

## Good Agronomic Practices for Efficient of Management of Chickpea Wilt

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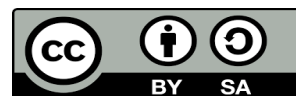
### ABSTRACT

Chickpea wilt caused by *Fusarium oxysporum* f. sp. *ciceri*, is an important and most serious disease in Eastern U.P. The crop has been facing numerous biotic and abiotic constraints. Among the biotic crops affected by disease caused by many pathogens, chickpea wilt could be managed by the integration of various agronomic practices like, different date of sowing and uses of different type of soil amendments. The six different sowing dates Viz., 1<sup>st</sup> October, 8<sup>th</sup> October, 15<sup>th</sup> October, 22<sup>nd</sup> October, 29<sup>th</sup> October and 05<sup>th</sup> November. The lowest average of disease incidence (13.27%) and average higher crop yield (14.42 q/ha) which was obtained in 5<sup>th</sup> November date of sowing. The next best effective date of sowing was 29<sup>th</sup> and 22 October, which were showed 19.45 & 22.95% average disease incidence and 9.62 & 10.02 q/ha, average yields respectively. The maximum average disease incidence (31.00%) and average lowest yield (8.10) was observed in 1<sup>st</sup> October date of sowing crops. The seven different types of soil amendments Viz., Pyrite and Gypsum were applied in soil @ 2.0 t/ha and Neem cake, Paddy straw, Wheat straw, Castor cake and Mustard cake @ 20.0 t/ha. All the amendments were significantly effective in reducing the wilt. The minimum average disease incidence 37.20% and respective its yield 6.85 q/h was recorded in the amendment with Neem followed by Mustard cake and Pyrite, the average disease incidence 41.40% and 46.65% and its respective yields 6.25 and 5.17 q/ha respectively. Paddy straw was least effective soil amendments which shows maximum average disease incidence 64.30% with minimum average yield 3.80q/ha.

**Keywords:** GAP, Chickpea, wilt, *Fusarium oxysporum* f. sp. *ciceri*, sowing dates and soil

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### INTRODUCTION

Chickpea (*Cicer arietinum* L.) is one of the major legume crops grown in cool season, majority in dryland condition (Nene et al., 2012). Chickpea served as major dietary protein for humans as the cheapest cost compared to the other sources of protein (Iqbal et al. 2006). Like other crops, chickpea is subjected to many biotic and abiotic stresses, which causes limited production as per the theoretical potential. The productions of chickpea in the Indian conditions are severely affected by pathogenic fungus, bacteria, virus and nematodes (Nene and Shelia, 1996 and Patra and Biswas (2017). It causes on an average 10% loss in yield and the damage has been observed up to 61% and 43% at seedling and adult stages respectively. Under severe condition, the wilt infection can damage the crop completely and cause 100% yield losses (Navas Cotres et al., 2000). However, very meager information is available on this disease. Therefore, it was felt necessary to explore the possibility for the control of the soil borne disease through the use of different sowing dates and different soil amendments.

### MATERIALS AND METHODS

The experiments were conducted at Students Research Farm Pilikothi, Jaunpur in two successive years during 2019-2020 and 2020-2021. Seven types of soil amendments like pyrite and Gypsum were applied in soil @ 2.0 t/ha and Neem cake, Paddy straw, Groundnut cake, Castor cake and Mustard cake @ 20.0 t/ha were incorporated ten days before sowing of Radhey healthy seeds in 3 x 2 m plot size with RBD design. The

experiment was carried out in a sick plot and each treatment were replicated thrice and irrigated from time to time as and when required. The disease incidence were recorded when the plants of Chickpea attained the age of two month and suitable control was also maintained with any amendments in the soil. Disease incidence and yield data were recorded after crop maturity and analysed statistically.

### Statistical analysis

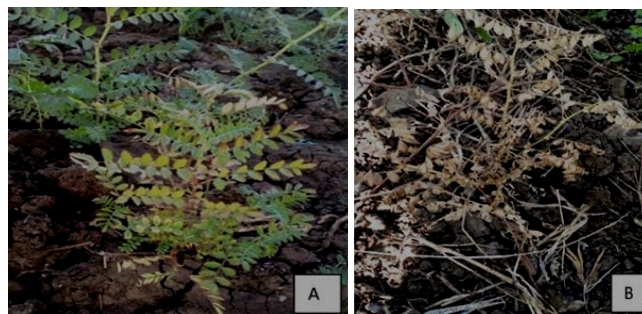
The effect of different soil amendments and date of sowing on disease incidence and yield against wilt of chickpea was calculated in terms of percent disease incidence and yield (q/ha) as per the formula given and the data was analyzed by using the OPSTAT statistical programme by Sheoran (2006).

$$\text{Percent disease incidence} = \frac{\text{Total number of wilted plant}}{\text{Total plant population}} \times 100$$

### RESULTS AND DISCUSSION

#### Major symptoms of the chickpea wilt disease

Yellowing and drying of leaves from base to upward,



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Fig.1: A, B and C. Symtoms of wilt of Chichpea

drooping of petioles and rachis, withering of plants, browning of vascular bundles and finally wilting of plants (Fig.1 A, B & C).

The wilt caused by *Fusarium oxysporum* f. sp. *ciceri* is a soil borne disease and the mode of dissemination are many such as infected plant debris, soil and seed as mycelium, microconidia, macroconidia and most commonly as Chlamydospores (Fig.2 A, B, C & D) (Golakiya et al., 2018).

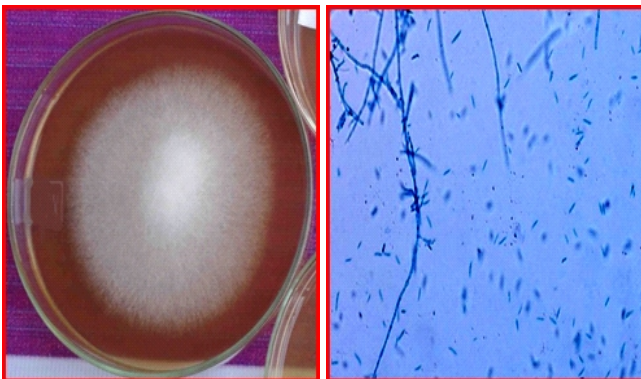


Fig.2: A. Culture of *Fusarium oxysporum* f. sp. *ciceri*, B. Microconidia, C. Macroconidia, D. Chlamydospore

**Effect of different sowing dates on the disease incidence and yield of Chickpea**

The result obtained from Table 1, and corresponding line graph (Fig.3) revealed that the minimum average disease incidence 13.27% with maximum average yield 14.42q/ha was found in 1<sup>st</sup> November of dates of sowing. The next best effective sowing dates are, which showed the average disease incidence 14.97% and 16.52% in respective to average yield are 12.32q/ha and 11.10q/ha respectively. The next best effective date of sowing was 29<sup>th</sup> and 22 October, which were showed 19.45 & 22.95% average disease incidence and 9.62 & 10.02q/ha., average yields respectively. These were statistically at par with each other's in respect to average disease incidence and yield also. The maximum average disease incidence (31.00%) with minimum average yield (8.10q/ha.) was found in 1<sup>st</sup> October date of sowing. The average disease incidence decreased with increased yield at 1<sup>st</sup> October to 5<sup>th</sup> November of the sowing dates in this experiment. The earlier workers have also reported that delayed sowing helped in lowering down disease incidence and increased crop yield by Ram and Singh (2022) against the influence of date of sowing on incidence of wilt disease of lentil. Maurya and Singh (2014) and Ram (2021) recorded that

Table 1: Effect of different sowing dates on disease incidence and yield of chickpea.

Dates of sowing	Disease incidence (%)		Yield (q/ha)		Average Disease incidence %	Average Yield (q/ha)
	2019-20	2020-21	2019-20	2020-21		
1 <sup>st</sup> October	31.40 (34.08)*	30.60 (33.58)	8.00 (16.43)	8.20 (16.64)	31.00 (33.83)	8.10 (16.54)
8 <sup>th</sup> October	29.30 (32.77)	29.00 (32.58)	8.45 (16.90)	8.60 (17.05)	29.15 (32.68)	8.52 (16.97)
15 <sup>th</sup> October	24.00 (29.33)	26.00 (30.66)	9.35 (17.80)	9.00 (17.46)	25.00 (30.00)	9.17 (17.62)
22 <sup>nd</sup> October	21.30 (27.49)	24.60 (29.73)	10.85 (19.24)	9.20 (17.66)	22.95 (28.65)	10.02 (18.45)
29 <sup>th</sup> October	17.90 (25.03)	21.00 (27.28)	10.30 (18.72)	9.00 (17.46)	19.45 (26.17)	9.62 (18.07)
5 <sup>th</sup> November	12.25 (22.48)	14.30 (22.22)	15.50 (23.19)	13.35 (21.53)	13.27 (21.37)	14.42 (22.31)
C.D. At 5%	(2.76)	(3.15)	(1.32)	(1.38)	(3.54)	(1.95)

\*Angular transformed value in parenthesis

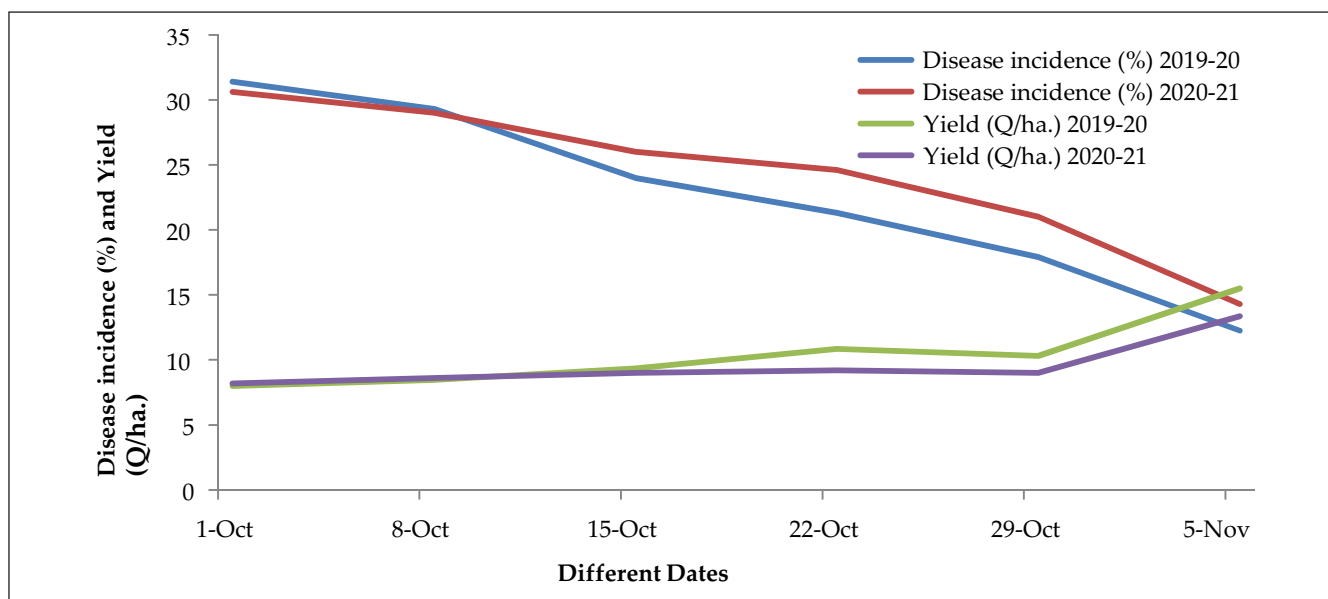


Fig.3: Effect of different sowing dates on disease incidence and yield of Chickpea (2019-21)

#### Effect of different soil amendments on disease incidence and yield of Chickpea

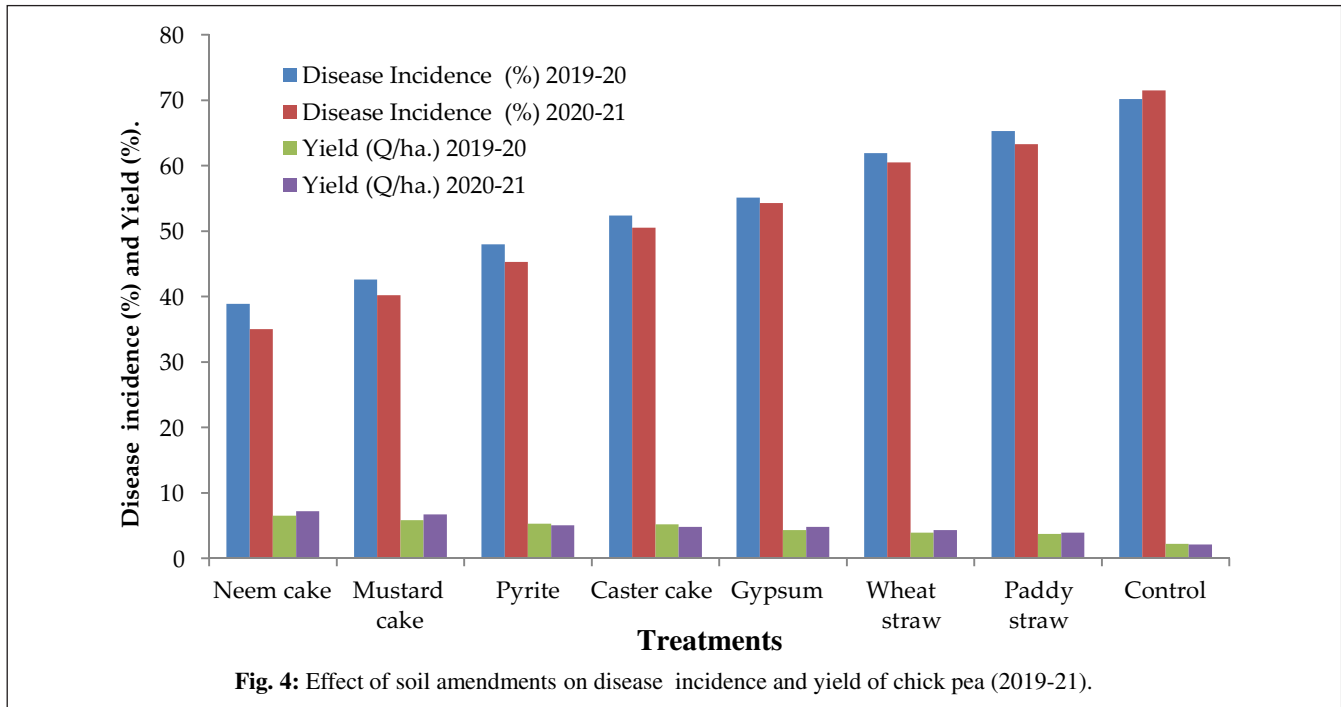
The results presented in Table 2, and corresponding histogram (Fig. 4) reveals that observations on disease incidence that all the amendments were significantly effective in reducing the wilt. Among them incorporation of Neem cakes was found significantly superior and show minimum average disease incidence 37.20 and respective yield 6.85 q/h. Next best soil amendments was mustard cake followed by Pyrite, which showed the 41.40%, 46.65% average disease incidence and average yield was 6.25 and 5.17 q/ha respectively. Among the tested soil amendments Castor cake and Gypsum were also effective than the control and these

were statistically at par in both years in respective disease incidence and yields also. Paddy straw was least effective soil amendments which shows maximum 65.30 disease incidence in 2019-20 and 63.30% in 2020-21 with minimum yield 3.70 q/ha & 3.90 q/ha respectively. The present finding coincides with the observation made by Prasad and Kumar (2017) and Singh (2021) who reported that the soil amendments with Neem cake was proved to be effective against *Fusarium oxysporum* f. sp. ciceri and *Fusarium oxysporum* f. sp. lini. The incidence of gram wilt was significantly reduced by treating the soil with Neem, Groundnut, sesame and Mustard cake (Biswas and Ali 2017).

Table 2: Effect of different soil amendments on disease incidence and yield of chickpea

Soil amendments	Dose t/ha	Disease incidence (%)		Yields (q/ha.)		Average disease incidence %	Average yields (q/ha.)
		2019-20	2020-21	2019-20	2020-21		
Neem cake	20	38.90 (38.56)	35.50 (36.54)	6.50 (14.77)	7.20 (15.56)	37.20 (37.58)	6.85 (15.20)
Mustard cake	20	42.60 (40.74)	40.20 (39.35)	5.80 (13.94)	6.70 (15.00)	41.40 (40.05)	6.25 (14.48)
Pyrite	02	48.00 (43.85)	45.30 (42.30)	5.30 (13.31)	5.05 (12.97)	46.65 (43.08)	5.17 (13.17)
Caster cake	20	52.40 (46.38)	50.50 (45.29)	5.20 (13.18)	4.80 (12.56)	51.45 (45.83)	5.00 (12.92)
Gypsum	02	55.10 (47.93)	54.30 (47.47)	4.30 (11.97)	4.80 (12.66)	54.70 (47.70)	4.55 (12.31)
Wheat straw	20	61.90 (51.88)	60.50 (51.06)	3.90 (11.39)	4.30 (11.97)	61.20 (51.47)	4.10 (11.68)
Paddy straw	20	65.30 (53.91)	63.30 (52.71)	3.70 (11.09)	3.90 (11.39)	64.30 (53.31)	3.80 (11.24)
Control		70.20 (56.91)	71.50 (57.73)	2.20 (8.53)	2.10 (8.33)	70.85 (57.32)	2.15 (8.43)
C.D. At 5%		(2.42)	(2.46)	(1.96)	(1.72)	(2.15)	(2.06)

\*Angular transformed value in parenthesis



the wilt of chickpea and green pea caused by, *Fusarium oxysporum* f. sp. *ciceri* and *Fusarium oxysporum* f. sp. *pisi* was effectively controlled by sowing the crop in October and November.

## CONCLUSION

Present study demonstrated that different agronomical practices can be used for protecting of huge losses wilt disease of chickpea caused by *Fusarium oxysporum* f. sp. *ciceri*. The minimum average disease incidence 13.27% with maximum

average yield 14.42 q/ha was found in 1<sup>st</sup> November of dates of sowing and maximum average disease incidence (31.00%) with minimum average yield (8.10q/ha.) was found in 1<sup>st</sup> October date of sowing. Among the Neem cakes was found significantly superior and show minimum average disease incidence 37.20 and respective yield 6.85 q/ha. Paddy straw was least effective soil amendments which shows maximum 65.30 and 63.30% disease incidence with yield 3.70 and 3.90 q/ha recorded in year 2019-20 and 2020-21 respectively.

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