Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Annals of Experimental Biology, 2017, 5 (1): 14-17
(http://www.scholarsresearchlibrary.com)

ISSN:2348-1935

Biology and Management of Legume Flower Thrips (*Megalurothrips sjostedti*) (*Thysanoptera: Thripidae*), a Major Insect Pest of Cowpea: A Review

Sani I[1*] and Umar KM[2]

[1]*Department of Biology, Umaru Musa Yar'adua University, Katsina, Katsina State, Nigeria*

[2]*Centre for Dryland Agriculture, Bayero University Kano, Kano State, Nigeria*

[*]***Corresponding author:*** *sani.ibrahim@umyu.edu.ng*

ABSTRACT

Legume flower thrips, Megalurothrips sjostedti, is a serious insect pest of leguminous plants particularly cowpea. It attacks cowpea from pre-flowering to flowering stages. The insect is commonly found in tropical Africa and has been recorded to cause yield loss of up to 100%. Megalurothrips and undergoes gradual type of metamorphosis in which both nymph and adults cause damage by piercing the plant tissues and sucking up the released plant juices. Chemical control measures have been the mainstay and most widely used for its control due to its physical and immediate action, despites its several drawbacks. However, there are other control measures such as cultural (e.g. irrigation, tillage operation, planting date, crop rotation and intercropping) and botanicals (e.g. Piper nigrum) that have been developed as alternatives to synthetic chemical insecticides. Moreover, the use of biocontrol agents like predatory thrips and predatory mites (e.g. Amblyseius spp) and entomopathogenic fungi isolates (e.g. Beauveria bassiana, Metarhizium anisopliae), are also promising in suppression of pest thrips in both indoor and outdoor crops. More research is also needed on biology, economic importance, insecticides resistance techniques and biological control agents of M. sjostedti to provide appropriate control methods and increase cowpea production.

Keywords: Biology, *Megalurothrips sjostedt,* Insect pest, Cowpea, Legume crops

INTRODUCTION

The legume flower thrips, *Megalurothrips sjostedti* (Thysanoptera: Thripidae), is one of the most serious insect pests attacking cowpea and other leguminous plants in tropical Africa [1]. Thrips are widely distributed and common throughout the old World tropics and subtropics [2]. *Megalurothrips* is an old World genus associated with the flowers of Fabaceae, with one species from Africa and 12 from Southeast Asia [3]. However, research has consistently shown that, *M. sjostedti* is the only species recorded from Africa [2].

According to Natural Resources Institute (NRI) [4], thrips populations are generally lower during heavy rains, but increase under dry conditions associated with the later stages of crop growth. Adult thrips, which are shiny black, minute insects, are found feeding in flower buds and flowers [5].

The yield reduction due to Legume flower thrips ranges from 20 to 80% but under severe infestation yield losses may be up to 100% [6,7].

Adult male is similar to female but smaller and paler with antennae more slender. The total development time ranged from 19 to 33 days at 26°C and 14°C respectively. The total fecundity ranged from 8.2 to 168.4 eggs per female and it was influenced by fluctuations in temperature and photoperiod [8]. Despite the considerable work done on various

control methods of thrips species, *M. sjostedti* has received relatively little attention. Chemical method is the most widely used in the management of Legume flower thrips in cowpea [4].

Reported that, applications of expensive insecticides can lead to reduction of about 80% of flower bud thrips population in cowpea production [9]. Development of an Integrated Pest Management (IPM) system for thrips pest management in greenhouse generally is built in four corner stone's: Cultural and mechanical measures, biological control, chemical control and host plant resistance [10].

Each stage in the life cycle of cowpea has one or more genuine insect pest that can result to severe damage and force the yield depressingly [11]. The most serious ones in Africa are; flower bud thrips, *M. sjostedti* and the pod borers, *Maruca vitrata* [12].

In this paper we would like to introduce biology, systematics, distributions, economic importance and controls practice of *M. sjostedti*.

SYSTEMATICS AND DISTRIBUTION

There are at least 6,000 species of thrips in the world [13]. Approximately 5500 described species of thrips in two suborders encompass eight families [9]. Among the families of order Thysanoptera, Thripidae is one of the most prevalent families [14]. Thrips are distributed worldwide in tropical and temperate zones inhabiting forests, grasslands, bushes, leaves and flowers [14]. *Megalurothrips* all of which live and breed in legume flowers and are widespread and common throughout the old World tropics and subtropics [2]. The African species, *M. sjostedti* (Trybom) and two of the Asian species, *M. usitatus* (Bagnall) and *M. distalis*, are known as pests of legume crops [1].

Previous studies have reported that, there are at least two other species of thrips that are found on cowpea in Africa: *Frankliniella schultzei* (Trybom) (Thysanoptera: Thripidae) and *Sericothrips occipitalis* Hood (Thysanoptera: Thripidae). These are known to be minor pests of cowpea [5].

BIOLOGY

It has been demonstrated that, most members within the family *thripidae* (order thysanoptera) have a characteristic life cycle that consists of six stages: an egg, two active larval stages, an in active and non-feeding pupal stage and adult stage (male and female) [15]. According to Salifu [16] development of thrips from egg to adult takes about 19 days at 29^{o}C and adult thrips live for about 23 days or less. Eggs are laid in the buds and calyx of developing flower [4]. The eggs are very tiny; a single egg is 0.25 mm long and 0.1 mm wide. They are white when freshly laid and turn pale yellow toward maturation [17]. Incubation period takes an average period of 2 to 3 days [18]. Thrips are described as haploidiploid, thus males have half the number of chromosomes and the other half (haploid number) is found in females [10].

The first and second instar larvae were translucent to white in colour and turn yellow after 2 to 3 days, the yellow form lasted for 2 to 3 days and change to arrange form which lasted for 3 to 4 days before pupation [18]. Both two larval stages are active feeding on host plant tissue, second stage larvae search for shelter to pupate, mostly in the soil [10].

The first pupal instar is termed the propupa, a non-feeding stage that is followed by the pupa, another non-feeding pupal stage [15]. The entire pupation period took an average period of 4 to 7 days [18]. Winged adults then emerge from the pupal stage [15]. The entire life cycle took 12 to 14 days [4]. Parthenogenesis was observed to occur in *M. sjostedti* giving rise to a wholly male progeny [18].

ECONOMIC IMPORTANCE

In West Africa, the flower bud thrips, M. sjostedti is the most economically important insect pest of cowpea causing yield losses between 20 to 70% depending on the severity of infestation [19]. Both nymph and adults are the damaging stages; they damage the terminal leaf buds and bracts/stipules [20].

Under severe infestation grain yield loss may be of up to 100% [6]. Thrips damage is caused by direct feeding on the contents of individual plant cells and the consequent reduction of photosynthetic capacity [21], their direct feeding cause's destruction of buds and flowers as well as malformations of pods [1]. Apart from the direct damage caused by thrips, it has been reported that they are vectors for a tospoviruses which causes serious damage to plant species [7].

CONTROL

Cultural control

Legume flower thrips are brought under control through many cultural practices. Prior to planting, ploughing and harrowing can destroy pupae in the field. Early planting also ensured crop to be well established and better able to withstand infestation [22]. This is because thrips populations are generally lower during the rains and increase when condition is drier [4]. Reduced thrips infestation has been observed on cowpea that is intercropped with sorghum, millet and cassava [4]. Legume flower thrips (*M. sjostedti*) on cowpea buds were also drastically reduced by intercropping cowpea with sorghum and maize [22].

Use of resistance varieties

Host-plant resistance can also be integrated with other control methods as a basis of integrated pest management [17].

The varieties "IT 90K-277-2", "KVx 404-8-1", "TVx 3236-01G", "IT91K-180" "Moussa Local", "Sanzisabinli", "Sewe", "TVu 1509", and "TVx 3236" are reported to show varying levels of resistance to the cowpea flower thrips in West Africa [23]. Varieties, such as TVx 3236, have also developed resistance to damage by thrips [4]. In Nigeria, the cowpea genotype TVu 1509 was identified as possessing some level of resistance to damage by thrips [6].

Biological control

Much research attention has been focused on biological control for the suppression of pest thrips in both indoor and outdoor crops [10]. This practice includes the use of natural enemies; (predatory thrips, predatory mites e.g. *Amblyseius* spp. anthocorid bugs or minute pirate bugs (*Orius* spp.), ground beetles, lacewings, hoverflies, and spiders) [24] and Fungal pathogens e.g. entomopathogenic fungi isolates (*Beauveria bassiana*, *Metarhizium anisopliae*, *Paecilomyces fumosoroseus*, and *Verticillium lecanii*) [25]. A number of studies have been conducted to evaluate the efficacy of entomopathogenic fungi against Legume flower thrips [26]. Found that, *Metarhizium anisopliae* has pathogenic effect on thrips in horti and floriculture in Africa. They have also established that strains of *Metarhizium anisopliae* can significantly alter feeding, fecundity, fertility and longetivity of *M. sjostedti*.

Evaluates the repellency of 24 plant extracts against adult female thrips of *M. sjostedti* in the laboratory, out of which *Piper nigrum*, *Cinnamomum zeylanicum* and *Cinnamomum cassia* described as strong repellents [1].

Recently, researchers have developed Bt proteins expressed in cowpea crop through genetic modification (GM) to control the legume pod borer. Cowpea expressing the lepidopteran-active Cry1Ab protein from *Bacillus thuringiensis* is the one being developed as a first generation Bt-cowpea crop for West Africa [27].

Use of botanicals

Over the past decade, there has been an increasing amount of literature on botanical potentials against *M. sjostedti* [28]. Reported that, West African black pepper extracts significantly reduce the population of Thrips in flowers. The Neem-based pesticides (trade names Azatin™) are reported to prevent development of flower thrips in the early larval stages and reduce egg-laying by adult thrips [13]. The botanical pesticides garlic, rotenone, ryania, pyrethrum, neem, sabadilla and nicotine have been suggested for thrips control [29].

Chemical control

Chemical control measures have been the mainstay and are the most widely used for control of flower bud thrips [11,25], Reported that, application of insecticides generally reduces cowpea pest infestation and markedly increase crop yields.

A suitable insecticide includes deltamethrin, malathion, monocrophos, pirimphos-methyl cypermethrin, dimethoate and lambda-cyhalothrin [4,22]. Morse et al. have reported that adoption of a broad range of strategies that include repeated applications of expensive insecticides has been recommended which shown reduction of about 80% of flower bud thrips population in cowpea production [9].

The indiscriminate use of these chemicals has given rise to problems such as resistance of the pest species to insecticide, accumulation of toxic residues in food, health risks to the user and livestock, and environmental contamination [28].

CONCLUSION

The current review adds to a growing body of literature on *Megalurothrips sjostedti*. A large and growing body of literature has investigated that, flower bud thrips (*M. sjostedti*) is one of the most damaging insect pest that attacks cowpea in the field in Africa. Synthetic chemical pesticides are widely used for management of this insect pest, despite their toxicity and hazardous effects to humans and the environment. However, because of serious deleterious side effect of chemical usage there is prevailing need to develop ecologically sound and sustainable alternative for management of Thrips. To better manage this insect and in order to increases cowpea production, much research attention is needed to focus on appropriate control strategies. Understanding of more biological control and other alternatives that are safe, effective, biodegradable and eco-friendly would be alternative and safer control approach for this serious insect pest. More broadly, research is also needed to determine its biological and ecological aspect especially its biology, ecology and distributions population dynamics outside of cropping systems.

REFERENCES

[1]. Abtew, A., et al., *Insects*, **2015**. 6: p. 608-625.
[2]. CBIT Publishing., *Queensland*. **2013**.
[3]. Funderburk, J., Tyler-Julian, L., and Mound, L., *Florida Entomologist*, **2014**. 97(2): p. 835-840.
[4]. Natural Resources Institute (NRI), *Biology and Control*, **1996**. p. 122-123.
[5]. Singh, S.R., and Allen, D.J., *Manual Series: IITA,* **1978**. p. 43-89.
[6]. Omo-Ikerodah E. E., Fatokun C. A., and Fawole, I., *Euphytica*, **2009**. 165: p. 145-154.
[7]. Mound, L.A., Annu Rev Entomol, **2005**. 50: p. 247-69.
[8]. Ekesi, S., Maniania, N.K., and Onu, I., *Entomologia Experimentalist Applicata*, **1999**. 93: p. 149-155.
[9]. Morse, J. G., and Hoddle, M. S., *Invasion Biology of Thrips Annual Revised Entomology*, **2005**. 516: p. 7-8
[10]. Looman, A.J.M., Parasitoids as Biological Control Agents of Thrips Pests. (n.d.). Thesis – Wageningen University, **2003**.
[11]. Ego EO, *American Journal of Scientific and Industrial Research*, **2001**. 2: p. 592-602.
[12]. Ogah, E. O., *Asian Journal of plant Science* **2013**. 1: p. 11-17.
[13]. https://www.cabdirect.org/cabdirect/abstract/20147801143
[14]. Iftikhar, R., et al., *Pakistan Journal of Zoology*. **2016**. 48(5): p. 1233-1240.
[15]. Reitz, S.R., *Florida Entomologist*, **2009**. 92: p. 7-13.
[16]. Salifu, A.B., *Revue de Zoologie Africaine*, **1992**. 106: p. 451-459.
[17]. Richard, D., *M.Sc thesis Ahmadu Bello University, Zaria, Nigeria*, **2009**.
[18]. Ogol, C.K.O, *M.Sc thesis – University of Nairobi, Kenya*, **1988**.
[19]. Ngakou, A., et al., *Crop Protection*, **2008**. 274: p. 481-488.
[20]. Bediako, A., *M.Sc. Thesis, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana*, **2012**.
[21]. Tang, L., *Florida Entomologist*, **2015**. 98(2): p. 620-625.
[22]. Africa Soil Health Consortium, *Plantwise*, **2014**.
[23]. Amoah, B.A. *M.Sc. Thesis, Kwame Nkrumah University of Science and Technology Kumasi, Ghana*, **2010**.
[24]. Ramachandran, S., et al., *Agricultural and Forest entomology*, **2001**. 3: p. 129-137.
[25]. Ekesi, S., et al., *Journal of Applied entomology*, **1998**. 122: p. 629-634.
[26]. Ekesi, S., Maniania, N.K., *Academic / Plenum publishers, New York: Kluwer*, **2000**. p. 165-191.
[27]. *GM Crops.* **2011**. 2(3): p. 211-224.
[28]. Oparaeke A.M., *Plant Protect Sci*, **2006**. 42: p. 106-111.
[29]. http://attra.ncat.org/attract-pub/PDF/thrips/pdf