Effect of chemical management against Wilt disease of vegetable pea caused by *Fusarium oxysporum* f.sp. *pisi*

SHRAWAN KUMAR, M.R. DABBAS, OMITA MISHRA AND SANJIV KR. SINGH

J. Mycopathol, Res, 54(1) : 77-80, 2016;
ISSN 0971-3719

Department of Botany,
University of Calcutta,
Kolkata 700 019, India

J. Mycopathol. Res. ***54(1)*** *: 77-80, 2016;* (ISSN 0971-3719)

Effect of chemical management against Wilt disease of vegetable pea caused by *Fusarium oxysporum* f.sp. *pisi*

SHRAWAN KUMAR[1], M.R. DABBAS[1], OMITA MISHRA[2] AND SANJIV KR. SINGH[1]
[1]Vegetable Section, C.S. Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh
[2]Crop Protection Division, Indian Institute of Pulses Research, Kanpur, Uttar Pradesh

Received : 03.07.2015 RMS Accepted : 05.10.2015 Published : 25.04.2016

Under laboratory conditions, out of 14 fungicides, only six fungicides *viz.,* propiconazole (100%), copper oxychloride (100%), bavistin (100%), mancozeb (100%), SAAF (100%) and tebuconazole (100%) proved to be the most effective as they have inhibited the fungal growth of *Fusarium oxysporum* f.sp. *pisi* and was found to be as the most effective fungicides. In glass house condition, among the fungicides were further tested as seed dresser by their efficacy in pot experiment. The six fungicides tried, bavistin (0.2%) found most effective against Fusarium wilt (90.07% disease control) with maximum seed germination (97.43%), as well as minimum wilt incidence (7.76%) and maximum yield (535.00 g/pot green pods). Further, next best effective fungicides were Copper oxychloride (0.2%) and tebuconazole (0.2%) which were statistically as par in case of disease intensity, but not in disease incidence and grain yield.

Key words: Fusarium wilt, vegetable pea, *Fusarium oxysporum* f.sp. *pisi,* fungicides

INTRODUCTION

Pulses are the unique crops for three reasons *i.e.* they have capability to fix atmospheric nitrogen in symbiotic association with root nodule bacterium (*Rhizobium*), pulses are versatile crops to fit in diverse cropping systems and grown during *rabi* season. Pea belongs to the family Leguminosae, sub family Papilionaceae and genus *Pisum. Pisum sativum* sp. *hortense* L. popularly known as garden pea with local name as Matar is one of the most important pulse used as vegetable and canning purpose (Fageria *et al,* 2006). Pea is the second most important food legume in the world after pigeonpea. Pea is grown mainly as a *rabi* crop, sown in October to November and harvested in February to March. The major pea growing states in India are Uttar Pradesh, Bihar, Haryana, Punjab, Himachal Pradesh, Odisha, West Bengal and Karnataka which together share of Uttar Pradesh and Jharkhand as much as 55.0% of the total area during 2012-13. Uttar Pradesh ranks first, with 46.9% and Jharkhand 8.9% share in the production of the country (NHB, 2013). In India, total area under pea cultivation is about 420.9 thousand ha with the production of 4006.2 thousand mt and productivity 9.5 mt ha^{-1}. In Uttar Pradesh, total area under pea crops is about 175.01 thousand ha with production 1877.93 thousand mt. and productivity

[1]E-mail : shrawankumarsingh07@gmail.com

10.7 mt ha--1 (NHB, 2013). To this effect selection of resistant varieties against devastating diseases such pea root rot caused by *Aphanomyces euteches*, Fusarum wilt, Downy and Powdery mildews virus and insects (Muehlbauar, 1991). Among the fungal diseases wilt (*Fusarium oxysporum* f. sp. *pisi)*, downy mildew (*Peronospora pisi*), powdery mildew (*Erysiphe polygoni*) and rust (*Uromyces fabae*) are important diseases.

MATERIALS AND METHODS

Present investigation was carried put during 2009-10. Laboratory experiment was carried out at the Department of Plant Pathology, C.S.A. University of Agriculture and Technology, Kanpur. *Fusarium oxysporum* f.sp.*pisi* (*F.o.* f.sp. *pisi*) affected samples were collected during the year 2009-10 from different pea growing regions of Uttar Pradesh. The efficacy of fungicides (0.2%) was tested against *F.o.* f.sp. *pisi* for radial growth and inhibition on the Potato dextrose agar medium using *in-vitro* and glass house condition.

Efficacy of various fungicides against F.o. f.sp. pisi

Fourteen fungicides viz., propiconozole (0.1%), copper oxychloride (0.3%), bavistin (0.2%), mancozeb (0.2%), SAAF (0.2%), propanil (0.1%), tebuconazole (0.1%), blitox-50 (0.2%), vitavax (0.2%), Indofil M-45 (0.2%), thiram (0.2%), captan (0.2%), hexaconozole (0.1%) and tricyclazole (0.1%) were assessed for their efficacy against *Fusarium oxysporum* f.sp. *pisi* through laboratory bio-assay using poison food technique (Schmitz, 1930). Requisite quantities of fungicides were incorporated in 2% potato dextrose agar medium, which was shaken well to make it homogenous. The medium was then poured into 90 mm Petriplates. The experiment was conducted in Completely Randomized Block Design (CRD) with four replications and suitable control was also maintained without adding any fungicide in the Petriplates. A circular disc of 5 mm diameter was taken from 7 days old culture of the pathogen, cut by sterilized cork borer and place in the centre of each petri-plates containing solidified fungicide mixed medium and control without any fungicides. After inoculation the petri-plates were incubated at 25±1^{O}C for 15 days. The radial growth of the fungal colony was assessed by measuring the growth of the colony diameter in mm and interpreted in per cent inhibition over control by following formula:-

$$\text{Per cent inhibition} = \frac{\text{Colony diameter (mm) in check} - \text{Colony Diameter (mm) in treatment}}{\text{Colony diameter (mm) in check}} \times 100$$

Seed treatment with fungicides sown in pots under glass house condition

All fungicides *viz.,* bavistin (0.2%), copper oxychloride (0.2%), SAAF (0.2%), propiconozole (0.1%), tebuconazole (0.1%) and mancozeb (0.2%) found effective in bioassay test were used for seed treatment. The experiment was also conducted in pots under glass house conditions with same sets of treatments for two crop seasons of 2009-10 and 2010-11, fifteen treated seeds were sown in each pot filled with *Fusarium oxysporum* f.sp. *pisi* at the rate of 5% weight of the soil. The experiment was laid out in CRD with four replications. The observation on the seed germination, seedling emergence and wilt incidence was recorded. Wilt incidence was calculated using following formula:-

$$\text{Disease incidence \%} = \frac{\text{Total number of wilted plant/pot}}{\text{Total plant population/pot}} \times 100$$

RESULTS AND DISCUSSION

Efficacy of various fungicides against F.o. f.sp. pisi

The radial growth of the fungus in various treatments was measured and the average diameter of the colony in each Petri-plate was calculated for each treatment and results are presented in Table1 and found significantly superior over control. However, among the 14 fungicides, only six fungicides *viz.,* propiconazole (100%), copper oxychloride (100%), bavistin (100%), mancozeb (100%), SAAF (100%) and tebuconazole (100%) proved to be the most effective as they have inhibited the fungus growth completely, whereas Propanil (96.66%), Blitox – 50 (95.00%) and Vitavax (92.22%) were found the next best in inhibiting the growth of the pathogen. Tricyclozole (72.78%) and hexaconazole (66.66%) were found least effective against *F. o.* f.sp. *pisi.* The present findings are in agrement to the opinious of Verma and Dohroo (2002); Maheswari *et al*., (2008)and Khan *et al,* (2011).

Evaluation of seed treatment with fungicides in pots under glass house conditions

All the six fungicides tested under glass house

Table 1 : Effect of fungicides on the colony growth of *Fusarium oxysporum* f. sp. *pisi (in-vitro)*

Fungicides	Doses %	Average diameter of fungal colony (mm)	Per cent Inhibition
Propiconazole	0.2	00	100
Copper oxychloride	0.2	00	100
Bavistin	0.2	00	100
Mancozeb	0.2	00	100
SAAF	0.2	00	100
Tebuconazole	0.2	00	100
Propanil	0.2	2.0	96.66
Blitox – 50	0.2	3.0	95.00
Vitavax	0.2	4.67	92.22
Captan	0.2	8.00	86.66
Thiram	0.2	9.67	83.88
Indofil M-45	0.2	11.0	81.66
Hexaconozole	0.2	16.33	72.78
Tricyclozole	0.2	20.00	66.66
Control	0.2	60.00	--
CD at 5%		1.784	
SEm ±		0.615	

par in case of disease intensity, but not in disease incidence and grain yield. However, least effective fungicide was mancozeb (0.2%) with minimum seed germination (82.78%) as well as maximum wilt incidence (36.66%) and minimum yield (290.00g/pot green pods) of vegetable pea, followed by propiconozole (0.1%) and SAAF (0.2%). Similar results have also been reported by Sumitha and Gaikwad (1995); Maheswari *et al and* (2008) and Khan *et al,* (2011).

Fusarium oxysporum f. sp. *pisi* causal agent of vegetable pea wilt is one of the major diseases of vegetable pea in India, results in huge economic losses. As the disease is seed borne and persist for long years in soil, management of disease by single approaches will be difficult and uneconomi-

Table 2 : Effect of seed treatment with fungicides on seed germination, seedling emergence and wilt incidence in pots under glass house conditions

Fungicide	Doses (%)	Seed germination (%)		Mean	Wilt incidence (%)		Mean	Disease control %		Mean	Yield g/pot (Green Pods)		Mean
		2009-10	2010-11		2009-10	2010-11		2009-10	2010-11		2009-10	2010-11	
Bavistin	0.2	98.50 (83.16)	96.35 (79.23)	97.43	8.86 (17.30)	6.66 (14.94)	7.76	88.18	91.96	90.07	520.00	550.00	535.00
Copper oxychloride	0.3	97.00 (80.28)	91.00 (72.57)	94.00	10.00 (18.37)	11.06 (19.36)	10.53	86.66	86.64	86.65	473.33	440.67	304.67
Tebuconazole	0.1	95.00 (77.08)	87.53 (69.33)	91.26	13.47 (21.52)	13.96 (21.69)	13.72	81.68	83.16	82.42	468.33	430.00	449.16
SAAF	0.2	90.75 (72.29)	85.65 (67.74)	88.20	16.64 (23.83)	19.61 (26.20)	18.12	77.81	76.32	77.06	448.33	413.33	430.83
Propiconozole	0.1	86.66 (68.87)	83.83 (66.28)	85.24	17.92 (25.03)	21.01 (27.12)	19.46	76.10	74.63	75.36	393.33	380.66	386.99
Mancozeb	0.2	83.33 (65.99)	82.23 (65.06)	82.78	40.00 (39.21)	33.33 (35.24)	36.66	46.66	59.76	53.21	230.00	350.00	290.00
Control	-	80.00 (63.74)	77.73 (61.83)	78.86	75.00 (60.26)	81.84 (64.77)	78.42				173.33	91.66	132.49
CD (0.05 %)		4.993	2.624		3.576	3.787					27.166	25.672	
SEm ±		1.686	0.886		1.208	1.279					9.175	8.671	

(Figure in parenthesis shows angular value)

conditions reduced the disease incidence and gave better grain yield as compared to control (Table 2). The fungicides were further tested as seed dresser by their efficacy in pots experiment as per procedure described earlier. The six fungicides tried Bavistin (0.2%) found most effective against fusarium wilt (90.07% disease control) with maximum seed germination (97.43%), as well as minimum wilt incidence (7.76%) and maximum yield (535.00 g/pot green pods) (Table 2). Further, next best effective fungicides were copper oxychloride (0.3%) and tebuconazole (0.1%) which were statistically at cal. The results of present finding will help to tackle the disease of chemical (fungicides) management.

REFERENCES

Fageria, M.S., Chaudhary, B.R. and Dhaka, R.S. 2006. Vegetable crops, production technology. *Kalyani Publication*, New Delhi, **2**: 126-136.

National Horticulture Board 2013. Indian Horticulture Database. *Ministry of Agriculture, Government of India,* Gurgaon. 169-176.

Khan, Anis, Alli, Mohd., Singh, Pradeep Kumar and Srivastava, A.S. 2011. *In-vitro* test of fungicides, bio agents and botanicals against *Fusarium oxysporum* f.sp. *pisi.* Zonal Symposium (Mid–Eastern) IPS, "*Sustainable Crop Protection in Changing Agriculture Scenario"* November 18-19th 2011. pp. 61.

Maheshwari, S.K., Nazir, A. Bhat, Masoodi, S.D. and Beig, M.A. 2008. Chemical control of lentil wilt caused by *Fusarium oxysporum* f. sp. *lentis. Ann. Pl. Protect. Sci.,* **16**: 419-421.

Muehlbauer, F. J., 1991. Incorporation of useful characters from germplasm resources into cultivars of food legumes. *Legume genetic resources for semi arid temperate environments Proceedings of an international workshop*, Cairo, Egypt., 363-393.

Schmitz, H., 1930. Poisoned Food Technique. 2nd Edn., Industry of Engineering Chemical, London, USA, pp. 333-361.

Sumitha, R. and Gaikwad, S.J. 1995. Efficacy of some fungicides against *Fusarium udum* in pigeonpea. *J. Soils and Crops,* **5**: 137-140.

Vavilov, N.I. 1949-50. Origin, variation immunity and breeding of cultivated plant (Translated by K.S. Chester) *Chronic Botanical.*, **13:** 1-6.

Verma, S. and Dohroo, N.P. 2002. Evaluation of fungicides against *Fusarium oxysporum* f. sp*. pisi* causing wilt of autumn pea in Himachal Pradesh. *Plant Disease Research,* **17:** 261-268.