INTERNATIONAL JOURNAL OF APPLIED BIOLOGY AND PHARMACEUTICAL TECHNOLOGY

www.ijabpt.com Volume-5, Issue-4, Oct-Dec-2014 Coden : IJABPT Copyrights@2014

ISSN : 0976-4550

Received: 25th July-2014 *Revised: 6th Sept-2014* *Accepted: 7th Sept-2014*

Research article

EFFICACY OF DIFFERENT INORGANIC MOLECULES ON WILT PATHOGEN OF CHICKPEA

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ABSTRACT: Chickpea (*Cicer arietinum* L.) is one of the most important legumes grown in Asia. Though the area under this crop is more, the average yield per hectare is low because of several biotic and abiotic factors. Among them, the wilt caused by *Fusarium oxysporum* f.sp. *ciceri* is most destructive seed and soil borne disease. (Haware *et al.*, 1986) which threatens successful cultivation of chickpea and causes severe losses in chickpea growing areas. (Grewal *et al.*,1974b and Singh *et al.*,1977.) Different insecticides and herbicides were tried under *in vitro,* the insecticides Emamectin benzoate 5% SG, Imidachloprid 75% WP, Quinalphos 25% EC, Entrust 80% WP were used in three different concentrations. Among these highest per cent growth of inhibition of *Fusarium oxysporum* f.sp. *ciceri* was observed in Imidacloprid 0.3g (50.92%) followed by Emamectin benzoate 0.05 mg (35.55%). The herbicides *viz.*, Pendimethalin 30%EC, Imazathaphyr 10% SL, 2,4-D sodium salt 80%WP, Metsulfuron methyl 20% WG were used in three different concentrations, highest per cent growth of inhibition of *Fusarium oxysporum* f.sp. *ciceri* was observed in Pendimethalin 0.5ml (73.33%), followed by Pendimethalin 0.4ml (65.55%).
Key words: Chick pea, *Fusarium oxysporum* f.sp. *ciceri*, wilt, *Invitro*, insecticides, herbicides.

INTRODUCTION

Among various pulses crops, chickpea (*Cicer arietinum* L.) is considered as one of the oldest one cultivated in Asia. Like many other crops, pulses, especially chickpea have also been reported to suffer sever yield losses due to various insect pests and diseases. Among different diseases, fungi especially, the wilt caused by species of *Fusarium* remains to be a challenging task in terms of management since it is soil- borne in nature (Agrios, 2000; Butler, 1918; Singh *et al.*, 1986). Various disease management methods have been implemented to combat and eradicate pathogenic fungi. These include cultural, regulatory, physical, chemical and biological methods. All these methods are effective only when employed well in advance as precautionary measure (Kata, 2000; Sharma, 1996). Once a disease has appeared, these methods become impractical / ineffective. In that situation, chemical control offers a good choice to grower to control the disease. Chemical pesticides have been in use since long and they provide quick, effective and economic management of plant diseases. Hence, a study was initiated to investigate the efficacy of certain inorganic molecules such as insecticides and herbicides used against *F. oxysporum* f.sp. *ciceri* under laboratory conditions.

MATERIAL AND METHODS

The following materials were used during the present investigations.

Insecticides and herbicides: Insecticides *viz.*, Emamectin benzoate 5% SG, Imidachloprid 75% WP, Quinalphos 25% EC, Entrust 80% WP and herbicides *viz.*, Pendimethalin 30%EC, Imazathaphyr 10% SL, 2,4-D sodium salt 80%WP, Metsulfuron methyl 20% WG were collected from department of entomology and agronomy, Dr.PDKV,Akola

In vitro assay of insecticides and herbicides against *Fusarium oxysporum* f.sp *ciceri*

The effect of four insecticides and four herbicides was evaluated *in vitro* against *Fusarium oxysporum* f .sp *ciceri* by employing "Poison Food Technique". The requsite amount of each insecticide and herbicide based on active ingradient was added to an autoclaved potato dextrose agar to obtain the desired concentrations. The same medium without the insecticide and herbicide served as control.

The medium was poured into 90mm petriplates in 3 replicates and after solidification, each plate was inoculated with a 6mm mycelial disc of test fungus. The inoculated petriplates were incubated for 7 days at 27±2^{0}C. After incubation, radial growth was measured. Per cent inhibition in growth was calculated from the mean diameter after the days when petriplates in control were fully covered with mycelial growth of pathogen as per following formula.

Per cent inhibition = $C - T / C$ x 100

Where

C=Growth of test fungus in control in mm.

T=Growth of test fungus in treatment in mm.

RESULT AND DISCUSSION

The data presented in Table 1 showed that highest per cent growth of inhibition of *Fusarium oxysporum* f.sp. *ciceri* was observed in Imidacloprid 0.3g (50.92%) followed by Emamectin benzoate 0.05 mg (35.55). The lowest per cent growth inhibition was observed in Quinalphos 0.1ml (12.96%). These findings are in conformity with Cowley *et al.* (1970) showed that carbaryl at 20 µg/ml inhibited the growth of the *Fusarium oxysporum* by 37 to 44% by adding the insecticides in Czapek nutrient media containing seventeen fungal species from Wisconsin prairie soils. Dwivedi and Pathak (1981) studied the effect of different insecticides on the growth of *Fusarium oxysporum* f.sp. *lycopersici* and found that BHC incorporated in sick soil reduces the population of the pathogen in contrast to this Nuvacron increases the population of pathogen. Michael and Fawole (2009) showed the effect of insecticide *viz.*, Karate against *Fusarium oxysporum* at the rate of 0, 100, 200,400 and 500 mg/L in potato dextrose media and incubated at 30^{0}C for 5 days found significant reduction of mycelial weight of *Fusarium oxysporum* irrespective of the rate applied. Houshyiar and Darvish (2011) investigate the possibility of an interaction between two systemic insecticides Thiodicarb and Imidachloprid against *Rhizoctonia solani* and *Fusarium moniliforme* in cotton and found that Imidachloprid inhibit the mycelial growth of *Fusarium moniliforme* by 70.8%.

Table 1: Efficacy of insecticides on growth of *Fusarium oxysporum* f.sp. *ciceri*

Insecticides	Treatments	Mean colony diameter (mm)	Per cent growth inhibition (%)
Emamectin benzoate 5% SG	0.03mg	62.67	30.36
	0.04mg	59.33	34.07
	0.05mg	58..00	35.55
Imidachloprid 75% WP	0.1g	58.33	35.18
	0.2g	54.33	39.63
	0.3g	44.17	50.92
Quinalphos 25% EC	0.1ml	78.33	12.96
	0.2ml	74.17	17.58
	0.3ml	69.67	22.58
Entrust 80% WP	0.02ml	77.33	14.07
	0.03ml	74.33	17.41
	0.035ml	72.00	20.00
	Control	90.00	0
F test		Sig.	
SE(m)±		0.22	
CD(P=0.01)		0.89	

The data presented in Table 2 showed that highest per cent growth of inhibition of *Fusarium oxysporum* f.sp. *ciceri* was observed in Pendimethalin 0.5ml (73.33%), followed by Pendimethalin 0.4ml (65.55%). The lowest growth inhibition was observed in Imazathapyr 0.1ml (20.18%). The results recorded in present studies are found in consences with Richardson (1958) showed that soils treated with 2,4 D affected wilt development in a susceptible and a resistant variety in different ways according to time of application.

Michael *et al.* (2009) showed the *in vitro* effect of herbicide Galex against *Fusarium oxysporum* at the rate of 0, 100, 200,400 and 500 mg/L in potato dextrose media and incubated at 30^0C for 5 days and the significant reduction of mycelial weight of *Fusarium oxysporum* was observed at 500mg/L. Ceballos *et al.* (2011) tested some herbicides such as MCPA, 2,4-DB, flumetsulam, bentazon, and haloxyfop-methyl, against *Fusarium oxysporum* and observed that the herbicide Bentazon exhibited the strongest inhibitory effect on the pathogen development by the application of field recommended rate.Overall Insecticide Imidachloprid showed maximum growth inhibition, among herbicides pendimethalin is effective.

Table 2: Efficacy of herbicides on growth of *Fusarium oxysporum* f.sp. *ciceri*

Herbicides	Treatments	Mean colony diameter (mm)	Per cent growth inhibition (%)
Pendimethalin 30%EC	0.3ml	41.33	54.07
	0.4ml	31.00	65.55
	0.5ml	24.00	73.33
Imazathaphyr 10% SL	0.1ml	71.83	20.18
	0.2ml	70.33	21.85
	0.3ml	68.67	23.70
2,4-D sodium salt 80%WP	0.2mg	61.50	31.66
	0.3mg	59.50	33.88
	0.4mg	48.50	46.11
Metsulfuron methyl 20% WG	0.03mg	70.17	22.03
	0.04mg	68.33	24.07
	0.05mg	65.33	27.41
	Control	90.00	0
F test		Sig.	
SE(m)±		0.35	
CD(P=0.01)		1.40	

ACKNOWLEDGEMENT

I feel immense pleasure in taking this opportunity of expressing my profound, humble indebtedness and deepest sense of gratitude and thanks to my chairmen student advisory committee Dr. S.S. Mane, Professor & Head Depatment of Plant Pathology, Post Graduate Institute, Dr. P.D.K.V., Akola for his valuable guidance, and constructive criticism, right from selection of research problem up to final shaping of the thesis in the present form.

It is my proud privilege to express my deep sense of gratitude towards members of my advisory committee, Dr. G.K. Giri, Associate professor, Department of Plant Pathology, Dr. U. P. Barkhade, Professor and Head, Department of Entomology, Dr. P. D. K.V. Akola, Dr. A.N.Patil, Senior Research Scientist Pulses, AICRP in pulses Dr. P.D.K.V. Akola for their intellectual stimulation, Kind suggestions and comments during investigation.

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