International Journal of Agricultural and Environmental Sciences
2018; 3(5): 92-96
http://www.openscienceonline.com/journal/ijaes

Significance of Post-Harvest Treatments to Control Groundnut Pod Sucking Bug *Elasmolomus sordidus* F. (Hemiptera: Lygaediae) at Elnuhud Locality, West Kordofan State, Sudan

Omer Rahama Mohamed Rahama[1, *], Tarig Abdalla Mohamed ELblaa[2], Abdelmanan Elzein Hassan Elamin[1], Ahmed Yousif Mohmed Khair[1], Elsadig Bleilo Ibrahim Musa[3]

[1]Department of Plant Protection Science, Faculty of Natural Resources and Environmental Studies, University of Kordofan, Elobeid, Sudan

[2]Gum Arabic and Forest Products Center, West Kordofan University, Elnuhud, Sudan

[3]Department of Crop Science, Peace University, Elfula, Sudan

Email address

omerrahma@yahoo.com (O. R. M. Rahama)

[*]Corresponding author

To cite this article

Omer Rahama Mohamed Rahama, Tarig Abdalla Mohamed ELblaa, Abdelmanan Elzein Hassan Elamin, Ahmed Yousif Mohmed Khair, Elsadig Bleilo Ibrahim Musa. Significance of Post-Harvest Treatments to Control Groundnut Pod Sucking Bug *Elasmolomus sordidus* F. (Hemiptera: Lygaediae) at Elnuhud Locality, West Kordofan State, Sudan. *International Journal of Agricultural and Environmental Sciences.* Vol. 3, No. 5, 2018, pp. 92-96.

Received: August 19, 2018; **Accepted**: September 12, 2018; **Published**: October 10, 2018

Abstract

This study was conducted in Elnuhud locality at West Kordofan State, Sudan in season 2016/2017 to assess post-harvest treatments for the control the groundnut pod bug *Elasmolomus sordidus* a harmful pest on oilseed crops. Two experiments were done at Eljeko village. In the first experiment three treatments were used at harvest time when the groundnut crop heaped to dry and infestation with the bug built up in the field, in the first treatment three bundles of groundnut crop were heaped on the ground, the second treatment three bundles were heaped on the ground surrounded by Wood Ash and, in the third one three bundles of the groundnut crop heaped surrounded by insecticide. The control kept away from infestation. In the second experiment 5 treatments were used, in the first one the groundnut crop bundles were put on the ground (Zero level) and in the second treatment; third; the fourth and the fifth one, Wooden bench (Rakoopa) with five levels of height were used 25 Cm; 50 Cm, 75 Cm; 100 Cm and 125 Cm. beside the control. The experiments were done using Randomized Complete Design with 4 replicates. One kilogram of groundnut pods was collected weekly for a month. In the lab 100 seeds weight obtained and loss in seed weight percentage calculated. Results showed that when infestation of the bug built up in the field the seeds stored on the ground surrounded by Wood ash had been affected significantly ($P< 0.05$) with obvious reduction in weight of 100 seeds while the seeds surrounded with insecticide showed no reduction in weight in comparison with the control in the first experiment. In the second experiment no significant loss ($P > 0.05$) in weight observed during the examination in samples taken from Wooden benches in comparison with the control**.** Loss in seed weight of 100 groundnut seeds reached 6% by the end of the month when bundles left on the ground and significantly differed ($P< 0.05$) from the control and the wooden benches treatments. We concluded that use of wooden benches treatments significantly kept the crop from the pod bug damage even in low height (25 Cm). Although, the use of pesticide gave the same result but the expected chemical residues raised concept of using Wooden benches as method of control and might be alternative for the control the pod bug and extremely suggested.

Keywords

Kordofan, Post-harvest, Wood Ash, The Pod Bug, Wooden-Bench, Rakoopa

1. Introduction

Groundnut or peanut (*Arachis hypogaea* L.) is grown over 20 million hectares in the tropical and sub-tropical part of about one hundred countries in the world. The total annual world production amounts to about 25 million tons of unshelled nuts, 70% of which is contributed by India, China and U.S.A [1, 2]. The groundnut is an excellent source of plant nutrients contains 45-50% oil; 27-33% protein as well as essential minerals and vitamins. The groundnut plays an important role in the dietary requirements for poor women and children and its haulms are used as livestock feed [3]. The groundnut oil is composed of mixed glycerides and contains a high proportion of unsaturated fatty acids, in particular, oleic (50-65%) and linoleic (18-30%) [4]. The groundnut is also important in the confectionary trade and the stable oil is preferred by the deep-frying industries, since it has a smoke point of 229.4°C compared to the 193.5°C of extra virgin olive oil. The oil is also used to make margarines and mayonnaise [4, 5]. Sudan is one of the major groundnut producing countries. In India ground nut or pea nut is known as the king of oilseeds, it is one of food and cash crop and is also called as wonder nut and poor men's cashew nut [6].

Many factors affected groundnut production in the Sudan and Kordofan region, of these is the pod sucking bug *Elasmolomus sordidus* (F.). This species is widespread in Africa, Asia, Brazil, Mexico and Hawaii. Besides groundnut, it also attacks sesame and cotton. The bug reduce quantity and quality of sesame and groundnut seeds and sucks the seed contents; particularly the oil, reducing the quantity and the quality of the oil [7]. Also, the effect of the bug resulted in loss of seed weight and causes seed shriveling and increases the free fatty acid of the oil, producing a rancid flavor [7-11]. The bug caused loss in the seeds weight and some varieties of sesame loss in weight after two months of infestation reached 13.2%. The oil content of sesame seeds has been affected with the bug and the oil percentage decreased with time [12]. Within 60 days of infestation, the loss of the oil reached 28.0% to 59.8% [13]**.** Regarding chemical control the insecticide compound Cyper Ruimoo 0.25% DP (cypermethrin) at the dose rate of 100g product/ m² gave excellent control of *E. sordidus* on sesame when applied on soil as dust before stacking [14]. Neem and birbira seed powder; pyrethrum flower dust and nimbecidine were used for control the sesame seed bug in stores because they are environment friendly way of control [15].

Although there are many reports about the problem, the knowledge regarding this serious insect pest of oilseed crops has remained very much the same and has, hitherto, received little attention. So, attempts under way to bridge the gaps at different levels and this project search for possible treatments to control this pest. The general objective of the study is to reduce losses due to groundnut pod bug infestation and assess the post-harvest treatments used and the specific objectives are to realize the best method for the control the groundnut pod bug and to find out alternate tool to control the groundnut pod bug *E. sordidus* to reduce use of insecticides.

2. Materials and Methods

2.1. Study Area

Two Feddans of groundnut were cultivated in season 2017/2018 in Elnuhud locality in Eljeko village 15 km east Elnuhud City (latitudes 12°.27′13°.55′N and longitude 27°.15′ - 29°.55′)

2.2. Cultivation of Groundnut Crop in Elnuhud Locality

Two feddans of groundnut were sown in a farm in Elnuhud locality at Eljeko village to obtain data for the study. The area was rain fed irrigated, the soil was prepared very well in June 2017 and standard cultural practices for groundnut was carried out. Then seeds of groundnut type Gebash obtained from Seed Company, sowing date were on mid July 2017 in rows. Sowing was made by hand and 1-2 seeds were sown in each hole. Cleaning the area by hoe from weeds was made regularly throughout the season.

2.3. Experimental Field Work

Assessment of the damage of the pod bug in the field at harvest time was studied by two trials for the groundnut crop after lifting the mature plants by hand then the groundnut was put in heaps to dry and natural infestation allowed to building up.

(i) first trial:

In this trial three treatments were used in the first one the groundnut was collected in small heap on the ground, in the second Wood ash surrounded the heap and in the third the insecticide surrounded the heap beside the control. The trial was executed using Randomized Complete Design (RCD) with 4 replicates.

Treatments:

(a) Three bundles of groundnut with about 30 cm diameters each were heaped on the ground in the field and replicates four times with distance of three meter.

(b) Three bundles of groundnut with about 30cm diameter each heaped replicate four times with distance of two meter and one 1/2 kg of wood ash will be put surround each unit twice a week at evening.

(c) Three bundles of groundnut about 30cm diameter each heaped replicates four times with distance of two meter and 1/4 kg of Thipermethrin (Elfaris) 0.25%DP (Pyrethroid compound) surrounded each unit twice a week.

(d) Three bundles of groundnut with about 3cm were kept away from infestation used as control.

(ii) second trial:

In this trial six treatments were used by putting groundnut bundles on five Wooden bench (Rakoopa) with four levels of height (Figure 1) and one bundles heaped on the ground besides the control which kept away. The trial was executed using Randomized Complete Design [RCD] with 4 replicates.

(a) the bundle of groundnut with about 30 cm diameter was put on wooden bench

(Rakoopa) with height of 25 cm replicates four times with distance of two meter.

(b) the bundle of groundnut with about 30 cm diameter was put on wooden bench (Rakoopa) with height of 50 cm replicates four times with distance of two meter.

(c) the bundle of groundnut with about 30 cm diameter put on wooden bench (Rakoopa) with high of 75 cm replicates four times with distance of two meter.

(d) the bundle of groundnut with about 30 cm diameter was put on (Rakoopa) with high of 100 cm replicates four times with distance of two meter.

(e) the bundle of groundnut with about 30 cm diameter was put on bench (Rakoopa) with high of 125cm replicates four times with distance of two meter

(f) the bundle of groundnut with about 30cm diameter was put (heaped) on the ground in the field and replicate four times with distance of two meter.

(g) the bundle of groundnut with same size kept away from infestation (control)

Figure 1. *Groundnut on wooden benches (Rakoopa) at Elnuhud site season 2017/2018.*

2.4. Weight of 100 Groundnut Seeds

Four random samples were taken every week for a month, replicated four times at harvest time when groundnut stacked to dry and infestation allowed building up in the field naturally. One kilogram of groundnut was taken then transferred to the lab for examination. Moisture equilibrium was achieved by sun drying. Hundred seeds of each treatment were weighed by a sensitive electric balance after to obtain loss every week. The rest of the sample kept for more examination to obtain oil quantity and quality. The percent weight loss was calculated by using the following formula:

$$\%\, weight\ loss = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \text{X}100$$

Where:

Initial weight is the weight of 100 un infested groundnut seeds.

Final weight is the weight of 100 infested groundnut seeds

2.5. Statistical Analysis

The data on quantitative parameter was statistically analyzed using one way ANOVA test, at 5% level of Significance LSD.

3. Results

3.1. Cultivation of Groundnut

Sesame promo k variety was sown at Elnuhud locality in Eljko village for one season on the third week of July 2017. The growing period of about three months and the harvest was on the third week of October 2017. The harvest was done by hand. The harvest crop heaped after lifting to dry and, natural population of sesame seed bug was allowed to build up then samples were collected for the study.

3.2. Weight Loss of Groundnut Seeds under Field Conditions

In the field, the seeds stored on the ground and that surrounded by wood ash had significantly reduction on weight while the seeds surrounded with pesticide showed no reduction of 100 seeds weight comparing with control due to natural infestation by the sesame seed bug (Table 1). Table 2 shows bundles of groundnut were put on wooden bench (Rakoopa) with 4 levels of height as treatments used in the field to avoid infestation by the seed bug. Significant loss in 100 seeds resulted when the groundnut bundles were put on the ground.

Table 1. *Evaluation of three post-harvest treatments on weight loss percentage of groundnut seeds due to the pod sucking bug infestation in the field at Elnuhud locality site in season 2017/2018.*

	First week	Second week	Third Week
Treatments	mean weight of 100 groundnut seeds/g		
Control	36	36	36
Bundles of groundnut on the ground	35.3 (1.9%)	34.9*(3%)	34.2*(5%)
Bundles of groundnut surrounded with wood ash	35.4 (1.6%)	34.9*(3%)	34.1*(5.2%)
Bundle of ground surrounded with pesticide	36	36	36

*The mean difference is significant at the 0.05 level.
( ) the number in brackets is weight loss percentage.

Table 2. *Evaluation of six post-harvest treatments on weight loss percentage of 100 groundnut seeds due to the pod sucking bug infestation in the field at Elnuhud locality site in season 2017/2018.*

	First week	Second week	Third week
Treatments	**mean weight of 100 groundnut seeds/g**		
Control	36	36	36
wooden bench (Rakoopa) high of 25 cm	36	36	36
wooden bench (Rrakoopa) high of 50 cm	36	36	36
wooden bench (Rakoopa) high of 75 cm	36	36	36
wooden bench (Rakoopa) high of 100 cm	36	36	36
wooden bench (Rakoopa) high of 125 cm	36	36	36
bundle of groundnut on the ground	35.2 (2%)	34.2* (5%)	33.8* (6%)

*The mean difference is significant at the 0.05 level. ( ) the number in brackets is weight loss percentage.

4. Discussion

The pod sucking bug which is also called sesame seed bug *Elasmolomus sordidus* (F.) has been known as one of harmful insect pests which cause considerable quantitative and qualitative loss to oilseeds crops particularly, groundnut and sesame. The pest usually control by insecticides [7, 11-13]. In this research we search for another method to control the pod sucking bug and a wooden bench method was suggested and applied for the control when field infestation happened at harvest time. The loss weight of groundnut seeds was used as factor for the assessment of the method. The results about weight loss percentage in 100 infested groundnut seeds in (Table 1) showed that significant difference ($P < 0.05$) between the treatments in which groundnut bundles heaped on the ground and that surrounded by wood ash and the control. Also the treatment in which insecticide used was compared with the control. The loss in weight caused by the bug infestation after groundnut heaped for drying was 1.9%; 3%, and 5% in the treatment of the groundnut heaped on the ground and it was 1.6%, 3%, and 5.2% when the groundnut bundles surrounded by Wood Ash during the first, the second, and the third week of the experiment respectively. Considerable loss was happened on weight of infested sesame seeds and the weight of 100 Sesame seeds decreased when time of harvest prolonged and harvest was delayed, this Mentioned by [13].

On the other hand when wooden benches (Rakoopa) were used with five levels of height 25cm, 50cm, 75cm; 100 cm, and 125 cm no loss in weight observed during the test period. The weight of 100 groundnut seeds loss was 2%, 5%, 6% in the first week; the second week, and the third week respectively when bundles heaped on the ground and significant ($P < 0.05$) loss in weight noticed in comparison with the control and the wooden benches (Rakoopa) treatments (Table 2). Therefore, use of the wooden benches (Rakoopa) is highly recommended as method for control the pod sucking bug. The use of pesticides constitutes potential hazards to man and agriculture environment too. Therefore us, reducing its' usage to control pest on groundnut crop is for the benefit of the farmers and the country because oilseeds crops are export crops in the Sudan. Therefore, we are looking forwards to introduce new trend to control pests of economic importance in west Kordofan state where groundnut grown as one of cash crops.

5. Conclusion

The wooden benches (Rakoopa) method as postharvest treatment is effective method to reduce the damage of the pod sucking bug. The method is in the direction of reduction insecticide usage if we know the farmers repeating use of pesticides when re-infestation of the pest happened within a few days after spray, though, efforts have to be directed to search for alternative method to put together it within an integrated pest management program.

6. Recommendations

The use of wooden bench is recommended to reduce pesticide use for control the seeds bug. In the future more research is needed to improve wooden benches method by using metal instead of woods to satisfy the expected expanding of the oilseeds crops cultivation.

Acknowledgements

Authors are acknowledging the Ministry of Higher Education and Scientific Research for the financial support rendered to this study within the project assessment of postharvest treatments to control seed bug in north and west Kordofan States.

References

[1] Khidir M. O. 1997. Oil seed crops in the Sudan. Khartoum University press, Khartoum, Sudan.

[2] El Naim, A. M., Eldoma, M. A. and Abdalla, A. E. 2010a. Effect of weeding frequencies and plant density on vegetative growth characteristic of groundnut (*Arachis hypogaea* L.) in North Kordofan of Sudan. International Journal of Applied Biology and Pharmaceutical Technology, 1 (3): 1188-1193.

[3] Ahmed M. El Naim, Mona A. Eldouma, Elshiekh A. Ibrahim, Moayad, M. B. Zaied. 2011. Influence of Plant Spacing and Weeds on Growth and Yield of Peanut (*Arachis hypogaea* L) in Rain-fed of Sudan Advances in Life Sciences. 2011; 1 (2): 45-48**.**

[4] Young C. 1996. Peanut oil. Bailey's Industrial Oil and Fat Product. 2, 337-392.

[5] Hui Y. H. 1996. Peanut Oil. Bailey's Industrial Oil and Fat Product. 2, 337-392.

[6] Priya, R. S; C. Chinnusamy; P. Manickasundaram and C. Babu 2013. Areview on weed management in groundnut (*Arachis hypogaea* L) International Journal of Agricultural Science and Research (IJASR), VOL. 3, ISSUE 1, mar 2013, 163-172.

[7] Ranga Rao GV, Rameshwar Rao V and Nigam SN. 2010. Postharvest insect pests of groundnut and their management. Information Bulletin No. 84. Patancheru 502 324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics. ISBN 978-92-9066-528-1. Order code IBE 084. 20 pp.

[8] Abdelmanan E. H. Elamin, Ahmed M. El Naim, El tigani A. Ali 2015. Impact of the Sesame Seed Bug (*Elasmolomus sordidus*) on Damaging Sesame Seeds.

[9] Berhe M., Berhanu A., Geremew T. and Melaku. W 2008. Sesame Harvest loss Caused by Sesame Seed Bug, *Elasmolomus sordidus.* F. at Kafata Humera Sesame E Fields SINET. Ethiop. J. Sci. 31 (2): 147–153.

[10] Berhe. M. and berhanu A. 2016. The need for short term training on sesame seed bug *Elasmolomus sordidus* Forsk) control to farmers and agricultural extension worker: A case study at Kafta Humera sesame fields Northern Ethiopia.

[11] Osman A. K, A. M. Abdalla and T. A. Elballa. 2009. Biology and damage inflicted by the sesame seed bug *Elasmolomus sordidus (F)* (Hemiptera - Lygaeidae) on groundnut. Sudan J Agric. Res. 14: 69-80.

[12] Hamdan, E. A. A, 2004. Studies on the morphology of the bug *Elasmolomus sordidus* (F.) (Hemiptera: Lygaeidae) and its feeding effects on the stored sesame seeds. A thesis submitted to the University of Khartoum in partial fulfillment of the requirements for the Degree of Master (Crop Protection).

[13] Hassan A. E 1995. Studies on the biology, ecology, behavior and assessment of the damage of the sesame seed bug *Elasmolomus sordidus* (F) (Hemiptera-Lygaeidae) in the Sudan. Thesis submitted for MSc. University of Khartoum.

[14] Suliman, E. H. and Ihsan A. A. S,. 2015. Evaluation of Cyper Ruimoo 0.25% DP (cypermethrin) for the control of sesame seed bug, *Elasmolomus sordidus* Fabricius (Hemiptera: Lygaeidae) on sesame in the Sudan. Sch J Agric Vet Sci 2015; 2 (2A): 94-96.

[15] Hagos S. 2011. Study on the potential of some botanical Powders and Nimbecidine® for the management of Sesame seed bug (*Elasmolomus sordidus*, Fab.) (Hemiptera: Lygaeidae) in Humera, Northwest Ethiopia. A thesis submitted to the school of graduate studies of Addis Ababa University for MSc.