Journal of Global Biosciences
ISSN 2320-1355
Volume 4, Number 8, 2015, pp. 3154-3157
Website: www.mutagens.co.in
E-mail: submit@mutagens.co.in
researchsubmission@hotmail.com

Research Paper

EFFICACY OF ENTOMOPATHOGENIC FUNGI AGAINST GRAM POD BORER, *Helicoverpa armigera* (HUB.) ON CHICKPEA

Savita. P. Adsure and Pandurang B. Mohite

Department of Entomology,
College of Agriculture, Kolhapur. MPKV, Rahuri.

Abstract

The effectiveness of entomopathogenic fungi *Metarhizium anisopliae, Beauveria bassiana, Nomuraea rileyi* with concentration 1x10^{9} to 1x10^{10} conidia ml^{-1} for each fungi were evaluated against *Helicoverpa armigera* (Hub.) infestation on chickpea under field conditions during 2009-10. *Metarhizium anisopliae* was found most effective entomopathogenic fungi at 1x10^{10} conidia ml^{-1} was found minimum surviving larval population 1.10 larvae and pod damage 9.50 per cent and also higher yield 14.50 q/ha.

Key words: *Helicoverpa armigera, Metarhizium anisopliae, Beauveria bassiana, Nomuraea rileyi*.

INTRODUCTION

Chickpea, *Cicer arientinum* Linn. is constitutes as world's third most important pulse crop and India contributes 80 per cent of the total world's production. Due to its richness in proteins and amino acids, it plays vital role in vegetarian diet. Southern and central part of India one of the major constrains for lower yield of crop is the damage caused by the pod borer, *Helicoverpa armigera* (Hub.) right from vegetative to podding stage. Under natural condition, fungi are frequent and often important natural mortality factor in all groups of insect populations. Over 700 species of fungi have been recorded as pathogens while most species are obligate pathogens offen quite specific and rarely found (Ramarethinam *et al.* 2005). The entomopathogenic fungi have been found promising in control of insect pests; (Lingappa *et al*. 2005) some of the important entomopathogenic fungi genera are *Metarhizium anisopliae* (Mets chnikoff)
Sorokin, *Beauveria bassiana* (Balsamo) Vuillrmin, *Nomuraea rileyi* (Farlow) Samson.

The mycoinsecticides based on deuteromycetous fungi such as *Metarhizium anisopliae* (Agarwal,1990), *Beauveria bassiana* (Sandhu et al. 2001), *Nomuraea rileyi* (Tang et al.1999) have been reported to useful to control insect pest. In the present study, entomopathogenic fungi have been used to determine their effectiveness in control of *Helicoverpa armigera* (Hub.) in gram field.

MATERIAL AND METHODS

The field evaluation of three different fungi to control *H. armigera* infestation on gram (*Cicer orientinum* L.) was carried out in randomized block design with three replications during the rabi season, 2009-2010 at farmers field in Chandre village, Tal. Radhanagari, Dist. Kolhapur. The crop was sown as intercrop in sugarcane during second fortnight of october and was raised by following all normal agronomical practices except plant protection measures. Spores of *M.*

anisopliae, B. bassiana were obtained from Biocontrol laboratory, M.P.K.V. Rahuri and *N. rileyi* from Agril. Research Station, Digraj, Tal- Miraj, Dist-Sangli and cultured in laboratory by adopting recommended procedure. Fungal concentrations were prepared by serial dilutions. The above formulated product spray at the rate of 4 gm per lit of different treatment. The formulation of conidia was sprayed with the knapsack sprayer.

Observations

A. Assessment of Larval Population

Five plants per plot were selected randomly and were tagged for recording observations. The pre count and post larval count were recorded a day before treatment and three, seven, and ten days after the application of the treatment. Efficacy of different fungi at different concentration were calculated on the basis of surviving larval populations per plant after the treatment. The data on surviving larval population of larvae were subjected to square root transformation ($\sqrt{x+0.5}$) and then subjected to statistical analysis. At harvest, the observations on damaged healthy pod and yield were recorded and the per cent pod damage was calculated.

B. Assessment of Pod Damage and Yield

Pod damage

Pod damage was taken at the time of harvesting, total number of pods and number of damaged pods was taken and per cent pod damage was worked by using following formula.

$$\text{Per cent Pod damage } = \frac{\text{Number of affected pods/plant}}{\text{Total number of pods/plant}} \text{ X } 100$$

Yield

The yield obtained in individual treatment of chickpea crop was recorded separately for assessing the efficacy of different treatments. Data of yield Kg/plot was converted into q ha^{-1} and it was subjected to analysis of variance.

RESULTS AND DISCUSSION

Pretreatment of larval population of *Helicoverpa armigera* was found nonsignificant indicating uniform population of *H. armigera*. A sharp decline in the larval population density of *H. armigera* was noted three day after the application of each spray compared to untreated control. In the field conditions different doses of conidial concentration ranging from each $1x10^9$ to $1x10^{10}$ conidia ml^{-1} were used against third instar larvae of *H. armigera* out of these fungi *M. anisopliae* with $1x10^{10}$ conidia ml^{-1} concentration recorded surviving larval population was 1.2 per plant, *M. anisopliae* with $1x10^9$ conidia ml^{-1} (2.03 larvae/plant), *B. bassiana* with $1x10^{10}$ conidia ml^{-1} (3.10 larvae/plant), *N. rileyi* with concentration $1x10^{10}$ (3.15 larvae/plant), *B. bassiana* with $1x10^9$ (3.20 larvae/plant) and highest surviving population of larvae in *N. rileyi* with $1x10^9$ conidia ml^{-1} (3.50 larvae/plant) was observed at 10 days after first spraying. In after second spraying lowest surviving population was observed at 10 days after spraying in treatment with *M. anisopliae* with $1x10^{10}$ conidia ml^{-1} concentration (1.10 larvae/plant), followed after *M. anisopliae* with $1x10^9$ conidia ml^{-1} (1.50 larvae/plant), *B. bassiana* with $1x10^{10}$ conidia ml^{-1} (1.80 larvae/plant), *N. rileyi* with concentration $1x10^{10}$ (2.10 larvae/plant), *B. bassiana* with $1x10^9$ (2.30 larvae/plant) and highest surviving population of larvae in *N. rileyi* with $1x10^9$ conidia ml^{-1} (2.50 larvae/plant).

Results indicated that *M. anisopliae* with $1x10^{10}$ conidia ml^{-1} concentration was the most promising treatment against the *H. armigera* recorded least pod damage (9.50 per cent) which was at par with treatment *M. anisopliae* with $1x10^9$ conidia ml^{-1} concentration recorded 11.83 per cent pod damage. The next best treatment was *B. bassiana* with $1x10^{10}$ conidia ml^{-1} concentration (14.11 per cent) which was at par with *N. rileyi* with concentration $1x10^{10}$ (16.00 per cent) and *B. bassiana* with $1x10^9$ (19.50 per cent) .The least effective treatment was *N. rileyi* with $1x10^9$ conidia ml^{-1} concentration recorded 19.50 per cent pod damage.

The performance of the treatments resulted in effective control of *H. armigera* was also reflected in the yield of Chickpea. The highest yield was observed in the treatment with *M. anisopliae* with $1x10^{10}$ conidia ml^{-1} recorded 14.15 q/ha. The treatment with *M. anisopliae* with $1x10^{9}$ conidia ml^{-1} recorded 13.00 q/ha the next higher yield which was at par with treatment yield *B. bassiana* with $1x10^{10}$ (12.50/ha), *N. rileyi* with $1x10^{10}$ (10.16 q/ha). The yield recorded in remaining treatment *B. bassiana* with $1x10^{9}$ concentration (10.00 q/ha) which was at par with treatment *N. rileyi* with $1x10^{9}$ conidia ml^{-1} concentration (9.76 q/ha).

In present investigation *M. anisopliae* was found very effective than *B. bassiana* and *N. rileyi*. Present finding are in agreement with Zhao-Jung sheng *et al.* (1990) who reported that effectiveness of *M. anisopliae* against *H. armigera, Plutella xylostella* and *Pieris rapae* and Padmaja and Kaur (2001) against *Cnaphalocrosis medinalis* (Guence). Similar observations were also reported by Nahar *et al*. (2004) and Harsoliya *et al*. (2007). Where as the pathogenicity of *B. bassiana* also tested by Saxena *et al.* (1997), and reported that *B. bassiana* @ 2.68×10^{7} spores ml^{-1} reduced pod damage by *H. armigera* in chickpea. Anonymous (1990), Gopalakrishnan and Mohan (2001) and Uma Devi *et al.* (2003), reported the effectiveness of *N. rileyi* against fruit borer on tomoto. But *M. anisopliae* showed high virulence. The variation in virulence among various fungi is of prime importance in determining their efficacy against on insect.

REFERENCES

Agarwal,G.P. 1990. Entomopathogenous fungi in India and management of insect pests. Indian phytopathology, 34:131-142.

Anonymous, 1990. Annual report for 1989-90,Indian Institute of Horticultural Research, Hessaraghatta, Banglore, pp 64-65.

Gopalakrishan, C. and K.S. Mohan, 2001. *Nomuraea rileyi* (Farlow): a potential entomopathogenic fungus for control of *Helicoverpa armigera* (Hub.) on tomato. Entomon 26 : 93-97.

Harsoliya, R. K; T. Hussain and R. Sumanitatham, 2007. Bioefficacy pesticides some botanicals and microbial pesticides against pod borer *Helicoverpa armigera* (Noctuidae; Lepidoptera in chickpea. Pestology. 31(6) : 36-37

Lingappa, S. Hem saxena and Vimala Devi, 2005. Role of biocontrol agents in the management of *Helicoverpa armigera* proceedings of National symposium on "Helicoverpa Management A National Challenge", 2005. Indian Institute of Pulses Research Kanpur, P.P. 159-184.

Nahar, P., P. Yadav, M. Kulye, A. Hadapad, M. Hassaini, Tour, U., S. Keller, A.G. Chandele, B.Thomas, and M.V. Deshpande, 2004. Evaluation of indigenous fungal isolates, *Metarhizium anisopliae* M34412, *Beauveria bassiana* B3301 and *Nomuraea rileyi* N812 for the control of *Helicoverpa armigera* (Hubner) in Pigeonpea filed. J. Biol. Control. 18 (1)1-8.

Padmaja, V. and G. Kaur, 2001. Pathogenicity of *Metarlizium anisopliae*(Metsch) Sorokin to rice leaf folder Cnaphalocrocis medinalis (Guenee). J. Biol. Control. 15 (2) : 201-203.

Ramarethinam, S., S. Marikmuthu, S. Loganathan, and N.V Murugesan, 2005. Potentials of entomopathogenic fungal based commercial formulation on some important pests of selected vegetables crops in India. Pestology. 26 (7) : 217 : 21.

Sandhu,S.S; S.E.Unkles; R.C. Rajak, and J.R.Kinghom, 2001. Generation of Benomyl resistant *Beauveria bassiana* strains and their infectivity against *Helicoverpa armigera.* Biocontrol Science and Technology,11:245-250.

Saxena, H., R. Ahmed, and A.H. Saxena. 1997. Field evaluation of *Beauveria bassiana* (Balsamo) Vuillemin against *Helicoverpa armigera* (Hubner) infection in chickpea. *J. Biol. Control.* 11 : 93-96.

Tang, T. C; D. J. Cheng and R.F.Hou, 1999. Virulence of the entomopathogenic fungus, *Nomuraea rileyi* to various larval stages of the corn earworm, *Helicoverpa armigera* (Lepidoptera: Noctuidae). Applied Entomology and Zoology, 34: 399-403.

Uma Devi, K., C. Murali Mohan, J. Padmawathi, and K. Ramesh, 2003. Susceptibility to fungi of Cotton Boll Worms before and after a natural epizootic of the entomopathogenic fungus *Nomuraea rileyi* (Hyphomycetes) Biocontrol Science and Technology. (13) 3 : 367-371.

Zhao-Jung Sheng, He-Pei Fong, Guo-Syping, Wu-Huizhen, Qu-Jixing, Tian-Hongping, Zhao-JS, He-PF, Qua-SP, Wu-Hz, Qu-Jx, and HP-Tian, 1990. Control of lepidopterous insect pests on vegetables by *M. anisopliae* as well as it's effect on robust seedling. Plant Prot. 27 (5) : 29-30.