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Management of Entomopathogenic Nematodes on the Red Palm Weevil (Rhynchophorus Ferrugineus) Larvae) in Georgia

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Abstract: - Management; S. carpocapsae, S. feltiae and H. bacteriophora on the larvae investigated. In the bioassay, 9x5x5 cm sized plastic boxes were used. Base of each box, whatman filter paper was placed and a last instar larva of red palm weevil was put the 1000 infective Juveniles larva and were incubated at 25°C. After infection, R ferrugineus larvae were checked daily and mortality on larva were recorded. The study was ended at the end of 5th day and the results were evaluated. All entomopathogenic nematode species used in this study caused different mortality on red palm weevil larvae. The highest mortality was caused by S. carpocapsae with 96.4%, S. feltiae followed it with 92.6% and H. bacteriophora caused 56.2% mortality on R. ferrugineus larvae respectively. As a result, potential use against should be discussed to control this pest.

Keywords:- *Rhynchophorus ferrugineus; Steinernema. carpocapsae; Steinernema feltiae; Heterorhabditis bacteriophora.*

I. INTRODUCTION

Palm tree is family of perennials lianas, shrubs, and trees. They are grown in hot climates. The weevil is one of two species of weevil beetle known as the red palm weevil. The adult beetles are relatively large, and is four centimeters long, and have a red color. Weevil larvae can enter meter thereby attenuation palm tree. presented as in date palm plantations.

As is known, entomopathogenic nematodes belongs to *Steinernema carpocapsae*, *Steinernema feltiae* genus of Steinernema and are associated with bacteria Xenorhabdus, while *Heterorhabditis bacteriophora* belongs to the genus Heterorhabditis associated with bacteria Photorhabdus. Joint action of bacterium and nematodes leads to insect mortality which regulation number of harmful insects. The following cycle are characteristic development which have similar histories: egg, four juvenile stages and the adult form. After covering with cuticle - protective film of the second stage juveniles, the nematodes stop feeding, leave the dead host and carry with them reproductive bacterium for infestation of a new host. Nematodes penetrate into the hemolymph of a living host, inject into it symbiotic bacteria which causes insect mortality in approximately 24-72 h. Nematodes produce amphimictic population (nematodes of male and female genus) in the host intestinal (2,8).Steinernematidae nematodes heterorhabditdae nematodes. Next. these species of nematodes are distinguished by safety to humans and the environment, and they are effective biological agents for biological control of pests (5,4).

II. MATERIALS AND METHODS

Management EPNs Rhynchophorus ferrugineus laboratory conditions Management, *S.feltiae* in conditions of room temperature 24-25°C and 75% humidity for trial were used pest form of larva. Mortality rate of for individuals was determined by Abbott formula (Abbot, 1925). Last instar larvae of the Rhynchophorus ferrugineus. R. ferrugineus were collected from palm trees in West part of Georgia (Adjara). insects produce palms.

For efficacy assays, Whatman filter papers were placed on the base of 9x5x5 cm sized plastic culture boxes and a last instar larva of R. ferrugineus was put on each box. At a rate of 1000 Infective juveniles(IJs) larva was inoculated for each red palm weevil larva.. Infected larvae were checked daily, mortality on larvae were recorded and the study were ended at the end of 5th day. Twenty exemplar of R ferrugineus larvae were used for each EPN species, and the bioassays were repeated twice. To be sure that the mortality were caused by EPNs, infected larvae were put on White trap and the emergences of IJs were observed (12,11).

III. RESULTS AND DISCUSSION

Different mortality on last instar larvae of red palm weevil caused by entomopathogenic nematodes(EPN) were observed. Only water were inoculated to the larvae of control groups and no death larva was observed. All three EPN species were caused mortality on red palm weevil larvae in this study. The highest mortality (96.4%) caused by *S. carpocapsae* on R. ferrugineus larvae. 92,6% 56.2% respectively.

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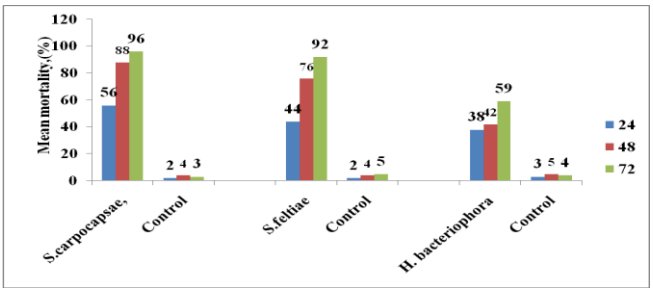

Fig 1:- Virulence of *S. Rhynchophorus ferrugineus*

Steinernema carpocapsae species can. This type of effective parasitism helps to cause high mortality on its hosts. Based on the results of this study and according to the mortality, EPNs can be hoping candidates to control the larvae of red palm weevil. The report about natural *Steinernema carpocapsae* infection of R. ferrugineus from Georgia (Adjara Region) explains this high mortality. The results have shown that the high virulence of *S. carpocapsae* against R. ferrugineus, then *S. feltiae* and *H. bacteriophora* depended on the time and type of the nematodes. On the 5th day after treatment with a nematode suspension 1000 infective juveniles/ml of *S. carpocapsae* in the given trial reveals 56, 88 and 96.4% mortality rate whereas *S. feltiae* mortality rate is 44, 76, 92,6%, *H. bacteriophora* 38, 42, and 59% respectively. The obtained results show that under laboratory conditions *S. carpocapsae S.feltiae* against R. ferrugineus be controlled than *H. bacteriophora* and therefore, future study is to be conducted in field conditions.

IV. CONCLUSION

In current research among three EPN species, *S. carpocapsae* resulted the highest mortality on R ferrugineus larvae. In addition, active species noticed was *S. feltiae*, while *H. bacteriophora* also instigated less mortality on palm weevil larvae.

Our consequences prove that larvae were extremely vulnerable to the EPNs tested. All three species of EPN tested exhibited efficiency at various rates against R. ferrugineus populace. It was also confirmed in this study that time length EPNs application against percentage mortality population under laboratory conditions.

Especially virulence should be investigated for further biological control studies.

REFERENCES

[1]. Abbott W.S. A method for computing the effectiveness of an insecticide. J. Econ. Entomol., 18.(1925).265-267.

[2]. Akhurst, R., and K. Smith. Regulation and Safety. In: Gaugler, R. (Ed.), Entomopathogenic Nematology. CABI, New York, (2002):31 1-332

[3]. Abraham, V.A., M.A. Shuaibi, J.R. Falerio, R.A. Abozuhairah and P.S.P.V. Vidyasagar. An Integrated Management Approach for Red Palm Weevil Rhrynchophorus ferrugineus Oliv. A Key Pest of Date Palm in the Middle East. Agricultural Science 3 (1998): 77-83.

[4]. Bedding, R.A., and Molyneux, A.S. Penetration of Insect Cuticle by Infective Juveniles of Heterorhabditis spp. Heterorhabditidae Nematoda. Nematologica 28 (1982): 354-359.

[5]. Bumell, A.M., and S.P. Stock. Heterorhabdits, Steinernema and Their Bacterial Symbionts-Lethal Pathogens of Insect. Nematology 2(2000): 31-42.

[6]. Uğur Gözel, Çiğdem Gözel, Çiğdem Yurt and Deniz İnci. Efficacy of Entomopathogenic Nematodes on The Red Palm Weevil Rhynchophorus ferrugineus (Olivier, 1790) (Coleoptera: Curculionidae) Larvae. International Journal of Bioassays 4.10 (2015): 44364439

[7]. Dutky, S.R., J.V. Thompson, and G.E. Cantwe. A Technique for the Mass Propagation of the DD-136 Nematode. Journal of Insect Pathology 6 (1964): 417-422.

[8]. Kaya, H.K., and R. Gaugler. Entomopathogenic Nematodes, Annual Review of Entomology. 38 (1993): 181-206.

[9]. Krueger, Robert R. "Date Palm Genetic Resource Conservation, Breeding, Genetics, And Genomics In California" (PDF). The Conference Exchange. Retrieved 2018-03-26.

[10]. Mujahid Manzoor, Jam Nazeer Ahmad, Muhammad Zahid Sharif, Dilawar Majeed, Hina Kiran, Muhammad Jafir and Habib Ali Comparative effectiveness of entomopathogenic nematodes against red palm Weevil (Rynchophorus ferrugineus) in Pakistan. Journal of Entomology and Zoology Studies 2017: 5(5): 756-760

[11]. Mikaia. N. Monograph. Research of entomopathogenic nematodes abroad (Israel, Germany). Georgian National Academy of Sciences, Tbilisi.2012, 1-79

[12]. Santhi VS, Salame L, Nakache Y, Koltai H, Soroker V. Glazer I. Attraction of entomopathogenic nematodes *Steinernema carpocapsae and Heterorhabditis bacteriophora* to the red palm weevil (Rynchophorus ferrugineus). Biological Control. 2015; 83:75-81.

[13]. Shahina F, Gulsher M, Javed S, Khanum TA. Bhatti MA. Susceptibility of different life stages of red palm weevil, Rhynchophorus ferrugineus, to entomopathogenic nematodes. International Journal of Nematology. 2009: 19:232-240.

[14]. White G. A method for obtaining infective nematode larvae from cultures. Science (Washington). 1927, 6.