



ISSN (E): 2277-7695  
 ISSN (P): 2349-8242  
 NAAS Rating: 5.23  
 TPI 2023; 12(3): 5359-5362  
 © 2023 TPI

[www.thepharmajournal.com](http://www.thepharmajournal.com)

Received: 13-01-2023

Accepted: 23-02-2023

#### Mergewar AR

Department of Plant Pathology,  
 College of Agriculture, Latur,  
 Maharashtra, India

#### Mulekar VG

Department of Plant Pathology,  
 College of Agriculture, Latur,  
 Maharashtra, India

#### Sunita J Magar

Department of Plant Pathology,  
 College of Agriculture, Latur,  
 Maharashtra, India

#### Waghmare SV

Department of Plant Pathology,  
 College of Agriculture, Latur,  
 Maharashtra, India

## Effect of various soil types on incidence of *Fusarium Oxysporum* f. sp. *Ciceri* causing chickpea wilt

Mergewar AR, Mulekar VG, Sunita J Magar and Waghmare SV

### Abstract

Chickpea (*Cicer arietinum* L.) is the most important pulse crop cultivated in India and affected by many fungal and viral diseases and among all the diseases, wilt caused by *Fusarium Oxysporum* f. sp. *Ciceri* is one of the most common fungal pathogen which causes ultimate yield loss in chickpea crop. Results revealed that under polybag culture, the various soil types significantly influenced seed germination, plant mortality, shoot length, root length and seedling vigour index. The plant mortality recorded with various soil types were ranged from 29.62 to 59.52 per cent. However, silt soil type resulted with significantly least plant mortality (29.62%), followed by clay loam (36.53%), clay (41.66%), sandy clay (45.09%), sandy loam (48.83%), sandy clay loam (53.33%), red sandy (56.41%) and sandy (59.52%).

**Keywords:** Chickpea, wilt, *F. Oxysporum* f. sp. *Ciceri*, Soil type

### Introduction

Chickpea (*Cicer arietinum* L.) is one of the most important *Rabi* pulse crop in India sharing hectareage next to pigeonpea and makes up for 20% of the world pulse production. It belongs to family *Leguminosae*. Chickpea is commonly known as Bengal gram, garbanzo bean, gram, chana, chole and harbhara. It plays a vital role in the diet of poor people which serves as a major source of vegetable protein (21.1%), carbohydrates (61.5%) and fat (4.5%). It does not contain any anti-nutritional factor. It is mainly used for human consumption as well as for animal feeds. It is consumed as whole seed, dal, boiled, fried, salted or more generally which is cooked.

Various diseases affect the chickpea viz. *Ascochyta* blight, damping off, *Botrytis* grey mold, *Phytophthora* root rot, seed rot / *Pythium* rot and rust but wilt caused by *Fusarium Oxysporum* f. sp. *Ciceri* is the most serious disease. The chickpea wilt fungus, *Fusarium oxysporum* f. sp. *ciceri* is a vascular pathogen. This pathogen is soil and seed borne (Haware *et al.*, 1978) [4]. Under severe conditions, the wilt disease can damage the crop completely and causes losses up to 100% (Navas-cortes *et al.*, 2000) [5]. Considering, the importance of disease in the state, the losses incurred in the farmer's field and the problem has increased in past 6-7 years with heavy economic losses. Therefore, it was felt necessary to investigate on effect of various soil types on chickpea wilt incidence.

### 2. Materials and Methods

Eight different types of soils based on their texture were collected from Latur and nearby area and identified by calculating their sand, silt and clay proportion in the laboratory.

To find out the incidence of wilt in various soil types, the experiment was conducted in screen house at Department of Plant Pathology, College of Agriculture, Latur. Soils were sterilized with 4% formalin solution. After two days, artificially mass multiplied culture of *Fusarium Oxysporum* f. sp. *Ciceri* on sand maize medium was inoculated in each soil type to make soil sick. The treated soil types were incubated in screen house for 7 days for multiplication of the test pathogen. Sowing of the susceptible Cv. JG 62 was done in each soil types.

**Experimental details: Design** : CRD

**Replications** : Three

**Treatments** : Eight

#### Corresponding Author:

#### Mergewar AR

Department of Plant Pathology,  
 College of Agriculture, Latur,  
 Maharashtra, India

**Treatment details**

Tr. No.	Soil type	Tr. No.	Soil type
T1	Clay	T5	Sandy clay
T2	Sandy clay loam	T6	Sandy loam
T3	Clay loam	T7	Silt
T4	Sandy	T8	Red sandy

Per cent seed germination was calculated by using following formula.

$$\text{Per cent germination} = \frac{\text{Total no. of seeds germinated}}{\text{Total no. of seed sown}} \times 100$$

Per cent disease incidence (plant mortality) was observed up to 45 days after sowing and calculated using following formula.

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

The seedling vigour index was calculated by following formula, given by Abdul-Baki and Aderson, 1973.

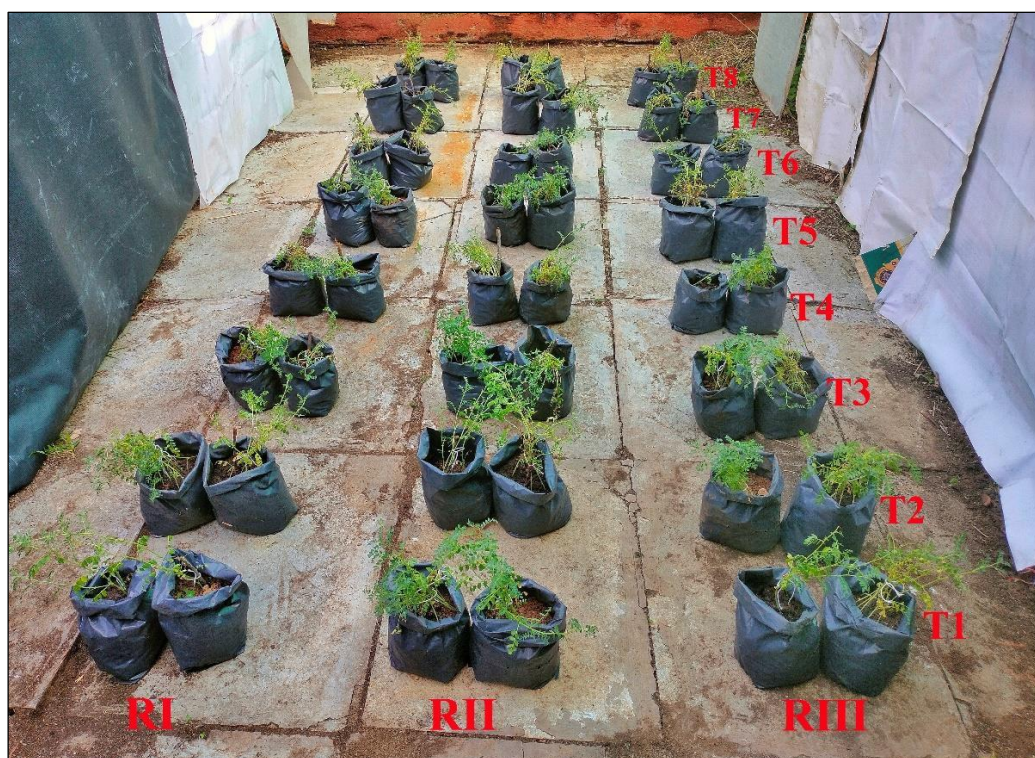
$$\text{SVI (Seedling vigour index)} = \% \text{ seed germination} \times (\text{Root length} + \text{shoot length}) \text{ cm}$$

**3. Results and Discussion**

**3.1 Effect of various soil types on germination and plant mortality**

An experiment was conducted to know the effect of various soil types on incidence of wilt caused by *Fusarium Oxysporum* f. sp. *Ciceri* in chickpea. Results revealed that various soil types significantly influenced the seed germination, plant mortality, shoot length, root length and seedling vigour index.

The results (Plate 1, Table 1 and Fig.1) revealed that all the tested treatments (different soil types) significantly influenced both germination and plant mortality caused by *Fusarium Oxysporum* f. sp. *Ciceri* in chickpea

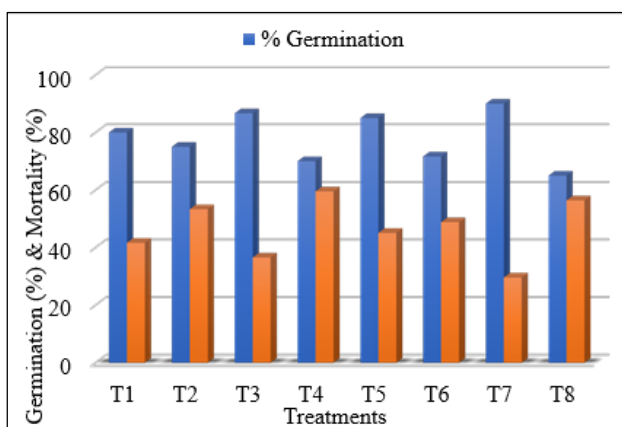


**Plate 1:** Effect of various soil types on incidence of *Fusarium oxysporum* f. sp. *ciceri* causing chickpea wilt (polybag culture)

**Table 1:** Effect of various soil types on incidence of *Fusarium oxysporum* f. sp. *ciceri* causing chickpea wilt (polybag culture)

Tr. No.	Soil Type	Seed germination (%) *	Plant Mortality (%) *
T1	Clay	80.00(63.43)**	41.66(40.19)
T2	Sandy clay loam	75.00(60.00)	53.33(46.90)
T3	Clay loam	86.66(68.57)	36.53(37.18)
T4	Sandy	70.00(58.78)	59.52(50.48)
T5	Sandy clay	85.00(67.21)	45.09(42.18)
T6	Sandy loam	71.66(57.83)	48.83(44.32)
T7	Silt	90.00(71.56)	29.62(32.97)
T8	Red sandy	65.00(53.72)	56.41(48.68)
	S.E. ±	0.88	0.70
	C.D. (P=0.01)	2.66	2.13

\*Mean of three replications \*\*Figures in parentheses are arcsine transformed values



**Fig 1:** Effect of various soil types on incidence of *Fusarium oxysporum* f. sp. *ciceri* causing chickpea wilt (polybag culture)

The germination recorded with the tested treatments (various soil types) were ranged from 65.00 to 90.00 per cent. However, silt soil type was effective with maximum germination (90.00%), followed by clay loam (86.66%), sandy clay (85.00%), clay (80.00%), sandy clay loam (75.00%), sandy loam (71.66%), sandy (70.00%) and red sandy (65.00%).

The plant mortality recorded with the tested treatments (various soil types) were ranged from 29.62 to 59.52 per cent. However, silt soil type resulted with significantly least plant mortality (29.62%), followed by clay loam (36.53%), clay (41.66%), sandy clay (45.09%), sandy loam (48.83%), sandy clay loam (53.33%), red sandy (56.41%) and sandy (59.52%).

**3.2 Effect of various soil types on plant growth parameters**

The results (Table 2 and Fig. 2) revealed that, highest shoot length (27.20 cm), root length (10.76 cm) and seedling vigour index (3416.40) were recorded with silt soil type. The second and third best soil types were found clay loam (25.96 cm, 9.90

cm and 3107.62, respectively) and sandy clay (24.63 cm, 9.63 cm and 2912.10, respectively). These were, followed by clay (23.90 cm, 9.46 cm and 2668.80, respectively), sandy clay loam (25.00 cm, 9.63 cm and 2597.25, respectively), sandy loam (22.53 cm, 8.86

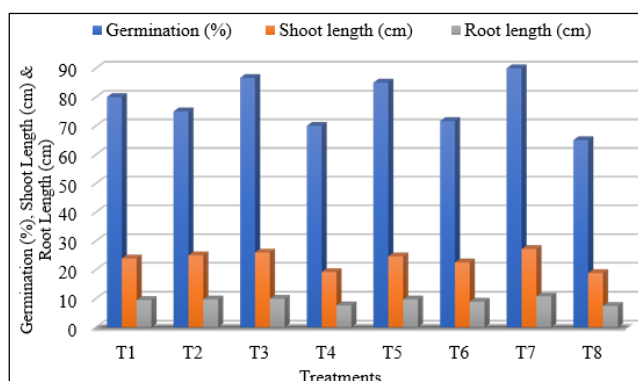
cm and 2249.40, respectively) sandy (19.20 cm, 7.56 cm and 1873.20, respectively) and red sandy (18.83 cm, 7.40 cm and 1704.95, respectively).

These results are in conformity with the findings of several earlier workers. Soil types viz., clay, sandy clay loam, clay loam, sandy, sandy clay, sandy loam, silt and red sandy were used to check disease incidence of *Fusarium Oxysporum* f. sp. *Ciceri* causing wilt of chickpea. Cook and Papendick (1972) [3] reported that sandy soil was most conducive to wilt incidence in tomato. Singh *et al.* (2017) [6] reported that sandy soil supported highest wilt incidence in watermelon (75%), tomato (72%) and marigold (52%). Bashir *et al.* (2018) [2] reported that more wilt incidence was observed with sandy soil (36.27%).

**Table 2:** Effect of various soil types on chickpea plant growth parameters under sick soil (*Fusarium Oxysporum* f. sp. *Ciceri*) in polybag culture

Tr. No.	Soil Type	Seed germination* (%)	Shoot length* (cm)	Root length* (cm)	Seedling vigour index*(SVI)
T1	Clay	80.00(63.43)**	23.90	9.46	2668.80
T2	Sandy clay loam	75.00(60.00)	25.00	9.63	2597.25
T3	Clay loam	86.66(68.57)	25.96	9.90	3107.62
T4	Sandy	70.00(58.78)	19.20	7.56	1873.20
T5	Sandy clay	85.00(67.21)	24.63	9.63	2912.10
T6	Sandy loam	71.66(57.83)	22.53	8.86	2249.40
T7	Silt	90.00(71.56)	27.20	10.76	3416.40
T8	Red sandy	65.00(53.72)	18.83	7.40	1704.95
	S.E. ±	0.88	0.78	0.80	-
	C.D. (P=0.01)	2.66	2.36	2.43	-

\*Mean of three replications \*\*Figures in parentheses are arcsine transformed values



**Fig 2:** Effect of various soil types on chickpea plant growth parameters under sick soil (*Fusarium Oxysporum* f. sp. *Ciceri*) in polybag culture

#### 4. Conclusion

Results indicated that, silt and clay loam soil type were found most effective in minimizing chickpea wilt.

#### 5. References

1. Abdul-baki AA, Anderson JD. Vigour index determination in soybean by multiple criteria. *Crop Science*. 1973;13:630-633.
2. Bashir MR, Atiq M, Sajid M, Hussain A, Rehman HS, Mehmood A. Impact of organic matter and soil types on the development of *Fusarium* wilt of chilli. *Pakistan Journal of Agriculture Science*. 2018;55(4):749-753.
3. Cook RJ, Papendick RI. Influence of water potential of soils and 3555 plants on root disease. *Annual Review of Phytopathology*. 1972 Sep;10(1):349-374.
4. Haware MP, Nene YL, Rajeshwari R. Eradication of *Fusarium oxysporum* f. sp. *ciceri* transmitted in chickpea seed. *Phytopathology*. 1978;68(9):1364-1367.
5. Navas-cortes JA, Hau B, Jimenez-diaz M. Yield loss in chickpeas in relation to development of *Fusarium* wilt epidemics. *The American Phytopathological Society*. 2000;90(11):1269-1278.
6. Singh BK, Singh VP, Srivastava S, Pandey AK, Shukla DN. Influence of soil properties on wilt incidence of water melon, tomato and marigold. *Annual Research & Review in Biology*. 2017;19(5):1-6.