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Evaluation of Some Botanical Insecticides against irrigated Onion Thrip (*Thrip tabaci*) on Onion in Maiduguri Borno State, Nigeria

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Abstract: *The experiment was conducted under irrigation during the 2021 dry season to investigate the effects of some botanical insecticides against irrigated onion thrip (Thrip tabaci) on onion in Maiduguri Borno State, Nigeria. The experiment was carried out in the Teaching andResearch Farm of the Department, Agricultural Technology Ramat Polytechnic Maiduguri BornoState, Nigeria. The experiment was laid out in a Randomized Complete Block Design (RCBD) with five(5) treatments replicated four (4) times each. Data was collected on number of insects per plot, number of leaves per plot, number of damaged leaves per plot, and yield weight (kg/ha). All data collected were subjected to analysis of variance (ANOVA) appropriate toRandomized Complete Block Design (RCBD) and means were compared using Least Significant Difference (LSD) at 5% level of significance (Statistix version 8.0). The result obtained from theexperiment showed that, neem seed, neem oil and fresh ginger are effective against onion thrip, especiallyThrip tabaci Compared to papper seed. Therefore, neem seed, neem oil and fresh ginger could be usedin managing plant onion thrip (Thrip tabaci) as an alternative to synthetic insecticides which have environmental hazard in an ecosystem apart from the cost involved in it, and harmful effectsto both human and animals.*

Keywords: Onion thrip (*Thrip tabaci)*, Onion (*Allium cepa*), neem, pepper, and ginger

INTRODUCTION

Onion (*Allium cepa*) is a widely grown herbaceous annual vegetable crop with crops-pollinated and monocotyledonous. Consumption of onion has been increasing significantly in the world party because of the health benefits they possessed (Waiganjo, 2008). In some African countries such as Nigeria, Niger, Ethiopia etc,it is important vegetable produced across a wide ranges latitudes. It is indispensable vegetables crops used as condiments most envisine in Africa. It is one of the oldest known and an important bulbous vegetable crop grown in Nigeria, Niger, Chad, Cameroon and Ethiopia. It is used in preparation of different foods. It has a great potential to produce every year for both local consumption and export with an average yield of 10.77 tons per hectare. (Jensen L, 2001)

The household level, onion cultivation is an important source of income and contribution to food and income security for producers. The onion is often the biggest source of cash income and helps to meet the needs of farmers(Jensen L, 2001).

Onion thrips*, (Thrips tabaci): L. (Theysanopterathripdae)* is polyphagousandhas been recorded on more than 300 species of plants (Gill,*et al.,* 2015).

It is a major insect pest in onion, thrips may cause crops to mature early and subsequent reduce yield. Adult and nymphal stages (immature) of thrips feed rasping the leave and other tissues of plants to release the sap. Which they then consume with punch and suck behaviour that removal leaf chlorophyll causing white to silver patched and streaves the major caused by thripraulping of the leaves enable various plant pathogens to gain entry, thus increasing diseases problems. (Founier *et al*., 2001).

In some of theWest African, thrips are present in all onion growing areas and can cause up to 50% loss in yield by direct feeding as well as reducing the quality and quantity by rasping the leaves and other tissues, onion crops to release the nutrients. Onion field can be destroyed by onion thrip especially in dry season and are the major problem on onion in Nigeria (Johnson, 2002).

Onion is an important vegetable crop and *Thripstabaci* is the major insect pest of onion several synthetic insecticides have been widely used to control onion thrips in field and effective in bringing down pest populations. These chemicalinsecticides are costly and unsafe to humans, animals and environment, particularly to small scale farmers who fail to follow practices of safe handling and application of pesticides more over most small increasing cost of pesticides. These lead to the search for the alternatives control measures which is plant extract that is less toxic, affordable, environmentally friendly and available.

MATERIALS AND METHODS

Experiment Site

The experiment was conducted at Teaching and Research Farm of Ramat Polytechnic Maiduguri, during the year 2019/2020 dry season. Maiduguri is geographically located at latitude 11.5°N and longitude 10.93°E. Maiduguri is climatically characterized by insideous wind, long dry season and short raining season which last for about 3-4 months starts from early July-September with total annual rainfall distribution of 500-600mm. The dry season starts from October and last up to May. Maiduguri temperature is ranges from 22.10°C - 30.90°C have been recorded in the months of April with the highest average temperature have been recorded in the months of January.

Materials used in the experiment are; rake, how, bucket, cutlass, rope, tape, ranging pole, ruller, plastic container, weighing balance, marker, pegs, neam seed, neem oil, fresh ginger and onion seedlings

Sample collection and preparation

The onion seedlings were purchased at Shokari Garden Adjacent to custom of Jere Local Government Area, Maiduguri, Borno State.

Neam (*Azadirachter indica)*seed were obtained at Ramat Polytechnic Maiduguri, the Neam seeds were shade dried then the shell was removed and grinded into powder form, the powdered were weighed using weighing balance in 40g then for the experiment.

The fresh ginger (*Zingiberofficinate*) wasobtained from Maiduguri Monday Market. The Gingerwas weight in 40g was then blended row and used for the experiment.

40g both ginger and neam seed were sucked in 1 liter of water and allow it for 24 hours, it was then filtered using funnel and filter paper, the clean liquid was then used for spraying the field (Experiment field) at the interval of one (1) week for six (6) weeks, using one (1) liter capacity hand held sprayer.

Experimental Design and Treatments

The experiment was laid in Randomized Complete Block Design (RCBD)which consists of (5) five treatments replicate (4) four times each. these are; neem oil 20 ml/L of water, neem seed 40g/L of water,Pepper seed 40g/L of water, fresh ginger 40g/L of water and Control (untreated).

Field Layout

The field was measured at 14×10m given 140m² and the land was demarcated into 20 plots measured in 2×2m each.

Measurement of plant Parameters(Data Collection)

The following parameters were measured and recorded;

- Number of insects per plot: number of insects was manually counted with hands and recorded
- Number of damaged leaves per plot: number of damaged leaves was manually counted with hands and recorded
- Plant height (cm): plant height was measured manually using a thread and transferred to measuring tape.
- Number of leaves per plot: number of t leaves was also manually counted with hands and recorded
- Yield weight per plot: yield weight was measured using sensitive electronic weighing balance.

Data Analysis

All data collected were subjected to analysis of variance (ANOVA) appropriate toRandomized Complete Block Design (RCBD) and means were compared using Least Significant Difference (LSD) at 5% level of significance (Statistix version 8.0) software.

RESULT AND DISCUSSION

Table 1: Effect of Fresh ginger, Pepper seed, Neem seed and oil on Number of Insect (*Thrip tabaci)* at different weeks on Onion plant

Treatments	1weeks	2weeks	3weeks	4weeks	5weeks
Neem oil 20 ml/L of water	0.00	0.00^{c}	0.00^{c}	0.33^{c}	1.00^{c}
Neem seed 40g/L of water	0.00	0.00^{c}	0.00^{c}	0.00^{c}	0.00^{d}
Pepper seed 40g/L of water	0.00	1.00 ^{b}	1.67^{b}	2.67^{b}	3.00^{b}
Fresh ginger 40g/L of water	0.00	0.00^{c}	0.00^{c}	0.33^{c}	0.00^{d}
Control	0.00	2.67^{a}	4.33^{a}	5.67^{a}	8.67^{a}
CV	0.00	35.21	28.46	29.57	10.19
SE	0.00	0.21	0.28	0.43	0.21

Means in the column accompanied by the same letter (a) are not significantly difference at (P< 0.05%) using least significance different (LSD).

Table 1: shows effect fresh ginger, pepper seed, neem seed and oil onnumber of insect at different weeks. At one week, the result shows that, no insect was found in any plot including the control. The findings also shows that, there was no significant different among the plot treated with Neem seed 40g, neem oil 20mil and fresh ginger 40g at 2,3 and 4 weeks.

At 5 weeks, the result shows that, statistically there are significant different among the treatments except between fresh ginger 40g and neem seed 40g (Analysis of Variance at 0.5% level of Significant).

The findings depicts that highest number of insect presence was recorded under Control, followed by Pepper seed 40g. The least number of insects was recorded under Neem oil 20ml and fresh ginger 40g. However, there is no insect present in plot treated with Neem oil20ml at all weeks.

Table 2: Effect of Fresh ginger, Pepper seed, Neem seed and oil onNumber of damaged leaves at different weeks on Onion plant

Treatments	1weeks	2weeks	3weeks	4weeks	5weeks
Neem oil 20 ml/L of water	0.00^{b}	0.67^{bc}	1.17^{b}	0.67^{bc}	0.33^{bc}
Neem seed 40g/L of water	0.00^{b}	0.00^{c}	0.00^{c}	0.00^{c}	0.00^{c}
Pepper seed 40g/L of water	0.33^{b}	1.00 ^{b}	1.17^{b}	1.00^{b}	0.70^{b}
Fresh ginger 40g/L of water	0.00^{b}	0.33^{bc}	0.33^{c}	0.00^{c}	0.00^{c}
Control	2.17^{a}	2.83^{a}	3.50^{a}	5.50^{a}	6.43^{a}
CV	51.64	49.97	25.10	26.26	22.51
SE	0.21	0.39	0.25	0.31	0.27

Means in the column accompanied by the same letter (a) are not significantly difference at (P< 0.05%) using least significance different (LSD).

Table 2: shows the effect of fresh ginger, pepper seed, neem seed and oil onnumber of damaged leaves at different weeks on onion plant. At one week. The findingsshows that, statistically there are no significant different among all the treatments except in control. The

results also shows that, there are significant different among all reatments but, there is no significant different between need oil 20ml and fresh ginger 40g at 2 weeks. Furthermore, there are significant different among all treatments except neem seed 40g and fresh ginger 40g at 3 weeks. At 4 and 5 weeks, the finding shows that there are significant different among all the treatments accept neem seed 40g and fresh ginger 40g on number of leaves affected.

The result obtained shows that control appeared with highest number of leave affected followed by pepper seed 40g while the least leaves damage was recorded under fresh ginger 40g followed by neem Seed 40g. However, there is no number of damage leaverecorded underplot treated with neem seed 40g.

Table 3: Effect of Fresh ginger, Pepper seed, Neem seed and oil onNumber of plant height (cm) at different weeks on Onion plant

Treatments	1weeks	2weeks	3weeks	4weeks	5weeks
Neem oil 20 ml/L of water	6.00^{bc}	8.17^{b}	10.50^{b}	12.83^{b}	13.83^{c}
Neem seed 40g/L of water	6.93^{a}	9.83^{a}	13.67^{a}	15.67^{a}	19.00^{a}
Pepper seed 40g/L of water	5.33^{cd}	7.33^{c}	9.33^{c}	11.67^{c}	13.33^{c}
Fresh ginger 40g/L of water	6.27^{ab}	8.37^{b}	10.33^{bc}	12.67^{b}	16.00^{b}
Control	4.67^{d}	5.77^{d}	6.40^{d}	8.00^{d}	10.33^{d}
CV	7.83	5.15	5.84	4.04	3.93
SE	0.38	0.33	0.48	0.40	0.47

Means in the column accompanied by the same letter (a) are not significantly difference at (P< 0.05%) using least significance different (LSD).

Table 3: shows the effect of fresh ginger, pepper seed, neem seed and oil on plant height (cm) at different weeks on Onion. The result reveals that, at week one there are significant different among all treatment. At 2weeks, statistically there are significant different among the treatments except in plot treated with neem oil 20ml and fresh ginger 40g. However, at week 3 there are significant different among all the treatments. At week four no significant different exist between neem seed 20ml and fresh ginger 40g, but in other treatments there are significant different. While at 5 weeks significant different exist among all the treatmentson plant height (Analysis of variance at 05% level of significant).

The findings revealed that Neem Seed 40g recorded with highest plant height followed by fresh ginger 40g while control was recorded with least plant height followed by pepper seed 40g as well as neem Seed 20g.

Table 4: Effect of Fresh ginger, Pepper seed, Neem seed and oil onnumber of leaves at different weeks on Onion plant

Treatments	1weeks	2weeks	3weeks	4weeks	5weeks
Neem oil 20 ml/L of water	8.47[a]	9.10[a]	10.00[ab]	10.50[ab]	11.33[bc]
Neem seed 40g/L of water	10.27[a]	10.77[a]	11.60[a]	12.33[a]	14.67[a]
Pepper seed 40g/L of water	9.13[a]	9.33[a]	9.77[ab]	10.33[ab]	11.33[bc]
Fresh ginger 40g/L of water	8.60[a]	9.67[a]	10.27[ab]	10.50[ab]	11.67[b]
Control	7.67[a]	8.67[a]	9.17[b]	9.37[b]	9.60[c]
CV	18.00	11.94	10.87	10.59	8.95
SE	1.29	0.92	0.90	0.91	0.86

Means in the column accompanied by the same letter (a) are not significantly difference at (P< 0.05%) using least significance different (LSD).

Table 4: shows the effect of fresh ginger, pepper seed, neem seed and oil on Number of number of leaves at different weeks on onion. The finding revealed that, there are no significant different among all the treatment including control at week 1 and 2. At 3 and 4 weeks there are also no significant different among neem oil 20ml, pepper seed 40g and fresh ginger 40g. At 5 weeks there are also no significant different between neem oil 20ml and pepper seed 40g on number of leaves (Analysis of variance at 05% level of significant).

The result depicts that neem Seed 40g appeared with highest number of leaves, while control appeared with least number of leaves.

Table 5: Effect of Fresh ginger, Pepper seed, Neem seed and oil onyield weight (kg) on Onion after harvest

Treatments	Yield weight (kg)
Neem oil 20 ml/L of water	2.33[c]
Neem seed 40g/L of water	3.27[a]
Pepper seed 40g/L of water	1.83[d]
Fresh ginger 40g/L of water	2.83[b]
Control	1.23[e]
CV	5.61
SE	0.11

Means in the column accompanied by the same letter (a) are not significantly difference at (P< 0.05%) using least significance different (LSD).

Table 5: Shows the effect of fresh ginger, pepper seed, neem seed and oilon yield weight (kg) on Onion after harvest. The findings reveals that, there are significant different among all the treatments on yield weight.

The result shows that, the highest yield was recorded under plot treated with neem seed 40g (3.27kg) subsequently, followed by Fresh Ginger 40g (2.83kg) and Neem oil 20ml (2.33kg) followed by pepper seed 40g (1.83kg). However, control was recorded with least yield, (1.23kg).

Discussion

The result obtained from theexperiment showed that, neem seed, neem oil and fresh ginger are effective against onion thrip, especiallyThrip tabaci Compared to papper seed and control. These was in line with the report of Reddy et al. (2007) determined the efficacy of indigenous botanical extracts like neem seed kernel extract for the management of the onion thrips in a farmer's field at Kalshettihalli village of Chikmagalur district of Karnataka State, India. The authors reported that the neem extract was superior than wild tobacco leaf extract and carbosulfan (250g.a.i./hactare) in controlling thethrips on onion, obtain higher bulb yield and cost: benefit ratios in both the seasons. Their findings were in contrary to our botanical extract results that show the reverse and the bulb weight was found to be non-significant.

Khaliq,*et al*., (2014) encouraged onions invidious as a biological agent in the thrips niche obtained 96% thrips mortality by Humicolor and Neam (*Azadirachter indica*). Extracts used to control thrips.

Khaliq,*et al*., (2014) also mentioned that,*cymtopogancitrates* and *partheniumhysterophorous* were found effect on the onion *thrips*. According to Mohammad*et al.,* (2000) found that, the enthonal extracts of neam seed powder (N.S.P) evaluated against onion thrip reduced thrip population under field condition.

The observed behaviour ofonion bulb yield in the experiment was in line with the report of Dantata *et. al*., (2011).Found that, growth and yield of tomato was response to application of different plant extracts.

In Conclusion, The result obtained from this experiment showed that, neem seed, neem oil and fresh ginger are effective against onion thrip, especiallyThrip tabaci Compared to papper seed. Therefore, neem seed, neem oil and fresh ginger could be usedin managing plant onion thrip (*Thrip tabaci*) as an alternative to synthetic insecticides which have environmental hazard in an ecosystem apart from the cost involved in it, and harmful effectsto both human and animals.

Recommendation

Based on the above findings of the study, it was recommended that, farmers shouldadopt the using of plants plant extacts(neem seed, fresh ginger and neem oil) to serve as a means of controlling onion thrips (*Thrips tabaci*) under irrigation. Botanicals that are affordable,available, environmentally friendly and easy to handle by the farmers, as well as less or no toxicity toboth human and animals.

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