Global Scientific JOURNALS

GSJ: Volume 6, Issue 1, January 2018, Online: ISSN 2320-9186
www.globalscientificjournal.com

THE EFFECT OF NEEM AND GALLIC AS PESTICIDE IN COWPEA STORAGE

Isinkaye, O D', Oke D. O²

1. Department of Agricultural and Bio-Environmental Engineering, The Federal Polytechnic, School of Engineering, Ado Ekiti, Ekiti State. Nigeria.

2. Community College of Allegheny County, Pittsburgh, PA, United States.

Email ijeluekiti@gmail.com
Mobile +2347032614238

Abstract

Experiments were carried out to investigate the bio-chemical properties of neem and garlic as, pesticide, in the post-harvest storage of agricultural grains in south-western Nigeria. Forty containers with one hundred good quality dried-cowpea seeds were selected. Each container was filled with healthy, bean weevils. Ten out of the twenty containers were treated with grounded -powdered garlic and labelled (A.). The second set of ten containers were separately treated with neem extracts mixed in different ratios of 1:1, 2:1, 3:1, 2:3, 3:2, 4:1, 1:4, to give weights of 5g, 10g, 15g, 20g, 25g, 30g, 35g, 40g and 45g respectively, and were labelled(B). Another ten containers were added a mixture of garlic and neem at ration 1:1 and labelled (C) while the fourth set of containers were used as control without the addition of any pesticide and labelled (D). Each container was perforated at the top, before being sealed. From the test results, the longer the insect were exposed to neem and garlic, the more the mortality of insects. Also, it was observed that garlic was more potent in controlling insects with high mortality of beans weevils recorded.

Keywords: Neem, Garlic, Pesticide, post-harvest, Cowpea and Weevil.

1. INTRODUCTION:

There have been new innovations and great improvement in techniques and machineries used for agricultural productions, which have over the years been increasing the yield and quality of agricultural produces. This has necessitated the great need for effectiveness in preserving the bumper harvests.

Over the years, man have been adopting various mean of preserving and protecting his agricultural produces, method used among others includes; smoking, drying, freezing, spraying with chemicals and application of some fumigants against spoilage caused by insect and pest attack. Some farm produces and food preserved with chemical/pesticides have been observed to contain some chemical residues which is injurious to human and animal health (Whitford et al, 2010). Pesticides was introduced, which is a chemical substance intended for preventing, destroying or controlling pests, including vectors of human or animal diseases, unwanted species of plant or animals causing harm during or otherwise interfering with the production, processing, storage of agricultural commodities (FAO, 2002). According to Kunuiki 2001, pesticides prevent crop loss to insects and other pests.

However, the consequences of using pesticides for food production and the realization that some foods do contain chemical residues are of paramount to today's health conscious consumer. According to the Whitford et al (2010) selecting produce, foods that are certified free of pesticides residues are most preferred. The dangers of pesticide used can be difficult to pin point, since exposure may be small but cumulative, prolonged pesticide exposure in human may negatively affect the nervous, reproductive and immune system and also raises the possibility of increased risk of some cancers (Christos, et al 2011). A study conducted by the World Health Organisation (WHO) and United Nations (UN) environmental programme estimates that each year, three million workers in agricultural sector in the developing world experience severe poisoning from pesticides, about eighteen thousand of whom died as reported by (WHO, 2004).

Environmental effects of some pesticide on non-target species are sometimes detrimental as some insecticides kill or harm other creature in addition to those they are intended to kill. Birds maybe poisoned when they feed on food that was recently sprayed with insecticides or when insecticide granule were mistakenly or accidentally discharged on food materials (Christos and Ilias, 2011).

The increasing reported cases of food poisoning arising from the harmful chemicals used in preserving food calls for shift away from chemical preservations of agricultural produces. In February, 2008, the National Assembly House Committee on Health in Nigeria alerted National Agency for Food and Drug Administration Committee (NAFDAC) of health hazard incident in Yobe State alleged to be due to the preservation of beans with chemicals. In view of the risks, there is a need for an alternative means of preserving agricultural produces. Hence, the need for investigation into the effectiveness of the preservative properties of Neem and Garlic is unique and timely.

Neem Plant

Neem (Azadirachta indica) is a fascinating tree that is native to India and Burma (BOSTID, 1992). Neem can be found in virtually all areas in Nigeria, it is normally called "dongoyaro". In most areas, it is being used as source of shade due to its many foliage and also as medicinal most especially for malaria treatment. Neem potential for controlling pest was first noticed in 1959 by a German entomologist (BOSTID, 1992).

The plant contains some compounds which are useful for pest control. Good example is limuloids which are useful for insect and pest control (Neem Foundation, 2010). Study revealed that Neem extracts could influence almost 200 insects' species. Below is the table showing the effects of Neem products on some insects.

Table 1: Effect of Neem and its products on some insects

White fly	Repels, retards growth, inhibiting feeding.
House fly	Inhibits feeding, disrupts moulting, repels.
Head lice	Kills, very sensitive to neem oil.
Beam aphid	Reduces fecundity and moults.
Rice gal midge	Toxic.
Corn earthworm	Retards growth, repels adults, inhibits feeding and disrupts moulting, toxic to larvae.
Rice weevil	Inhibits feeding, disrupts growth toxic
Cowpea weevil	Inhibit feeding, toxic
Flea beetle	Inhibit feeding.

Source: Neem- A tree for solving Global Problem (BOSTID, 1992)

Garlic

Garlic is a member of the lily family, liliaceae. It is a relative of the onion and leek and other species containing the aromatic sulphur-base compound which contributed to the characteristic odour and taste. Garlic was indigenous to Europe and Western Asia (Christopher H. 1998). There are about 400 varieties of garlic. The most commonly cultivated and eaten form of garlic is "Allium sativum". There are two sub-varieties of Allium sativum namely soft neck garlic and hard neck garlic. Garlic is used and cultivated for food and medicine. It has ability or potential to effectively preserve and protect food substance against deterioration occasioned by pest or insect attack (Beneforce, 2002).

Garlic as pesticide

Garlic contains chemicals that are isolated from each other until a clove is bruised, cut or crushed. When a clove of garlic is minced, and enzyme called allinase come in contact with a substance called allin to produce allicin, the source of garlic aroma and taste (Slopp, 1988). The chemical extracted from this plant is a good repellent and also good in killing insects (Alfred, 1972).

Neem Extracts Preparation

Extracts could be prepared from neem plant in these forms:

a) Water extraction
b) Alcohol extraction
c) Hexane extraction

The formulations could be in form of granules, dust, wet table powders or emulsifiable concentrates (Feuerhake, 1984).

MATERIALS AND METHOD

Preparation of extracts

Green leaves of neem were collected during the raining season (Month of June) and sun dried. Dried neem seeds were also collected and mixed with the sundried leaves. The mixture were pounded in a mortar to smaller particles and stored in an air tight container to prevent it from losing its choky or pungent smell. Soft neck garlic that is common in the local marked here were purchased, peeled and blended in a blender on the day of application to the bean seeds so as not to spoil or grow mould.

Three sets of extracts were prepared, one comprising the mixture of powdered neem leaves and seeds, labelled (A), another comprising blended garlic only, labelled (B) and last comprising mixture of garlic with neem extract in different proportion as (C).

Treatment Method

One hundred (100) Cowpea seeds(Vigna unguiculata) that are whole, free of insect attack were counted into plastic container have perforated covers to allow breathing. The neem extract (grinded leaves and seeds) was applied in concentration of 5g,10g,15g,20g,25g,30g,35g,40g,45g to each container containing 100 cowpea seeds. Matured weevils were then introduced into the containers each container containing 100 cowpea seeds. Ten (10) matured cowpea weevils were then introduced into the containers each. The same treatments were carried out inn garlic labelled (B) Garlic with neem extracts mixed in different ratios of 1:1, 2:1, 3:1, 2:3, 3:2, 4:1, and 1:4, to give weights of 5g, 10g, 15g, 20g, 25g, 30g, 35g, 40g, & 45g respectively. For example, 2.g 5g of neem extract was injected into other sets of 100 beans seeds and 10 matured beans weevils each. These were labelled (C).

A control was introduced labelled (D) which was not treated with any of the extracts. It contains 100 whole bean seeds and 10 number of bean weevils. This was introduced so as to observe, if there would be difference between the survival of weevil in treated beans and that which does not have any of the extract.

Extract A = neem extract + 100whole Beans + Weevils (Treatment)

Extract B= crushed fresh garlic+ 100 whole Beans + 10 Weevils (Treatment)

Extract C = crushed fresh garlic + neem extract + 100 whole Beans +10 Weevils (Treatment)

Extract D =100 whole Beans +10 Weevils (Control)

The experiment was carried out in June and the average temperature and relative humidity of the laboratory in which the experiment was conducted were 26.7^0C and 89%. Observation and readings were taken over 24 hours after applying the extracts and the introduction of beans weevils. Reactions of the beans weevils were observed, mortality rate of the beans weevils were observed. The results were analysed using statistical method called ANOVA.

RESULTS AND DISCUSSION

Results

The results of the experiment are shown in table 2-5

Table 2: Mortality of insects according to the weight of neem extracts for four days

Sample	A1	A2	A3	A4	A5	A6	A7	A8	A9
Day	5g	10g	15g	20g	25g	30g	35g	40g	45g
1	0	0	1	1	0	2	2	2	3
2	1	3	4	2	4	5	4	4	5
3	3	6	7	5	4	6	6	5	6
4	3	7	7	6	6	7	7	8	8

Table3: Mortality of insects according to the weight of garlic extract for four days

Sample	B1	B2	B3	B4	B5	B6	B7	B8	B9
Day	5g	10g	15g	20g	25g	30g	35g	40g	45g
1	2	2	2	5	4	4	4	5	5
2	3	2	3	5	5	6	6	6	6
3	5	6	6	10	10	10	10	10	10
4	6	6	8	10	10	10	10	10	10

Table 4: Mortality of insects according to the weight of neem and garlic for four days

Sample	C1	C2	C3	C4	C5	C6	C7	C8	C9
Days	5g	10g	15g	20g	25g	30g	35g	40g	45g
1	0	2	4	3	5	3	4	3	2
2	2	3	4	4	5	4	5	4	4
3	3	5	5	5	5	5	5	6	4
4	4	6	5	7	6	7	7	9	6

Table 5: Analysis of Variance

Extract		Mortality	
Weight(g)	neem	garlic	neem+ garlic
5	3	6	4
10	7	6	6
15	7	8	5
20	6	10 *	7
25	6	10	6
30	7	10	6
35	7	10	7
40	8 *	10	9*
45	8	10	6

NB: result obtained on the fourth day after application

The results were statistically analysed using ANOVA and also graphically represented in figure 1 and 2 also in table 1.

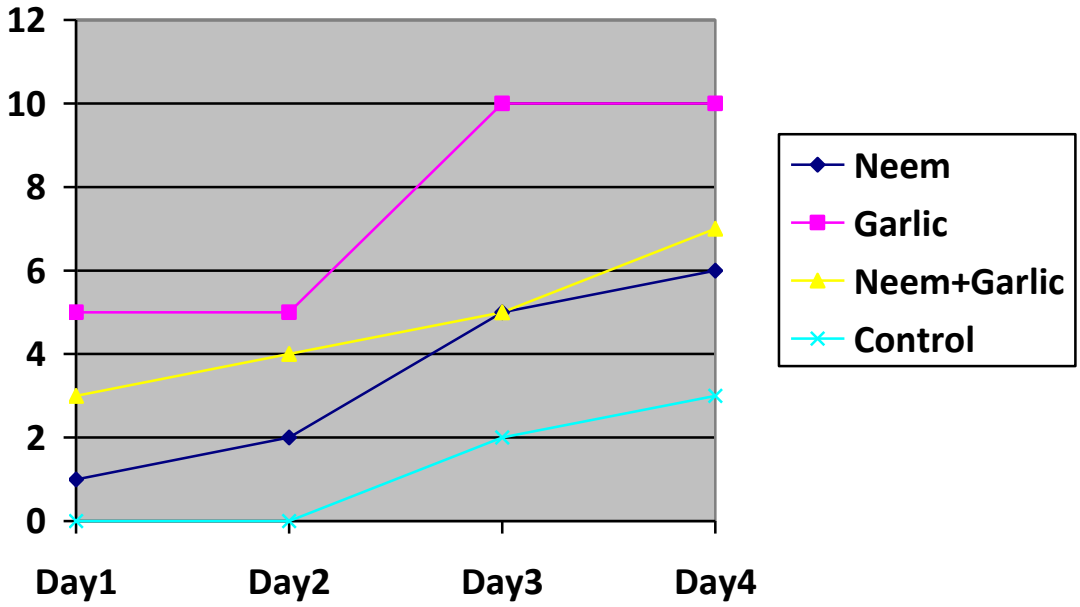

Fig.1. Mortality of insects against days at 20kg extracts

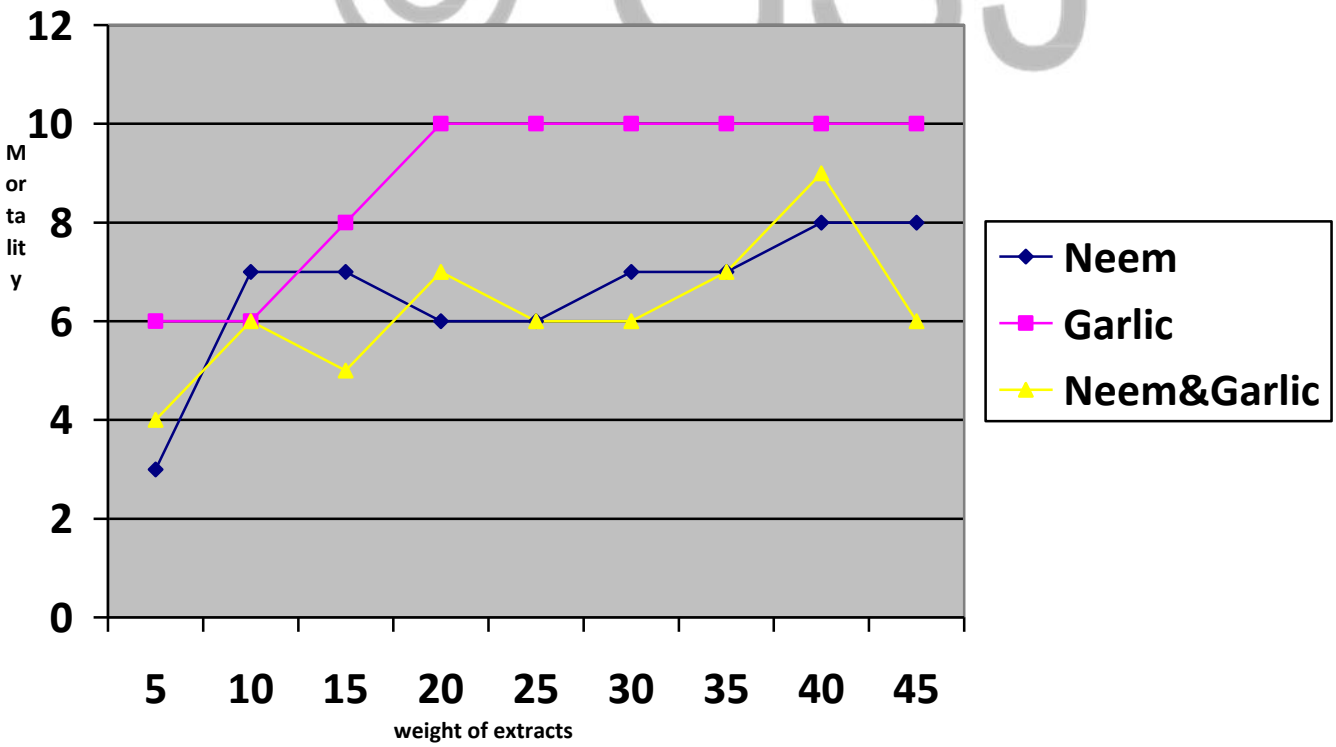

Fig.3.Mortality against Weight on the fourth day after application

Table 7: ANOVA Table

Source of variation	D.F	SS	MS	F.CAL	F tab (5%)
Weight	8	42.67	5.33	5.33	0.05
Extract	2	38.00	19	19	3.63
Error	16	16.00	1		
	26	96.67			

H_0 is rejected (observed f is greater than tabulated f at 5% significant level.

RESULTS AND DISCUSSION

Effect of Neem Extract on insects

Cowpea weevils in day one of the experiment (A1) were no mortality recorded in experiment A1and A2 with small quantity (5g and10g) but there was mortality recorded in 15g and above. This shows that the quantity or dosage applied has significant. It was also observed that the mortality of insects increases with days. That is due to long exposure to neem extracts. This result validated the earlier report of Neem Foundation 2010 which state that liminids in neem possess potent chemicals such as azadirachin which reduces the feeding behaviour of many species of insects and pests.

Effect of garlic extract on the insects

From table 2, it was observed that there was sharp disparity between the potency of garlic on insect than neem. With the same dosage of garlic as the neem applied on the bean weevils under the same condition, it was observed on the first day of application of the garlic extract that mortality of insects were 2, 2 , 2 , 5 , 4 , 4 , 5 and 5.In contrast, table 1 where neem extract was applied with exact doses and under same controlling condition, the mortality of insect on first day after application of garlic were 0,0,1,0,2,2,2 and 3 in the storage containers. The observation shows that mortality rate of insect on the application of garlic extract was higher than in neem extract. Total mortality was recorded on the third day of application of the garlic extract of 20g and above. This is to say that 20g of garlic extract is enough in the storage container to cause total mortality of insects. **T**he reason of the high mortality of insect in garlic extract could be the presence of allicin which is known to repel insects and prevent insect from feeding that eventually leads to mortality.

Effect of mixture of garlic with neem on insects

From table 3, on the first day after application of the extract, container C_1 containing 5g of the mixture did not record any mortality of insect. Observation from other containers i.e. C_1, C_2, C_3, C_4, C_5,C_6, C_7, C_8 and C_9 containing 10g, 15g, 20g, 25g, 30g, 35g, 40g and 45g of the mixture in definite proportions, show that there is not a definite pattern of change in the mortality of the insects. Although mortality rose from zero to five inC_5, as the weight increased to 45g inC_9, mortality reduced to two. On the contrary to table 2 whereB_4, B_5, B_6, B_7, B_8 and B_9 have a record of total mortality; C_4, C_5, C_6, C_7, C_8 and C_9 have a record of 7,6,7,7,9 and 6 mortality. This shows that the combination of garlic and neem is less effective on insects than garlic only.

CONCLUSION AND RECOMMENDATION

Conclusion

From the result of the study, it is concluded that neem and garlic are very good in preserving grains such cowpeas and others. It was also concluded that:

- Neem has pesticidal property. The constituent in neem which is responsible for such property is azadirachtin.
- Garlic has pesticide property. Allicin present in garlic account for this property
- Garlic is more effective in the preservation than neem
- The mixture of neem with garlic is less effective than garlic only but more effective than neem only
- The higher the concentration of neem, the greater the mortality of insects, thus higher concentration enhances the preservative effect of the extract.

Recommendation

Potential hazard to consumers from contaminant of food with pesticides residue are currently a major public concern. Consumers of food wish that the food they consume be safe. Recently, the deaths from contaminated foods arising from chemical pesticide call for a better and effective plant pesticide. The extract from garlic and neem as plant pesticides bridge the gap. Neem and Garlic are hereby recommended for use as pesticide in crop preservation. It is also recommended that further works on its application be pursued or carried out.

REFERENCE:

[1] **Alfred, (1972):** *Neem- A Tree Of Life*: **Awake!** *August2: (30-31)*

[2] **Beneforce (2002):** Garlic Information: Poor Man's Treacle, Garlic Scoot Publishers. New Jersey.

[3] **Board of Science and Technology International Development BOSTID (1992):** NEEM – A Tree for Solving Global Problems. National Academy Press. Washington D.C.

[4] **Christopher, H. (1998):** Garlic- The Pungent Panacea.

[5] **Chistos A. Damalas and Ilias G. Eleftherohorinos, (2011):** Pesticide Exposure, Safety Issues, and Risk Assessment Indicators. International Journal of Environmental Research and public Health, v8 (5) May, 2011. Pmc31o8117

[6] **FAO, (2002)**: International Code on the Distribution and Use of Pesticide

[7] **Feurehake, K.J. (1984):** Effectiveness and Selectivity of Technical Solvents for the Extraction of Neem Seed Components with Insecticidal Activity. Leisenhistein – Keng.

[8] **Food science central, (2010):** Garlic-Natural Preservative for Bread and Chicken **[Online].** http://www.foodsciencecentral.com/fsc/ixidl3955**[**2010, **January 14]**

[9] **George, M.L. and Thomas M.P. (2007):** Evaluation of caffeine and Garlic Oil as Bird Repellents*:*Wildlife Damage Management, Internet Centre for USDA National Wildlife Research Centre-Staff Publications. University of Nebraska

[10] **Hile, A.G., Zhihxing, S., Zhang Z and Block E. (2004):** Aversion of European Starlings (Stumus vulgaris) to Garlic Oil Treated Granules*:* **Garlic Oil as an Avian Repellent.**

[11] **Kuniuki, S (2001):** Effect of Organic Fertilization and Pesticide Application on Growth and Yield of Field-Grown Rice for 10 Years. Japanese Journal of Crop Science vol. Issue 4, pages 530&531

[12] **Slopp J., (1988):** Garlic and its Smell. Spices of the Ancients. International Institute of Tropical Agriculture.

[13] **Mason, J.R., and Linz, G. (1997):** Repellent of Garlic Extract to European Starlings. Crop Production 16: 10

[15] **Neemfoundation, (2010):** *All about Neem* **[Online].** http://www.neemfoundation.org/neem- articles/neem-in-organic-farming [2010, **January 14]**

[15] **Oyewole, B.A., Agun, B.J., and Adeoti, O. (2009):** Effect of Salt and Garlic Treatments on Meat Processing. Proceedings of 5^{th} Engineering Forum of School of Engineering, The Federal Polytechnic Ado Ekiti. Pp163-167

[16] **Sallam W., Ishioroshi, M. And Sanejima, K., (2004):** Antioxidant & Antimicrobial effect of Garlic in Chicken Sausage.Lebensmittel – Wisen

[17] **Schmutter, K. And Asher, K.R.S., (1984):** *N*atural Pesticides from the Neem Tree (Azadirachta indica A Juss) and other Tropical Plants. Mason Publishers. Mexico

[18] **Whitford L. and Carl T. (2010):** Pesticides and Food Safety: Purdue Pesticide Program-22

[19] World Health Report 2004. WHO, Geneva; 2004.