Research Paper :

Effect of NPK fertilizers on chilli wilt caused by *Fusarium pallidoroseum* (Cooke) Sacc. at three different stages

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International Journal of Plant Protection, Vol. 4 No. 2 (October, 2011) : 256-259

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SUMMARY

The effect nitrogen, phosphorus and potassium on chilli wilt incidence was observed at three phenological stages *viz*., pre-flowering, 50 per cent flowering and final fruit picking. The wilt incidence showed significant increase with increase in levels of nitrogen. At pre-flowering stage, minimum wilt incidence (8.48 %) was observed when the crop was fertilized with 60 kg N ha^{-1}. At 50 per cent flowering and final fruit picking stages, a similar trend was observed. However, potassium fertilizers reduced the wilt incidence with increase in its levels. The minimum wilt incidence of 9.17 per cent was noticed with 90 kg K_2O ha^{-1}. A similar trend was observed at 50 per cent flowering and final fruit picking stages. Phosphorus application, however showed a slight effect on wilt incidence. At pre-flowering, minimum wilt incidence of 9.87-10.41 per cent was recorded on applying phosphorus @ 30-60 kg ha^{-1}.

Najar, A.G., Ganie, S.A., Ahmad, Mushtaq and Anjum, Qaisar (2011). Effect of NPK fertilizers on chilli wilt caused by *Fusarium pallidoroseum* (Cooke) Sacc. at three different stages. *Internat. J. Plant Protec.,* **4**(2):256-259.

Key words : Nitrogen, Phosphorus, Potassium, Chilli wilt , *Fusarium pallidoroseum*

Received : *February, 2011*
Revised : *May, 2011*
Accepted : *July, 2011*

Chilli (*Capsicum annuum* L.) is an important solanaceous vegetable crop grown for its unripe-green and ripe-red fruits. Of the many bottlenecks in increasing the fruit production, the occurrence of diseases such as damping of (*Pythium* spp.), leaf and fruit blight (*Phytophthora capsici*), leaf spots (*Alternaria solani*, *Cercospora capsici*) and wilt (*Fusarium* spp.) are note worthy and considerably reduce the yields (Anonymous, 1993). *Fusarium* is one of the common soils inhibiting plant pathogenic fungus. *Fusarium oxysporum* which causes wilt of pigeonpea, wilt of tomato, wilt of chickpea, wilt of guava and many other crops. Several other species of the fungus are responsible for causing huge losses to their respective hosts (Mehrotra and Aneja, 2003). Besides being the cause of wilt diseases, species this fungus are also found associated with seedling blight and damping off diseases (Agrios, 2006). The practice of mono-culture wilt susceptible cultivars of chilli and other solanaceous vegetables (Foster and Walker, 1947; Kapoor, 1988; Dar and Mir, 1995) together with such predisposing factors as frequent irrigation and excessive use of nitrogenous fertilizers (Foster and Walker, 1947; Matta and Garibaldi, 1972; Huber and Watson, 1974; Williams, 1979; Dar and Mir, 1995; Verma and Sharma, 1995) seem to have given fillip to the development and spread of the disease in the valley during the past few years.

MATERIALS AND METHODS

The effect of nitrogen, phosphorus and potassium fertilizers on chilli wilt incidence was studied in disease sick field. Three levels *viz*., 60, 90 and 120 kg of nitrogen and three levels *viz*., 30, 60 and 90 kg each of P_2O_5 and K_2O per ha were applied in the form of urea, diammonium phosphate and muriate of potash, respectively with three replications in a randomised block design (RBD). Half the dose of nitrogen and full doses of potassium and phosphorus fertilizers were applied as basal dose before transplanting the seeding of chilli cultivar local long at row to row and plant to plant spacing to 30 and 25 cms, respectively in the first week of June. The remaining half dose of nitrogen was applied 30 days after transplanting in each treatment. Observations on wilt incidence were recorded at pre-

flowering (35 days after transplanting), 50 per cent flowering and final fruit-picking stages of crop growth by counting the plants showing wilting out of the total number of plant examined.

$$\text{Wilt incidence (\%)} = \frac{\text{Number of plants wilted}}{\text{Number of plants examined}} \times 100$$

RESULTS AND DISCUSSION

The effect of three fertilizers on wilt incidence was observed at three phenological stages *viz*., pre-flowering, 50 per cent flowering and final fruit picking, of chilli cultivar local long. The data on the incidence recorded at pre-flowering stage (Table 1) indicated significant differences in per cent wilt incidence recorded in plots receiving different levels of all the three fertilizers. The wilt incidence showed significant increase with increase in levels of nitrogen. A minimum disease incidence of 8.48 per cent was observed when the crop was fertilized with 60kg nitrogen ha^{-1} (N_1) which increased to 10.41 and 12.49 per cent when the crop was fertilized, respectively, with 90 and 120 kg nitrogen ha^{-1}. Potassium fertilizer, however exhibited depressive effects on the wilt incidence reducing the disease with increase in its levels. The minimum incidence of 9.17 per cent was noticed in K_3 (90 kg K_2O ha^{-1}) followed by 10.41 per cent in K_2 (60 kg K_2O ha^{-1}). The maximum wilt incidence 11.80 per cent

Table 1 : Effect of nitrogen (N), phosphorus (P) and potassium (K) fertilizers on incidence of wilt (*Fusarium pallidoroseum*) of chilli cv. Local Long recorded at pre-flowering

Fertilizer level (kg ha^{-1})	Wilt incidence (%)* at fertilizer level						
	Phosphorus (P_2O_5 kg ha^{-1})			Mean	Potassium (K_2O kg ha^{-1})		
	30 (P_1)	60 (P_2)	90 (P_3)		30 (K_1)	60 (K_2)	90 (K_3)
Nitrogen (N)							
60 (N_1)	8.09 (16.52)	8.33 (16.76)	9.02 (17.47)	8.48 (16.93)	9.72 (18.17)	8.32 (16.76)	7.40 (15.79)
90 (N_2)	9.72 (18.17)	10.41 (18.82)	11.10 (19.46)	10.41 (18.82)	11.80 (20.09)	10.41 (18.82)	9.02 (17.47)
120 (N_3)	11.80 (20.68)	12.50 (20.70)	13.16 (21.27)	12.49 (20.69)	13.8 (21.87)	12.47 (20.68)	11.11 (19.47)
Mean	9.87 (18.31)	10.41 (18.82)	11.10 (19.46	10.46 (18.87)			
Potassium (K_2O)							
30 (K_1)	11.11 (19.46)	11.80 (20.09)	12.50 (20.67)	11.80 (20.09)			
60 (K_2)	9.71 (18.16)	10.41 (18.82)	11.08 (19.44)	10.41 (18.82)			
120 (K_3)	8.79 (17.25)	9.02 (17.47)	9.71 (18.14)	9.17 (17.62)			
	N	P	K				
S.E.±	0.21	0.21	0.21				
C.D. (P = 0.05)	0.58	0.58	0.58				

* Mean of three replications; figures in parentheses are angular transformed values; all interactions were non-significant

Table 2 : Effect of nitrogen (N), phosphorus (P) and potassium (K) fertilizers on incidence of wilt (*Fusarium pallidoroseum*) of chilli cv. Local Long recorded at 50 per cent flowering stage

Fertilizer level (kg ha^{-1})	Wilt incidence (%)* at fertilizer level						
	Phosphorus (P_2O_5 kg ha^{-1})			Mean	Potassium (K_2O kg ha^{-1})		
	30 (P_1)	60 (P_2)	90 (P_3)		30 (K_1)	60 (K_2)	90 (K_3)
Nitrogen (N)							
60 (N_1)	31.94 (34.41)	32.63 (34.83)	33.33 (35.26)	32.63 (34.83)	34.02 (35.68)	32.64 (34.84)	31.25 (33.98)
90 (N_2)	34.02 (35.68)	34.72 (36.10)	35.65 (36.66)	34.79 (36.15)	36.11 (36.93)	34.72 (36.20)	33.56 (35.40)
120 (N_3)	36.81 (37.34)	37.96 (38.4)	38.19 (38.16)	37.65 (37.98)	38.89 (38.57)	37.50 (37.76)	36.57 (37.62)
Mean	34.24 (35.81)	35.10 (36.33)	35.72 (35.69)	35.02 (36.27)			
Potassium (K_2O)							
30 (K_1)	35.61 (36.65)	36.33 (37.07)	37.03 (37.4)	36.34 (37.07)			
60 (K_2)	34.25 (35.81)	34.95 (36.23)	35.34 (36.65)	34.95 (36.23)			
120 (K_3)	32.87 (34.97)	34.02 (35.68)	34.49 (35.95)	33.79 (35.53)			
	N	P	K				
S.E.±	0.24	0.24	0.24				
C.D. (P = 0.05)	0.48	0.48	0.48				

* Mean of three replications; figures in parentheses are angular transformed values; all interactions were non-significant

Table 3 : Effect of nitrogen (N), phosphorus (P) and potassium (K) fertilizers on incidence of wilt (*Fusarium pallidoroseum*) of chilli cv. Local Long recorded at final fruit picking stage

Fertilizer level (kg ha^{-1})	Wilt incidence (%)* at fertilizer level						
	Phosphorus (P_2O_5 kg ha^{-1})			Mean	Potassium (K_2O kg ha^{-1})		
	30 (P_1)	60 (P_2)	90 (P_3)		30 (K_1)	60 (K_2)	90 (K_3)
Nitrogen (N)							
60 (N_1)	63.42 (52.79)	64.12 (53.20)	64.81 (53.90)	64.12 (53.29)	65.28 (53.90)	63.88 (53.06)	63.19 (52.93)
90 (N_2)	64.81 (53.62)	66.20 (54.46)	66.67 (54.74)	65.89 (54.27)	67.13 (55.02)	65.74 (54.18)	64.81 (53.62)
120 (N_3)	67.59 (55.30)	68.29 (55.73)	68.99 (56.16)	68.29 (55.73)	69.45 (56.46)	68.06 (55.59)	67.36 (55.31)
Mean	65.28 (53.90)	66.20 (54.45)	66.82 (54.83)	66.10 (54.39)			
Potassium (K_2O)							
30 (K_1)	66.67 (54.74)	67.36 (55.16)	67.82 (55.44)	67.28 (55.11)			
60 (K_2)	65.04 (53.76)	65.97 (54.31)	66.67 (54.74)	65.89 (54.27)			
120 (K_3)	64.12 (53.21)	65.27 (53.89)	65.97 (54.31)	65.12 (53.80)			
	N	P	K				
S.E.±	0.25	0.25	0.25				
C.D. (P = 0.05)	0.48	0.48	0.48				

* Mean of three replications; figures in parentheses are angular transformed values; all interactions were non-significant

was recorded when only 30kg of K_2O ha^{-1} (K_1) were applied. Phosphorus application, however showed a slight effect on wilt incidence. Minimum wilt incidence of 9.87-10.41 per cent was recorded on applying phosphorus fertilizer @ 30-60. There did not, however, exist any interaction between nitrogen and phosphorus, nitrogen and potassium and phosphorus and potassium with regard to their effects on wilt incidence (Table 1).

The data recorded at 50 per cent flowering stage (Table 2) showed a similar trend. All the fertilizers applied at different levels significantly influenced the per cent wilt incidence. No significant interactions between different fertilizer levels were observed at this stage as well. The disease recorded at final fruit picking stage of crop growth again indicated significant effects of all the three tested fertilizers. The wilt incidence of 64.12 per cent observed at the lowest nitrogen application level of 60 kg ha^{-1} (Table 3). Similarly the wilt incidence increased with increase in level of phosphorus. However, the increase in potassium fertilizer levels resulted in corresponding decrease in wilt incidence. There was no significant interaction between nitrogen x phosphorus, nitrogen x potassium and phosphorus x potassium. The increased severity of soil borne diseases by application of higher doses of nitrogenous fertilizers has also been observed by other researchers (Weinke, 1962; Kiraly, 1976; Schneider, 1985; Singh *et al.*, 1989; Dwivedi *et al.*, 1990). The slight increase in disease incidence following P_2O_5 application in soil, as observed during the present investigation, is in agreement with the findings of Woltz and Jones (1981) who reported increased severity of Fusarium wilt of tomato with higher levels of phosphorus. Kannaiyan and Prasad (1974), Schneider (1985) and Gandhi *et al.* (1974) also reported reduced wilt incidence following increased K_2O fertilizer.

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