013-2014), the average incidence of wilt ranged from 14.75 (Beed) to 16.09 (Parbhani) per cent. However, the chickpea crop grown in the district of Parbhani was found to suffer more with wilt incidence of 16.09 per cent; with overall average incidence of wilt (15.23%). The second highest average wilt incidence of 16.05 per cent was recorded from the Nanded district. This was followed by the districts of Hingoli (15.29%), Jalna (15.26%), Latur (14.83%), Osmanabad (14.81%) and Aurangabad (14.76%) with average wilt incidence. Comparatively minimum average wilt incidence of 14.75 per cent was recorded in the district of Beed.

Table 1 : Average incidence of wilt (%) disease of chickpea in Marathwada region of Maharashtra during *Rabi* 2013-2014

Sr. No.	Districts	No. of locations	Wilt incidence (%)
1.	Aurangabad	13	14.76
2.	Jalna	16	15.26
3.	Beed	15	14.75
4.	Osmanabad	15	14.81
5.	Latur	18	14.83
6.	Nanded	13	16.05
7.	Parbhani	16	16.09
8.	Hingoli	09	15.29
Average wilt incidence (%)			15.23

During *Rabi*, 2014-15, wilt incidence (Table 2) was found to be comparatively minimum to that of during *Rabi*, 2013-14. The average incidence of wilt ranged from 14.05 (Beed) to 15.38 (Parbhani) per cent. However, the

chickpea crop grown in the district of Parbhani was found to suffer more with wilt incidence 15.38 per cent and; with overall average incidence of wilt (14.53%). The second highest average wilt incidence of 15.21 per cent was recorded from the Nanded district. This was followed by the districts of Hingoli (14.57%), Osmanabad (14.48%), Latur (14.27%), Jalna (14.17%) and Aurangabad (14.16%) with average wilt incidence. Comparatively minimum average wilt incidence of 14.05 per cent was recorded in the district of Beed.

Table 2 : Average incidence of wilt (%) disease of chickpea in Marathwada region of Maharashtra during Rabi 2014-2015

Sr. No.	Districts	No. of locations	Wilt incidence (%)
1.	Aurangabad	13	14.16
2.	Jalna	16	14.17
3.	Beed	15	14.05
4.	Osmanabad	15	14.48
5.	Latur	18	14.27
6.	Nanded	13	15.21
7.	Parbhani	16	15.38
8.	Hingoli	09	14.57
Average wilt incidence (%)			14.53

Variety-wise seasonal disease incidence :

In the eight districts of the Marathwada region 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 2013-14, average incidence (Table 3) of wilt on chickpea cultivars / varieties ranged from 11.63 (Digvijay) to 20.02 (Local) per cent. However, Local cultivar of chickpea was found to suffer more with wilt incidence of 20.02 per cent; with overall highest average incidence of wilt (15.23%). The second highest average wilt incidence (17.90%) recorded on Kabuli. This was followed by the cultivars viz., Vijay (14.17%), BDN-9-3

Table 3 : Variety-wise incidence of wilt (%) disease of chickpea in Marathwada region of Maharashtra during Rabi 2013-2014

Varieties	No. of locations	Average wilt incidence (%)
Local	30	20.02
Vijay	44	14.17
Kabuli	18	17.90
BDNG-797	08	13.55
BDN-9-3	07	14.10
Digvijay	08	11.63

(14.10%) and BDNG-797 (13.55%) with wilt average incidence. Comparatively minimum average wilt incidence of 11.63 per cent was recorded on the chickpea cv. DIGVIJAY.

During Rabi 2014-15, average incidence (Table 4) of wilt on chickpea cultivars / varieties ranged from 10.48 (Digvijay) to 19.50 (Local) per cent. However, Local cultivar of chickpea was found to suffer more with wilt incidence of 19.50 per cent; with overall highest average incidence of wilt (14.53%). The second highest average wilt incidence of 17.08 per cent was recorded on cv. KABULI. This was followed by the cultivars viz., BDN-9-3 (13.91%), Vijay (13.37%) and BDNG-797 (12.86%) with wilt average incidence. Comparatively minimum average wilt incidence of 10.48 per cent was recorded on the chickpea cv. DIGVIJAY.

Table 4 : Variety-wise incidence of wilt (%) disease of chickpea in Marathwada region of Maharashtra during Rabi 2014-2015

Varieties	No. of locations	Average wilt incidence (%)
Local	30	19.50
Vijay	44	13.37
Kabuli	18	17.08
BDNG-797	08	12.86
BDN-9-3	07	13.91
Digvijay	08	10.48

Thus, perusal of the data obtained during present survey study revealed that in the region of Marathwada, the chickpea crop grown during Rabi (2013-2014) season was severely affected with the wilt disease (*Fusarium oxysporum* f. sp. *ciceri*) than that of the crop grown during Rabi (2014-2015) season. Results (Table 5) revealed that in the eight districts surveyed during Rabi (2013-2014) and Rabi (2014-2015), the average incidence of wilt ranged from 14.40 (Beed) to 15.73 (Parbhani) per cent. However, the chickpea crop grown in the district of Parbhani was found to suffer more with wilt incidence of 15.73 per cent; with overall average incidence of wilt (14.88%).

The second highest average wilt incidence of 15.63 per cent was recorded from the Nanded district. This was followed by the districts of Hingoli (14.93%), Jalna (14.71%), Osmanabad (14.64%), Latur (14.55%), and Aurangabad (14.46%) with average wilt incidence. Comparatively minimum average wilt incidence of 14.40 per cent was recorded in the district of Beed.

Further, of the chickpea cultivars grown by the

Table 5 : Average incidence of the wilt (%) disease of chickpea in Marathwada region during Rabi 2013-2014 and Rabi 2014-2015

Sr. No.	Districts	No. of locations	Wilt incidence (%)		Average wilt incidence (%)
			Rabi 2013-2014	Rabi 2014-2015	
1.	Aurangabad	13	14.76	14.16	14.46
2.	Jalna	16	15.26	14.17	14.71
3.	Beed	15	14.75	14.05	14.4
4.	Osmanabad	15	14.81	14.48	14.64
5.	Latur	18	14.83	14.27	14.55
6.	Nanded	13	16.05	15.21	15.63
7.	Parbhani	16	16.09	15.38	15.73
8.	Hingoli	09	15.29	14.57	14.93
Average incidence (%)			15.23	14.53	14.88

Table 6 : Variety-wise average incidence of wilt (%) disease of chickpea in Marathwada region of Maharashtra during Rabi 2013-2014 and Rabi 2014-2015

Sr. No.	Varieties	Wilt incidence (%)		Average wilt incidence (%)
		Rabi 2013-2014	Rabi 2014-2015	
1.	Local	20.02	19.50	19.76
2.	Vijay	14.17	13.37	13.77
3.	Kabuli	17.90	17.08	17.49
4.	BDNG-797	13.55	12.86	13.20
5.	BDN-9-3	14.10	13.91	14.00
6.	Digvijay	11.63	10.48	11.05
Average wilt incidence (%)		15.23	14.53	14.88

farmers in this region, average maximum wilt incidence during Rabi (2013-2014) and Rabi (2014-2015) on chickpea Local cultivars (19.76%) followed by the Kabuli (17.49%), BDN-9-3 (14.00%), Vijay (13.77%), BDNG-797 (13.20%) and Digvijay (11.05%) 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 Marathwada region 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 favourable conditions of low moisture with high temperature prevailed in crop growth period, as wilt pathogen favours 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) 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. Reddy (2002) 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. Kohire *et al.* (2006); Nikam *et al.* (2008); Mulik (2009); Patil (2010); Kohire *et al.* (2012) and Magar (2012) reported that disease incidence of wilt in Marathwada region varied from 6.6 to 20 per cent. Awachar (2014) surveyed chickpea fields in Ahmednagar district causing 10-50 per cent losses in chickpea production due to *Fusarium oxysporum* f. sp. *ciceri*.

LITERATURE CITED

- Anonymous, (2014). Directorate of Economics and Statistics, Department of Agriculture and Cooperation. Agricultural statistics at a glance. pp: 94-96.
- Awachar, M. K. (2014). 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).
- Aykoid, W.R. and Doughty, J. (1964). Legume in human nutrition. FAO nutritional studies. 9 pp.

- Butler, E.J.** (1918). *Fungi and diseases of plants*. Book published. (M. C. Saxena, K. B. Singh, edi.), CABI Publishing, CAB Int. Wallingford, UK. pp. 233-270.
- Duke, J. A.** (1981). *Handbook of legumes of world economic importance*. Plenum Press, New York. pp: 52-57.
- Haware, M. P.** (1990). Fusarium wilt and other important diseases of chickpea in the Mediterranean area. *Options Mediterr. Ser. Semin.*, **9** : 163-166.
- Huisman, J.** and Venderpoel, A.F.B. (1994). Aspect of the nutritional quality and use of cool season food legume in animal food. pp: 53-57.
- Hulse, J.A.** (1991). Nature composition and utilization of legumes, pp. 11-27.
- Jalali, B. L.** and Chand, H. (1992). *Diseases of cereals and pulses*. (U. S. Singh, A. N. Mukhopadhyay, J. Kumar, and H. S. Chaube, edi.) Prentice Hall, Englewood Cliffs, NY. 1-429-444.
- Khilare, V.C.**, Ahmed, R., Chavan, S.S. and Kohire, O.D. (2009). Management of *Fusarium oxysporum* f. sp. *ciceri* by different fungicides. *Bioinfolet.*, **6** : 41-43.
- Kohire, O.D.**, Mulik, M.B., Kohire Patil, V.O., Thombre, B.B. and More, S.S. (2012). Survey of root diseases of chickpea in Jalna districts of Mahathwada region. *Internat. J. Pl. Protec.*, **5** (2): 381-385.
- Kohire, O.D.**, Shrirame, M.D., Dahiwal, A.L., Shirurkar, P. D. and Vishnupurikar, R.M. (2006). Status of chickpea wilt, dry root rot and stunt in major chickpea growing districts of Marathwada region of Maharashtra. Paper presented in Agro research conservation and management held at Raipur, on 14-15 Dec. 338 pp.
- Magar, G.S.** (2012). Investigation on wilt of chickpea incited by *Fusarium oxysporum* f. sp. *ciceri* (Padwick) Snyder and Hansen. M.Sc. (Ag.) Thesis, Vasant Rao Nayak Marathwada Krishi Vidypaeth, Parbhani, M.S. (INDIA).
- McRae, W.** (1932). Report on imperial mycologists science Agriculture Research Institute, Pusa. pp. 31-78.
- Muehlbauer, F.J.** and Rajesh, P. N. (2008). Chickpea, a common source of protein and starch in the semi-arid tropics. Book: *Genomics of tropical crop plants*. Pub. Springer NY. 1: 171-186.
- Muehlbauer, F.J.**, Redden, R.J., Nassib, A.M., Robertson, L.D. and Smithson, J.B. (1988). Population improvement in pulse crops: *An assessment of methods and techniques*. pp: 943-966. In: R.J. Summerfield (edi.), Kluwer Academic Publishers, Dordrecht, The Netherlands.
- Mulik, M.B.** (2009). Studies on wilt of chickpea incited by *Fusarium oxysporum* f. sp. *ciceri* (Padwick) Synder and Hansan. M.Sc. (Ag.) Thesis, Vasant Rao Nayak Marathwada Krishi Vidypaeth, Parbhani, M.S. (INDIA).
- Nene, Y.L.** and Reddy, M.V. (1987). Chickpea diseases and their control. *Phytopathology*, **42** : 499-505.
- Nikam, P.S.**, Jagtap, G.P. and Bidwe, K.U. (2008). Survey and surveillance of chickpea wilt complex caused by *Fusarium oxysporum* f. sp. *ciceri*. *J. Pl. Dis. Sci.*, **3** (1): 29-33.
- Patil, V.B.** (2010). Studies on survey and management of chickpea wilt in Marathwada region. Ph. D. (Ag.) Thesis, Vasant Rao Nayak Marathwada Krishi Vidypaeth, Parbhani, M.S. (INDIA).
- Prasad, N.** and Padwick, G.W. (1939). The genus *Fusarium* 11. A species of *Fusarium* as a cause of wilt of gram (*C. arietinum* L.). *Indian J. Agri. Sci.* **9**: 371-380.
- Reddy, Y. S.** (2002). Studies on wilt complex of chickpea (*Cicer arietinum* L.). M.Sc. (Ag.) Thesis, I.G.N.U., Raipur (CG), INDIA.
- Sharma, B.L.**, Gupta, R.N. and Gupta, J.S. (1983). Studies on survey of wilt and root rot incidence of *Cicer arietinum* in Northen region of Madhya Pradesh. *Indian Phytopath.*, **36** (1): 82-84.
- Sharma, D.** and Jodha, N.S. (1984). Pulse production in Semi-arid region of India Proc. of Pulses Prod. Constraints and Opportunities. pp: 241-265.