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Studies on the effectiveness of *Balanite aegyptiaca* extracts and apron star 42ws as seed dressing agent against *Messor galla* in Hong, Adamawa State, Nigeria

Ngwamah J. S
Department of Biological Sciences, Federal University Lokoja, Kogi State, Nigeria

Abstract

Messor galla have been incriminated to be one of the causes of missing stands leading to staggered plant which results to low harvest. There has been a report that extracts of Balanite aegyptiaca can be used as an efficient bioactive preparation in mosquito control. This study was conducted to evaluate the pesticidal activity of extracts of Balanite aegyptiaca Apron star 42WS as seed dressing agent against Messor galla in Hong of Adamawa State. A total of 24 Messor galla nests were selected and subdivided into sites A and B, each of 12 nests. The efficacy of the pesticidal activity of extracts from the leaf, stem-bark, root, seed, of Balanite aegyptiaca

Studies on the effectiveness of *Balanite aegyptiaca* extracts and Apron star 42 WS as seed dressing agents against *Messor galla* was conducted in Kala'a, Hong Local Government area of Adamawa State, Nigeria. 24 *Messor galla* nest were used for experiment. 12 *Messor galla* nest of site A were used for Broadcasted seeds. The treatment agents used were leaf powder, stem powder, seed powder, root powder and Apron star 42ws. The seeds used were *Sorghum*, Millet and Biniseeds. The differences in the effectiveness of various treatment agents on site A showed significant difference at 0.01 significant level, between all the treatments used. The highest percentage of seeds picked was from the control (93.83%), while least was from seed powder (14.25). Among the various treatment agents used on site A, seed powder (14.25)was the most effective seed dressing agent followed by Apron star 42ws (29.25%). The result in general indicated that seed powder was a better seed dressing agent against *Messor galla* than Apron star 42ws. On site B of the experiment the result indicated that, the germination of *Sorghum* and Millet showed no significant differences to control at 0.05 significant levels, but there was significant difference among the germination of Biniseeds at 0.05 significant levels. Least significant difference (LSD) proved Apron star 42ws to be the most effective seed dressing agent on the planted seeds. In this study Apron star demonstrated low effectiveness against *Messor galla* and *B. aegyptiaca* seed powder has proved high effectiveness against *Messor galla.* Therefore using *B. aegyptiaca* seed powder may be the best alternative in reducing burden due to the effect of *Messor galla* and burden due to the effect of hazardous chemical pesticide on but man and animals.

Key Words : *Balanite aegyptiaca*, *Messor galla*, pesticide, Apron star 42 WS.

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Contact : ngwamahs@yahoo.com

Introduction

There are 10,000 living species of ants and their organization undoubtedly represent pinnate of social evolution in animals. This type of organization has three social characteristic namely; over-lapping adult generation, cooperating brood code and more or less non-reproductive workers or helpers (Frank and Sudd, 2004).

Ants share the haploidiploid method of sex-determination with all hymenoptera and also have marked tendency of parental care. This means that resources are used to promote the survival and growth of the existing young ones rather than to produce a larger number of offspring. Among nonsocial group, time and energy may be spent in placing eggs into the tissue of plant host (saw flies) or host insect (parasitic forms) or in the production and provision of nest. The existence of this tendency to parental care has undoubtedly been important in the evolution of social hymenoptera. It is not easy, however, to trace the development of ants socially from pre-existing parental behavior (Brain et al., 2005).

There are many ants familiar to man but many are seldom seen, living almost entirely underground or foraging only at night. Ants (supper family, formicoidea) have worldwide distribution. Some certain genera and species are present in almost all countries and in all places. They

Fig 1 *Messor galla* around their nest

are among the successful insects which occur everywhere in terrestrial habitat and outnumber most of other terrestrial animals in individuals (Borrer et al., 1989 and Taylor, 2007).

Some species due to some certain characters such as their social organization are considered as their successful invaders (Moller, 1996, Williamson and Filter, 1996). Among the interesting or usual ants is Messor galla (Dawning, 2007).

Messor galla are commonly called stinging ants, Cow Killers, giant fire ants, giant read ants, army ants, field ants and cycle ants. The circle ant is a severe pest in southern U.S, Tropical Africa and all temperate Regions. They tend to be mistaken for fire ants but they have no relationship and are much larger (Griffin, 2008). They are called harvester ants because they hoard seeds and tend to harvest out a circle of area in turf a few feet in diameter with their entrance hole at the center of the circle of bare ground. The harvester ants not only construct large mound which causes the loss of grasses but also clear area of grasses from the central nest and along the foraging trails from the central mound.

Cleared areas around the nest may be 7m or more in diameter. Generally, nests are constructed in farmland, recreational areas and occasionally lawns. It is also thought that they may hinder receding of different grasses by collecting seeds. The presence of Messor galla in the farmlands brings about losses to man, which according to Ayertey (1986) and William (2001), have been classified as quantitative and qualitative losses. This include loss in seed viability, economic loss, which occur when such a loss reduce the income or necessitates expenditure attack on stored or field crops necessitate the application of control measures such as the use of insecticides which cause a lot of financial involvement. Some of the chemicals used as insecticides are hazardous which may lead to out-break of diseases and damage to human health and their domestic animals. Messor galla sometimes feed on germinated crops and/or remove seeds during planting from the planted holes to their nests, leading to missing stands and staggered planting that result to low yield. The search for effective non-toxic and affordable substance against Messor galla is of paramount importance in order to boost nation's economy, improve human health and provide sufficient food for human and animal consumption.

Statement of Problems

Ninety percent of the entire population in the study area is farmers who are faced with farming problems caused by harvester ants, more especially at planting period. The seed dressing chemicals are not available resource of poor farmers. Hence, after seedling establishment they continue to supply missing stands leading to staggered planting. Control of the Messor galla activities is done by cultural method, such as blocking their nest with sand or exposing their nest to flood which is not efficient. This situation has led to search for alternative seed dressing agents that are effective, available and within the reach of the poor.

Aims & objectives of the studies

The broad aim of the study was to evaluate the effectiveness of Balanite aegyptiaca as seed dressing agent for the control of harvester ants on sown and broadcasted seeds.

The specific objective includes:

1: Compare the effectiveness of leaf, stem, seeds, and root extracts of Balanite aegyptiaca as seeds dressing agent against Messor galla.

2: Compare the effectiveness of water extract of Balanites aegyptiaca with apron star 42ws as seed dressing agent against Messor galla. The study of the effectiveness of Balanite aegyptiaca extract is of utmost importance in health care delivery, boosting nation's economy and sustaining ecological balance. The inference derived from the study if very effective, would be used to substitute some of the hazardous chemical pesticides/insecticide. This would go a long way in reducing burden due to the effect of Messor galla and burden due to the effects of hazardous pesticides on both man and animals.

Methodology

Study area & Sites

The study was conducted in Kala'a, Hong Local Government Area of Adamawa State (Fig. 2). Adamawa State is located on Northeastern zone of Nigeria. It lies between latitude 70 and 11N0 of the equator and between longitude 110 and 140E of the Greenwich Meridian. It share boundary with Taraba State in the south and west, Gombe State in its Northwest and Borno to the north. In addition, it has an international boundary with Cameroun along its Eastern border. The state is divided

Into 21 Local Government Area.
The moderate mean rainfall is about 900mm and this area is ideal for the production of crops like Sorghum, Maize and Millet. The Temperature is at its peak in April about 400c, which may drops significantly at onset of the rains May/June. The town is estimated to accommodate 12,000 people. The indigenes are mainly farmers and few civil servants.

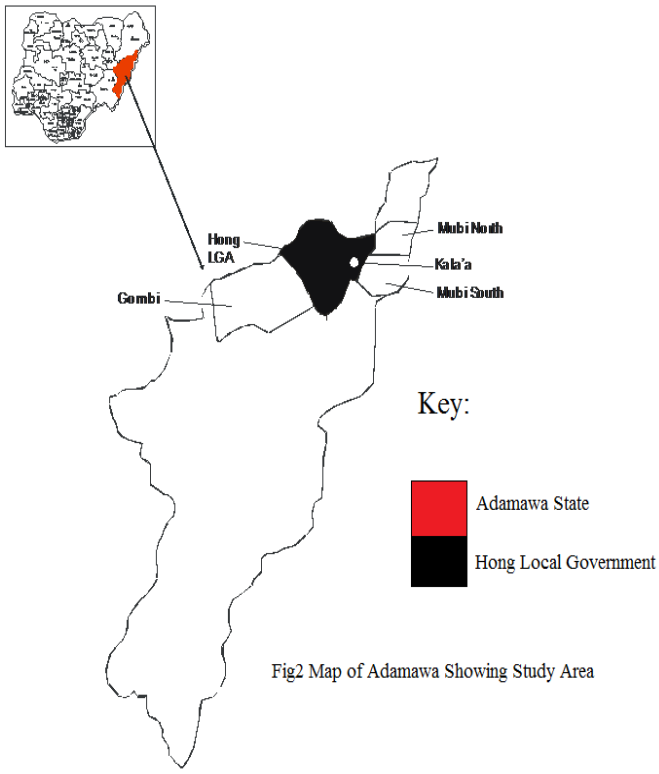

Fig2 Map of Adamawa Showing Study Area

Materials

Materials used during the study include Petri-dishes, freshly prepared Balanite aegyptiaca seed powder, Balanite aegytian root powder, Balanite aegyptiaca stem powder, Balanite aegyptiaca leaf powder and apron star 42ws. Others were Biniseeds, Millet and Sorghum, marker, wide mouth bottle and water for dilution.

Preparation of Balanites aegyptiaca Extracts

The ripped seeds of Balanites aegyptiaca were collected under the trees in Yola Army Barracks; then decorticated, winnowed, shade dried, before it was pounded into fine powdered form, using motor and pistil. In similar ways, the fresh leaves were from the plant, shade dried before it was pounded to fine powdered form.

The stem bark were remove from the Balanites aegyptiaca stems by axe the air dried before it was pounded to fine powdered form. The roots were dig out from the ground by hoe, and was cut out by axe, then shade dried, before it were pounded to fine powdered using motor and pistil. The Apron star42WS were bought at Jimeta market from Mustafa agro-chemical store.

Experimental Design

Twenty four (24) Messor galla nests were used for the experiment. These were divided into site A and B, each with 12 Messor galla nest

Method

Site A was used for placing Petri-dishes with deferent treatment around the nest and site B was used to plant the seeds treated with deferent treatment in rows.

Seed Dressing

Before placing the treated seeds into Petri-dishes, Petri-dishes were labeled with a marker for a clear differentiation. Seeds treated with B.aegyptiaca seed powder were marked as TS. Seeds treated with B.aegyptiaca leaf powder were marked as TL. Seeds treated with B. aegyptiaca root powder were marked as TR. Seeds treated with B.aegyptiaca stem bark powder is marked as TST. Seeds treated with apron star 42WS were marked as TA. The untreated seed were marked as US.

1000 grams of Sorghum wetted with water were mixed with 20grams of Balanite seed powder of these one hundred grains were counted and placed into a labeled Petri-dish and the same procedure repeated for Millet and Biniseeds. 1000 grams of sorghum wetted with water were mixed with 20grams of Balanite leaf powder. Then, one hundred grains were counted and placed into a Petri-dish and the same procedure repeated for millet and Biniseeds. 1000grams of Sorghum wetted with water were mixed with 20grams of Balanites stem powder. One hundred grains of the sorghum were counted and placed into a Petri-dish and the same procedure repeated for millet and Biniseeds.1000grams of sorghum wetted with water mixed with 20grams of Balanite root powder.

Then, one hundred grains were counted placed into a Petri-dish and the same procedure repeated for millet and Biniseeds.1000grams of sorghum wetted with water mixed with 20grams of apron star 42WS. Out of this, one hundred grains were counted and placed into a Petri-dish and the same procedure repeated for millet and Biniseeds.100 grain of sorghum, millet, and Biniseeds untreated seed were placed into Petri-dishes which served as the control.

Site A of the Experiment

The Petri-dishes containing the preparations were placed around the Messor galla nests and these were kept under observation for a period of five (5) hours, from 6:00 to 10:00am after which observation was made. The various treatments were placed one metre around the nests. After five hours the number of seed left on the petri-dishes were counted, and subtracted from initial seed placed, this gave the number of seed picked by Messor galla for each treatment. The data observed was subjected to ANOVA.

Site B of the Experiment

This site was used for planting deferent treated seeds in rows. The seeds treated with different treatments were planted in rows, as row A, row B, row C, row D, row E and row F. Row A. was used for seed treated with seed powder. Row B was used for seed treated with leaf powder. Row C was used for seed treated with root powder. Row D was used for seed treated with stem bark powder. Row E was used for seed treated with apron star 42 WS. Row F was used for untreated seed. The site was divided into three (3) classes (B1 B2 B3)

B1 was used for sorghum

B2 was used for millet

B3 was used for Biniseeds

The Sorghum seeds planted on site B1 were left for six days before the data was collected. The seedlings were counted and recorded. The same procedure followed for millet seeds planted on side B2. The Benny seeds planted on site B3 were left for four days, then the seedlings were counted and recorded, each Messor galla has six rows,(A-F), and have six seeds per hole.

Result

Mean Percentage of Sorghum, Millet, and BiniSeeds Picked by Messor gallaAnd Mean of Germinated Seed.

The results of the sorghum, Millet and Biniseeds treated with Balanite aegyptiaca extracts and apron star 42WS as dressing agent against Messor galla, are presented in table 1.

The Table depicts the mean percentage of millet, sorghum and Biniseeds picked by the Messor galla on site A and the mean of germinated seed on site B, in the study area. Statistical analysis showed that there was significant difference at 0.01 between all the treatments used on site A. There was no significant difference between the treatments used on sites B1 and B2 but there was significant difference at 0.05 significant level among the treatments used on site B3.

Efficacy of various treatments on sorghum seeds against Messor galla

The mean percentage of sorghum seeds picked by the Messor galla for the first week (Fig 3) were, leaf powder (89.83), stem back powder (98.42), root powder (91.42%), seed powder (47.25%) Apron star 42WS (68.92) and control (96.92%) (Table 1) when this were compared statically, there was a significant ($F.cal=4.53<0.05$) difference. The mean percentages of leaf powder (60.00%), stem bark powder (61.50) root powder (73.25%), seed powder (29.33%) Apron star 42WS (50.00%) and control (87.00%) showed significant ($F.cal=4.33<0.05$) difference in week three.

Fig 3 shows the mean difference from the control of sorghum seed picked by the Messor galla on site A of the experiment. Seed powder (47.25%), based on the least significant difference (LSD) analysis, proved to be the most effective seed dressing agent among all the treatment agents used in week one. Although mean result of Balanite aegyptiaca seed powder (47.25) is less than the mean result of Apron star 42WS (68.92), but the least significant difference (LDS) procedure showed that seeds picked by Messor galla from the two treatments were not significant different.

The statistical procedure showed that mean seeds picked by Messor galla from treatment with B. aegyptiaca root powder (91.42%), B. aegyptiaca stem powder (98.43%), B. aegyptiaca leaf powder,(89.83%) was not significantly different from the control. Result of week two of the experiment, showed that, B. aegyptiaca leaf powder (78.70%) and B. aegyptiaca stem bark powder (83.00%) were not significantly different from the control. B. aegyptiaca seed powder (22.85%) proved to be the most effective treatment agent used in seed dressing, among all the treatments agents used, because it has the least mean of seed picked by Messor galla followed by Apron star 42WS (56.92%) and root powder (61.92%) Result of week three (3) of the experiment on sorghum seeds, showed that the root powder (73.25%), and stem bark powder (61.50), were not significantly different from control while leaf powder (60.00%), seed powder (29.33%) and apron star 42ws (50.00%) were significantly different from control. The most effective seed dressing agents was seed powder (29.33%).

	. Mean % of Sorghum			Mean % of Millet			Mean % Benny seeds			Mean of germinated seeds		
Treatment	**week1**	**week 2**	**week 3**	**week1**	**week 2**	**week 3**	**week1**	**week 2**	**week 3**	**week1**	**week 2**	**week 3**
Leaf powder	89.83	78.70	60.00	**90.00**	**74.50**	**78.00**	86.69	76.42	66.80	17.50	15.00	12.00
Stem powder	98.42	83.00	61.50	95.73	67.75	75.00	88.17	60.17	53.75	18.50	16.25	12.50
Root powder	91.42	61.92	73.25	98.33	65.17	82.45	97.08	81.25	56.73	16.75	17.00	12.00
Seed powder	47.25	22.85	29.33	30.24	14.85	14.25	42.50	23.97	18.25	16.75	15.00	11.50
Apron star 42 Ws	68.92	56.92	50.00	66.24	35.08	29.25	70.42	42.50	35.33	17.50	14.00	08.75
Control	96.92	90.00	87.00	98.20	98.25	95.08	98.83	86.50	67.07	16.75	18.00	10.50
Significant difference	**	**	**	**	**	**	**	**	**	ns	ns	*

ns = Non Significantly different

** = Significantly different at 0.01

* = Significantly different at 0.05

Table 1: The mean of sorghum, millet, Biniseeds, picked by *Messor galla* on site A and mean of germinated seeds on site B in the study area

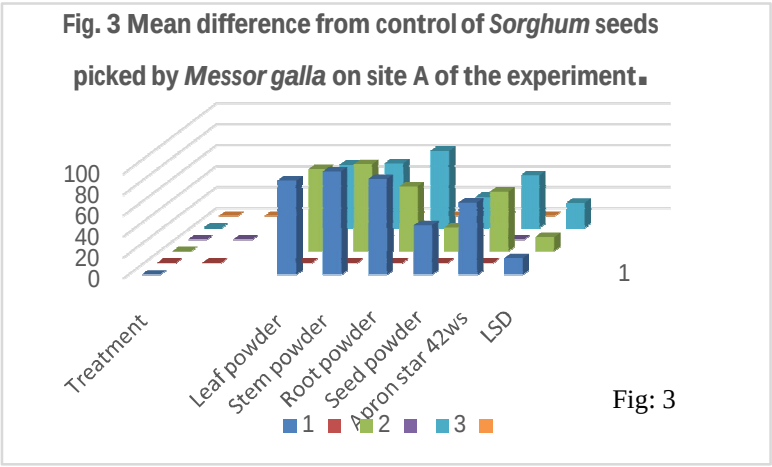

Fig: 3

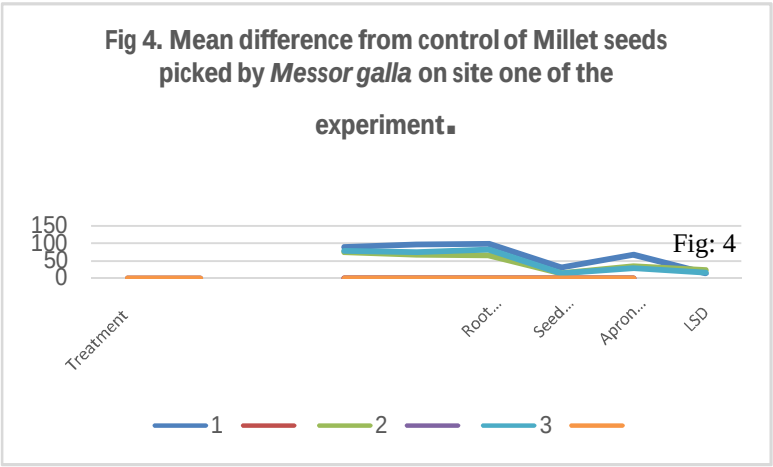

Fig: 4

Treatment	Mean	Difference from Control	Mean	Difference from Control	Mean	Difference from Control
Leaf Powder	86.69	1.75^{ns}	76.42	5.25^{ns}	66.80	0.25^{ns}
Stem Powder	88.17	10.66^{ns}	60.17	10.08^{ns}	53.75	1.35^{ns}
Root Powder	97.08	12.16^{ns}	80.25	26.33^{ns}	56.73	13.75^{ns}
Seed Powder	42.50	53.33^{*}	23.25	58.58^{*}	18.25	31.75^{*}
Apron Star 42ws	70.42	28.38^{*}	42.50	44.00^{*}	35.33	48.83^{*}
LSD	14.31		22.47		27.46	

Table 2: Mean Difference from Control of Biniseeds picked by *Messor galla* on site A of the experiment.

Effect of various Treatments on Picking of Millet Seeds against Messor galla

The mean percentages of Millet seeds in weeks (one, two and three,) are presented in table one. The leaf powder (90.00%), stem bark powder (95.73%), root powder (98.33%), seed powder (30.24%), apron star 42ws (66.24%), and control (98.20%), were significantly (F. Cal=25.08<0.05) different in week one. The mean percentages of week three, leaf powder (74.50%), stem powder (67.75%), root powder (65.17%), seed powder (14.85%), apron star 42WS (35.08%), and control (98.25%) showed significant different (F. cal=6.84<0.05). The mean percentage of week three (3), leaf powder (78.00%), stem powder (75.00%), root powder (82.45%), seed powder (14.25%), apron star 42WS (29.25%) showed significant F.cal=25.79<0.05) different in week three.

Fig 4 shows the mean difference of millet seeds picked by Messor galla from the control. Results of week one of the experiment, leaf powder (90%), stem bark powder (95.83%), and root powder (98.33%), showed no significant different from the control, while seed powder (30.25%) and apron star 42WS (66.42%), showed significant difference from the control.

Result of week two of the experiment, leaf powder (74.50%), stem powder (67.75%), and root powder (65.17%), showed no significant difference from control (78.25%), while apron star 42WS (35.08%,and seed powder (14.83%), showed significant difference from control. Seed powder (14.85%),proved to be the most effective seed dressing agent, followed by apron star 42WS (35.08%).

Result of Week three (3) of the experiment, the result of the mean difference showed that seed powder (14.25%), was the most effective agents, followed by apron star 42WS (29.25%).

Leaf powder (78.00%) and stem bark powder (75.00%), showed significant difference from control. Based on the statistical analysis, it is only the root powder (82.45%) that showed no significant difference from the control.

Effects of Various Treatments on Picking of Biniseeds against Messor galla. The mean percentage of the week one (table one), stem powder (88.17%), leaf powder (86.69%), root powder (97.08%), seed powder (42.50%), apron star 42WS (70.42%) and control (98.83%) were significantly different (F. cal=13.17<0.05). The mean percentage week two, stem powder (60.17%), leaf powder (76.42%), root powder (81.25%), seed powder (23.97%) apron star 42WS (42.50%) and control (86.50%) were significantly different (F. cal=7.12<0.05). The mean percentage of week three; stem bark powder (53.75%), Leaf powder (66.80%) and root powder (56.73%) are not significantly different from the control. Seed powder (18.25%), apron star 42WS (35.33%) were significantly (F.cal=2.91<0.05) different. Table 2: Showed the mean different of Benny seeds picked by Messor galla from the control on site A of the experiment, leaf. Powder (86.69%), stem powder (88.17%) and root powder (97.08%) showed no significant difference from control in week one. Seed powder (42.50%) is the most effective seed dressing agents, followed by apron star 42WS (70.42%) of the seeds picked by the *Messor galla*

Week two of the experiment; stem bark powder (60.17), leaf powder (76.42%) and root powder (81.25%), showed no significant difference from the control, while seed powder (23.97%) and apron star 42WS (42.50%) showed significant difference from control. Seed powder (23.97%) proved to be the most effective seed dressing agent, followed by apron star 42WS (42.50%) Week three (3) of the experiment; the result showed that leaf powder (66.80%), stem bark powder (53.75%) and root powder (56.75%) were not significantly different from control. However, seed powder (18.25%) and apron star 42WS (35.33%) showed significant difference from control.

Effect of Various Treatments on Planted Sorghum, Millet & Biniseeds

Treatment	Type of Seeds		
	Sorghum	Millet	Biniseeds
Leaf Powder	17.50	12.00	15.00
Stem Powder	18.50	16.25	12.50
Root Powder	16.75	17.00	12.00
Seed Powder	16.75	15.00	11.50
Apron Star 42Ws	17.50	14.00	8.75
Control	16.75	18.00	10.50
Significant Difference	ns	NS	*
LSD			2.50

Table: 3 The Mean of germinated Seeds

Millet showed no significant difference from control, but the germination of Biniseeds showed significant difference among the treatments used.

Table 4: Shows the mean percentage from control. Based on the LSD procedure apron star 42WS (8.75%) proved to be the most effective seed dressing agent on the planted seeds.

Treatment	Mean	Difference from Control
Leaf Powder	12.00	0.5^{ns}
Stem Powder	12.50	0.0^{ns}
Root Powder	11.00	0.5^{ns}
Seed Powder	11.50	1.5^{ns}
Apron Star 42 Ws	8.75	3.75^{*}
LSD	2.50	

Table 4: Mean difference of germinated Biniseeds on site B from the control of the experiment.

Discussion

The results of this study showed that Messor galla is one of the leading pest problems in the area .This is because up to 98.25% of the untreated seeds were picked by the ant. This is in agreement with the report by Sud et.al (1986), that *Messor galla* is the major pest on broadcasted seeds, it is the most common cause of missing stand after the seedling establishment during the planting period.

The result indicated that B. aegyptiaca seed powder and apron star 42WS were the most effective seed dressing agents used. However when the two treatments were analyzed separately and results compared seed powder appears more effective than apron star 42WS. In week one of the treatment on sorghum, apron star 42WS and seed powder were both effective at F.cal=4.53<0.05. However, when the subjected to least significant difference (LSD), the result showed that seed powder (42.25%) was more effective than apron star 42WS (68.92).

This study has also evaluated the effectiveness of B. aegyptiaca extracts and apron star 42WS as seed dressing agents for the control of Messor galla on sown seeds. The treatments used on B1 and B2 showed no significant difference among the treatment. This indicated that *Messor galla* had no impact on sown seeds. This is in line with the findings of Casper et al. (2007) and Theodor (2006) who observed that once the seed has gone beneath the soil, *Messor galla* cannot remove them.

Conclusion

The activity of *Messor galla* is noticed throughout the year although they were more active during planting and harvesting season. *Messor galla* cause serious economic loss to farmers and even non farmers in the whole globe, more especially in the tropical region. This pest can effectively be controlled with *B. aegyptiaca* Seed powder which is readily produced from *B.aegyptiaca* seed nuts which are in abundant supply in our environment without causing any hazard to man, domestic animals and environment in general.

References

- Ayertey, R.P. (1986): Ant Dependent food plants, selection by the Mistle Joe butterfly ogyria Amarylis 8 60-63pp.
- Brian, M.V., Downing, M. (2005): Social insect colony and behavioral
- Chapman and Hall-London. London Chicago 166-173pp
- Borrel, D.J., Triplehorn, C.A.., Johnson, N.F. (1989): An introduction to the study of insects 6th edition saunders college. 35-41pp
- Casper, s., Xavier, E., Isabell, H., flavior R. (2007): Seed predation by the
- tussock –grass (stipa tenacissima by ant (Messo Spp) in south eastern Spain: The adaptive value of trypanocarpy. Original research article journal of Aridenviroment volume 56, 43-61pp
- Darwin, C. (2007): The origin of species by means of natural selection.
- Princeton University Press. 263-270.
- Franks, N.R., Sudd, H. (2004). Sexual computation during colony
- Formation (Eeiton-Burehelli) beharvioral ecology. sociobiology, 18. 67-96pp.
- Moller, D., (1996): Lesson of invasion in theory from social insects.
- Biolcons 78:125-142pp
- Sudd, J. H., Nigel, R. (1989): The behavior and ecology of ants
- Oikos 4: 35-46pp
- Taylor, B. (2007): The ants of (sub-saharan) Africa available at : http://
- antbase.org/ants/Africa.U.S.A Chapman and Hall New York
- Theodor, B. (2007), Larvicidal activity of saponin containing extract and
- fractions seed mesocarp of Balanites aegyptiaca, fitoterapia, 77 (6), 420-424pp.
- William, J. (2001): The nest Structure and caste of the harvester ants Messor galla. New York. Molecular Biology. 24: 234 -238pp.
- Williamson, M., Fitter, A. (1996): the varying success of invaders
- Ecology 77; 1661-1666pp.