ETCOR Educational Research Center Inc.
SEC Reg. No. 2024020137294-00
Sta. Ana, Pampanga, Philippines
INTERNATIONAL MULTIDISCIPLINARY RESEARCH CONFERENCE
Website: https://etcor.org
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Ecological Control of Fruit and Shoot Borer in Eggplant (*Solanum melongena* L.) Using Botanical Pesticides

Dr. Josie E. Flores
Isabela State University-Echague, Isabela, Philippines
Corresponding Author email: *josieflores3021gmail.com*

Received:15 June 2024 **Revised**: 18 July 2024 **Accepted**: 19 July 2024

Available Online: 19 July 2024

Volume III (2024), Issue 3, P-ISSN – 2984-7567; E-ISSN - 2945-3577

Abstract
Aim: This study was carried out to assess the effects of plant extracts and biopesticides as pest management options in eggplant.
Methodology: This study used an experimental design to determine the effect of biopesticides as biocontrol agent against fruit and shoot borer in eggplant. This study was conducted at Barangay Bagnos, Alicia, Isabela with 5 treatments: Treatment 1 (T1)- Control-no biopesticides applied, T2-Aloe Vera Extract, T3-Neem Leaves Extract, T4-Beauveria sp. And T5- Isaria sp.
Results: The effect of biopesticides as biocontrol agent in eggplant control/minimize the incidence of fruit and shoot borer of eggplant.
Conclusion: The results of this study indicate that among the various plant extracts and biopesticide tested, Aloe vera exhibits significant potential as an effective pesticide for managing pests on eggplant. Aloe vera did not caused any phytotoxic effect on the growth and development of the crop.

Keywords: *Entomopathogenic fungi, leaf extract, fruit and shoot borer, Aloe vera, neem leaves*

INTRODUCTION

Among the insect pests, the shoot and fruit borer pose a significant threat to eggplant cultivation by causing damage to tender shoots and developing fruits, resulting in stunted growth, reduced fruit quality, and overall yield loss. The larvae of these pests create entry points for pathogens, compounding the damage. Conventional pesticides often prove ineffective, leading to challenges in control, and the economic impact is substantial, affecting both harvest quantity and market value. Organic farming practices aim to promote sustainability by focusing on human and soil health, crop rotation, and other ecologically sound methods. The use of organic pesticides aligns with these principles, providing a more environmentally friendly approach to agriculture.

Organic pesticides break down quickly, reducing the risk of long-term ecological harm compared to synthetic pesticides. These are also selective, targeting specific pests while minimizing harm to beneficial insects and non-target organisms, contributing to the preservation of biodiversity and ecological balance. Most importantly, biopesticides play a dual role in enhancing crop protection and promoting the sustainability and resilience of farming systems.

Eggplant, scientifically known as *Solanum melongena*, holds significant importance in global agriculture and nutrition as a widely cultivated vegetable. However, eggplant cultivation faces various challenges, and effective pest management is crucial for ensuring robust yields. An increasingly popular alternative in eggplant production is the adoption of biopesticides as pest control. These pest control agents are derived from natural sources, such as living organisms, and botanical extracts providing a viable and environmentally friendly option for agriculture. This aligns with the rising demand for sustainable farming practices that prioritize both ecosystem health and consumer well-being. The

ETCOR Educational Research Center Inc.
SEC Reg. No. 2024020137294-00
Sta. Ana, Pampanga, Philippines
INTERNATIONAL MULTIDISCIPLINARY RESEARCH CONFERENCE
Website: https://etcor.org
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

significance of utilizing biopesticides lies in their capacity to deliver effective pest control while minimizing environmental repercussions, ensuring food safety, and contributing to the overall sustainability of agricultural practices.

While traditional chemical pesticides have been the effective solution, concerns about their environmental impact, residue levels, and potential harm to human health have spurred interest in sustainable and eco-friendly alternatives. Moreover, it supports to the sustainable Development Goals of the Philippines on the use of clean water and sanitation (SDG 6) eliminating synthetic chemicals, organic farming reduces water pollution and conserves water resources. This encouraging the adoption of integrated pest management (IPM) practices and the use of organic alternatives to reduce the reliance on synthetic chemicals. These efforts are critical for reducing water pollution and ensuring sustainable water management in the country.

Objectives

This study aimed to determine the effect of biopesticides as biocontrol agent against fruit and shoot borer in eggplant.

Specifically, it aimed to:

1. determine the effect of botanicals and biopesticides on the growth and yield of eggplant;
2. determine the efficacy of botanical and biopesticides that manage or reduce the incidence of fruit and shoot borer infestations; and
3. determine which among the botanical and biopesticides control/minimize the incidence of fruit and shoot borer of eggplant.

Hypothesis

Given the stated research problem, the following hypotheses were tested on 0.05 and 0.1 level of significance:

T_1- Control (without application)
T_2- Aloe Vera Plant (30 ml/ L water)
T_3- Neem Leaves (30 ml/ L water)
T_4- *Beauveria bassiana* (16 ml/L water)
T_5- *Isaria fumosorose*a (16 ml/L water)

METHODS

Research Design

This study used an experimental design using 6 treatments to determine the effect of biopesticides to the fruit and shoot borer in eggplant.

Locale of the Study

This study was conducted at Barangay Bagnos, Alicia, Isabela on December, 2023 to April, 2024.

Data Collection

The data were gathered, read, and analyzed following the objectives of the study and in adherence to all protocols in the conduct of the research study.

Treatment of Data

Statistical analysis were used to determine the effect of botanicals and biopesticides on the growth and yield of eggplant, determine the efficacy and biopesticides that manage or reduce the incidence of fruit and shoot borer infestations. Following the Randomized complete block design and significant treatments was compared using the Tukey's Honestly significant difference (HSD) test was the statistical analyses used in this study.

ETCOR Educational Research Center Inc.
SEC Reg. No. 2024020137294-00
Sta. Ana, Pampanga, Philippines
INTERNATIONAL MULTIDISCIPLINARY RESEARCH CONFERENCE
Website: https://etcor.org
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Ethical Considerations

The researcher ensured that all research protocols involving ethics in research were complied for the protection of all people and institutions involved in the conduct of the study.

RESULTS and DISCUSSION

Percentage of Infected Fruits. The effect of botanicals and biopesticides on the percentage of infected fruits as affected by fruit and shoot borer is shown in Table 1. Results showed that the control plants had significantly recorded the highest percentage of fruit infestation while that those applied with either plant extracts and biopesticides had lower percentage infected fruits from 30.30 to 32.46 percent. It shows that the plants applied with botanicals as well as the entomopathogenic fungi lessen the percentage of infected fruits. This could be due to its repellent properties to keeps away the insect pest and protect the crops from the attacks of insect pests (Isman, 2006).

On the other hand, *Isaria fumosorosea* and *Bueveria bassiana* were likewise superior in suppressing the percentage of infected fruits caused by fruit and shoot borer. These entomopathogenic fungi (EPF), a microorganism had the ability to infect, parasitize, and kill arthropod pests. The process of infection starts with spore attachment to the exoskeleton of the arthropod due to electrostatic and hydrophobic forces, along with the activation of the lytic enzymes and secondary metabolites as cited by Skinner *et. al.,* (2004). The activation of these biochemical processes ensures the effective infection and subsequent control of pest population like in the case of eggplant.

Table 1. Percentage of Infected Fruits

TREATMENTS	Percentage of Infected Fruits
T_1- Control ((without application)	38.39[a]
T_2- Aloe Vera Plant	32.46[b]
T_3- Neem Leaves	30.3[b]
T_4- Beauveria bassiana	32.60[b]
T_5- Isaria *fumosorose*a	32.94[b]
F- RESULTS	**
C. V. (%)	6.49

Note: Means with common letter are not significantly different using Tukey's HSD.
***-significant at 1% level*

Number of Dead Insects. The effects of the various treatments on the population of dead insects revealed that all the plant extracts as well as the entomopathogenic fungi biopesticides significantly reduced invasion of insects. Notably, untreated plants exhibited the highest mortality rate of insects with average count of 41.00 dead insects. This was higher over the plants applied with plant extracts and entomopathogenic fungi. Specifically, the mean number of dead insects recorded were 20.33 for Treatment 3, 20.00 for Treatments 2, Treatment 4 with 20.00 and 18.33 for Treatment 5. This suggests that while commercial insecticide (T_1) is more lethal to insects, plant-based treatments and biological agents also contribute significantly in controlling insect populations. These findings support that extracts from plants like neem possess insecticidal, antifeedants, ovicidal oviposition inhibitors and growth reducing effects on several insect species (Sithisut *et al.* 2011, Regnault-Roger *et al.* 2012). Moreover, the foliar application of neem, aloe vera *B. bassiana* and *I. fumorosea* that yielded comparable number of dead insects might be due to the systemic translocation of these of pesticides that greatly affects sucking insects (Kumar and Poehling, 2006; Kumar *et al*., 2005).

ETCOR Educational Research Center Inc.
SEC Reg. No. 2024020137294-00
Sta. Ana, Pampanga, Philippines
INTERNATIONAL MULTIDISCIPLINARY RESEARCH CONFERENCE
Website: https://etcor.org
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Table 2. Number of Dead Insect

TREATMENTS	Number of Dead Insect
T_1- Control ((without application)	41.00[a]
T_2- Aloe Vera Plant	20.00[b]
T_3- Neem Leaves	20.33[b]
T_4- Beauveria bassiana	20.00[b]
T_5- Isaria *fumosorosea*	18.33[b]
F- RESULTS	**
C. V. (%)	24.33

Note: Means with common letter are not significantly different using Tukey's HSD
***-significant at 1% level*

Tunnel Length Due to Fruit Borer (cm). Regarding the tunnel of holes on fruits of eggplant as affected by shoot and fruit borer (*Leucinodes orbonalis* Guenee) and treated with different plant extract and entomopathogenic fungi, result showed that it did not vary significantly across all treatments as presented in Table 3. The tunnel lengths created by the eggplant fruit borer ranged from 2.95 cm to 3.90 centimeters. This indicates that the different pest control treatments applied had a comparable effect on the activity of fruit borer resulting in similar level of damage. It shows that treatments employed served as preventive measures rather than curative and maybe the fruit borer had already established themselves in the fruits hence the treatments have no significant effect on reducing tunnel length. Fruit borers once established inside thee fruits, it make difficult to reduce the tunnel length.

Table 3. Tunnel Length Due to Fruit Borer (cm)

TREATMENTS	Tunnel Length (mm)
T_1- Control ((without application)	3.41
T_2- Aloe Vera Plant	2.95
T_3- Neem Leaves	2.96
T_4- Beauveria *bassiana*	3.90
T_5- Isaria *fumosorosea*	3.48
F- RESULTS	ns
C. V. (%)	20.48

ns – not significant

Number of Infected Fruits per Plot. The results of the infected fruits per plot of the test plant applied with botanical insecticides is shown in Table 4. Data analysis showed that all of the infected fruits were due to rot and sunken appearance of the fruits of eggplant. These soft rot diseases are caused by pathogens that secrete enzymes capable of decomposing cell wall structures, thereby destroying the texture of plant tissue. It shows that the treatments recorded comparable number of infected fruits and the botanicals and entomopathogenic fungi did not reduce the number of infected fruits. The mean number of infected fruits ranged from 23.66 to 27.00 fruits.

ETCOR Educational Research Center Inc.
SEC Reg. No. 2024020137294-00
Sta. Ana, Pampanga, Philippines
INTERNATIONAL MULTIDISCIPLINARY RESEARCH CONFERENCE
Website: https://etcor.org
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Table 4. Number of Infected Fruits per plot

TREATMENTS	Number of Infected Fruits
T_1- Control (without application)	26.66
T_2- Aloe Vera Plant (30 ml/ L water)	27.00
T_3- Neem Leaves (30 ml/ L water)	23.66
T_4- *Beauveria bassiana* (16 ml/L water)	24.00
T_5- *Isaria fumosorose*a (16 ml/L water)	24.33
F- RESULTS	ns
C. V. (%)	10.44

ns – not significant

Growth and Yield Parameter

Plant Height. The leaf extract and biopesticide did not exhibit any phytotoxic effects on plant growth as evidenced by the plant's robust appearance. The mean height of the plants at 30 days after transplanting ranged from 55.50 cm to 5.30 centimeters shows that the effect did not interfere with the plants' normal growth processes, as evidenced by consistent plant height and the lack of negative symptoms. This might be attributed to the composition of the leaf extracts and biopesticides that are naturally occurring in the plant environment which may have evolved to be non-toxic to the plants.

However, at 50 days after transplanting, the height of the plants varied among treatments. Plants in Treatment 2 (Aloe vera) registered the tallest with 109.03 centimeters, though the height is similar to those treated with neem leaf extract and entomopathogenic fungi. The shortest plants were recorded in the control plots with 87.03 centimeters. While there were significant differences in height at 50 days after transplanting, but these were not substantial enough to attribute the effect was solely the treatments employed.

Despite of these, researchers claimed that biostimulants, including Aloe vera are essential for plant growth due to the rich biochemical composition that includes essential and non-essential amino acids, saccharides (such as glucose, mannose, and cellulose), microelements (Cu, Fe, Mn, Zn), macroelements (Ca, K, Mg, N, P), vitamins (B_1, B_2, B_6 and vitamin C), phytohormones (such as gibberellins and salicylic acid), and compounds typical to aloe, such as aloin (Abbas *et al.*, 2016). Aloe vera extracts also contain active compounds that can enhance plant performance under stress conditions, including heat and drought stresses (Farooq *et al.*, 2017).

Table 5. Plant Height (cm) at 30 and 50 Days after Transplanting (cm)

TREATMENTS	Plant Height (cm)	
	30 DAT	50 DAT
T_1- Control (without application)	56.30	87.03^{c}
T_2- Aloe Vera Plant (30 ml/ L water)	55.50	109.03^{a}
T_3- Neem Leaves (30 ml/ L water)	56.43	104.73^{ab}
T_4- *Beauveria bassiana* (16 ml/L water)	56.2	100.26^{b}
T_5- *Isaria fumosorose*a (16 ml/L water)	56.06	101.1^{b}

ETCOR Educational Research Center Inc.
SEC Reg. No. 2024020137294-00
Sta. Ana, Pampanga, Philippines
INTERNATIONAL MULTIDISCIPLINARY RESEARCH CONFERENCE
Website: https://etcor.org
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

F- RESULTS	ns	**
C. V. (%)	5.19	3.24

Note: Means with common letter are not significantly different using Tukey's HSD
***- significant at 1% level*
ns – not significant

Number of Branches. The number of branches of eggplant varies as indicated in Table 6. The highest branches count was noted in the plants treated with Aloe vera (T_2) with 8.93 counts followed by the plants in T_3 (8.66), T_4 (8.60) and T_5 (8.46) while the lowest branches count was recorded in T_1 with an average of 7.96 branches. The increase in the number of branches was due to taller plant height which might be the result of complex interactions between hormonal regulation, resource availability, genetic factors, and environmental conditions. These factors collectively ensure that taller plants can optimize their growth and reproductive success by producing more branches.

However, similar result was observed by Oparaeke *et al.* (2005) in cowpea that difference in the production of more branches of cowpea and phytotoxicity was not observed when sprayed with aqueous extracts but generally there were stimulating properties of plant extracts due to organic compounds such as polyphenols, amino acids, plant hormones, and vitamins, as well as micro- and macro elements.

Table 6. Number of Branches

TREATMENTS	Number of Branches
T_1- Control (without application)	7.96^c
T_2- Aloe Vera Plant (30 ml/ L water)	8.93^a
T_3- Neem Leaves (30 ml/ L water)	8.66^b
T_4- *Beauveria bassiana* (16 ml/L water)	8.60^b
T_5- *Isaria fumosorose*a (16 ml/L water)	8.46^b
F- RESULTS	**
C. V. (%)	1.49

Note: Means with common letter are not significantly different using Tukey's HSD.
***- significant at 1% level*

Length (cm) and Diameter of Fruits (cm). Results on the length of fruits of eggplant however showed no significant differences among treatments existed. Fruit length ranged from 19.10 cm to 21.08 centimeters is likely attributed by the genetic traits of the plants. These traits plays a crucial role in shaping the phenotypic characteristics of the plants thereby ensuring consistent fruit development across all treatments.

In terms of fruit diameter, variations were observed among Treatment 4 (Aloe vera) which recorded registered mean diameter of 4.10 centimeters similar to neem treated plants with 3.91 centimeters. Following closely were plants in Treatment 5 which received biopesticide and showed an average diameter of 3.67 centimeters while the smallest fruits were noted in T_4 and T_5.

As cited by Farooq *et al.,* (2017) the increase in fruit diameter of eggplant is due to the essential elements absorbed by plants, which cause cells and tissues to grow and develop plant organs, resulting in increased and influenced fruits diameter. It shows that such processes did not hinder by the application of leaf extract and biopesticides as in the result on this parameter.

ETCOR Educational Research Center Inc.
SEC Reg. No. 2024020137294-00
Sta. Ana, Pampanga, Philippines
INTERNATIONAL MULTIDISCIPLINARY RESEARCH CONFERENCE
Website: https://etcor.org
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Table 7. Length (cm) and Diameter of Fruits (cm)

TREATMENTS	Length (cm)	Diameter (cm)
T_1- Control (without application)	19.10	3.73^{bc}
T_2- Aloe Vera Plant (30 ml/ L water)	21.08	4.10^{a}
T_3- Neem Leaves (30 ml/ L water)	19.93	3.91^{ab}
T_4- *Beauveria bassiana* (16 ml/L water)	20.58	3.60^{c}
T_5- *Isaria fumosorose*a (16 ml/L water)	20.19	3.67$_{bc}$
F- RESULTS	ns	**
C. V. (%)	3.59	3.60

Note: Means with common letter are not significantly different using Tukey's HSD
***- significant at 1% level*
ns- not significant

Number of Marketable and Non-marketable Fruits per Plant. Statistical analysis revealed significant difference in the number of marketable fruits among treatments. It shows that the effect of bio-pesticides to increased number of marketable fruits depends on the management practices for controlling eggplant shoot and fruit borer infestation. The most effective insect protection was observed on plots treated with Aloe vera which significantly increased the number of marketable fruits by effectively controlling eggplant shoot and fruit borer infestation effectively (Table 8). Greater number of marketable fruits was noted in Treatment 2 with 5.56, consistently followed by Treatment 3 with 5.36 counts, Treatment 4 and 5 with both 4.36 counts while the lowest number of marketable fruits are those found in the untreated plots with 4.23 fruits. This finding indicates that all the treatments has the capability to suppress insect pest resulting to a higher number of eggplant fruits in comparison to the control treatments.

Regarding the number of non-marketable fruits per plant, analysis of variance showed that any of the treatments did not affect the number of non-marketable fruits with means ranging from 1.63 to 2.70 fruits per plant.

Table 8. Number of Marketable and Non-marketable Fruits per Plant.

TREATMENTS	Marketable Fruits	Non-Marketable Fruits
T_1- Control (without application)	4.23^{d}	2.66
T_2- Aloe Vera Plant (30 ml/ L water)	5.560^{a}	2.70
T_3- Neem Leaves (30 ml/ L water)	5.36^{b}	2.36
T_4- *Beauveria bassiana* (16 ml/L water)	4.93^{c}	1.63
T_5- *Isaria fumosorose*a (16 ml/L water)	4.90^{c}	2.43
F- RESULTS	**	ns
C. V. (%)	1.46	10.44

Note: Means with common letter are not significantly different using Tukey's HSD.

Weight of Marketable per Sampling area. The weight of marketable fruits in all the treated plants showed heavier marketable fruits. Specifically, plots treated with Aloe vera had heavier fruits due

ETCOR Educational Research Center Inc.
SEC Reg. No. 2024020137294-00
Sta. Ana, Pampanga, Philippines
INTERNATIONAL MULTIDISCIPLINARY RESEARCH CONFERENCE
Website: https://etcor.org
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

to lesser infested fruits with mean of 2886.66 grams however not at par with the plants in Treatment 3, Treatment 4 and even Treatment 5. The untreated control registered lighter fruits of 2620 grams. Results showed that without the application of pest control, fruit weight decrease for both infested and healthy fruit which leads to significant yield lost. Eggplant shoot and fruit borer larvae that bore into the tender fruit and feed on internal fleshy part of the fruit, growth and development of fruits causes weight loss. It shows that the application of plant extract as well as entomopathogenic fungi lessen the fruit infestation, finally weight loss is controlled significantly in differential manner (Table 9).

Table 9. Weight of Marketable Fruit per Sampling Area (grams/6 m^2)

TREATMENTS	Weight of Fruits
T_1- Control (without application)	2620.00^{c}
T_2- Aloe Vera Plant (30 ml/ L water)	2886.66^{a}
T_3- Neem Leaves (30 ml/ L water)	2866.66^{ab}
T_4- *Beauveria bassiana* (16 ml/L water)	2776.66^{abc}
T_5- *Isaria fumosorose*a (16 ml/L water)	2706.66^{bc}
F- RESULTS	**
C. V. (%)	3.31

Note: Means with common letter are not significantly different using Tukey's HSD.
***- significant at 1% level*

Computed Fruit Yield per 1000m^2 (kg). Table 10 presents the computed fruit yield of eggplants per 1000 square meters under various treatments. The data reveals that the plants in Treatment 2 achieved the highest fruit yield, recording 2886.66 kilograms. It was comparable to the plants in Treatment 3 with 2866.66 kg, Treatment 4 with 2776.66 kg, and Treatment 5 with 2706.66 kilograms however, in comparison to the untreated control group which yielded 2620.00 kilograms.

Table 10. Computed Fruit Yield (kg/1000m^2)

TREATMENTS	Weight (kg)
T_1- Control (without application)	2620.00^{c}
T_2- Aloe Vera Plant (30 ml/ L water)	2886.66^{a}
T_3- Neem Leaves (30 ml/ L water)	2866.66^{ab}
T_4- *Beauveria bassiana* (16 ml/L water)	2776.66^{abc}
T_5- *Isaria fumosorose*a (16 ml/L water)	2706.66^{bc}

Note: Means with common letter are not significantly different using Tukey's HSD.
***- significant at 1% level*

Conclusions

The results of this study indicate that among the various plant extracts and biopesticide tested, Aloe vera exhibits significant potential as an effective pesticide for managing pests on eggplant. Aloe vera did not caused any phytotoxic effect on the growth and development of the crop.

ETCOR Educational Research Center Inc.
SEC Reg. No. 2024020137294-00
Sta. Ana, Pampanga, Philippines
INTERNATIONAL MULTIDISCIPLINARY RESEARCH CONFERENCE
Website: https://etcor.org
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Recommendations

Based on the findings of the study, it is recommended the incorporation of Aloe vera extract into pest management practices for eggplant cultivation. By adopting Aloe vera extract as a biopesticide, eggplant farmers can effectively manage pests while promoting sustainable and environmentally friendly agricultural practices.

REFERENCES

AFM, S., Zaglool, M., El-Ghadban, E., Abd, S. El-Kareem A., Waly, A. (2016). Effect of foliar application with aloe leaf extract (ALE) on vegetative growth, oil percentage and anatomical leaf structure of sage (*Salvia officinalis* L.) plant under sand soil conditions. Hortsci. J. Suez Canal Univ, 5: 9-14.

Adhikari, K. (2020). Use of neem (*Azadirachta indica* A. Juss) as a biopesticide in agriculture. JAAB Journal of Agriculture and Applied Biology 114 Volume 1 | Number 2 | December | 2020

Ali, S. S., Ahmed, Rizwan H., Bhatti, F., Khoso, A., Mengal, A. MI, Shahwani, S. A. (2017). Efficacy of different bio-pesticides against major sucking pests on brinjal under field conditions. J Basic Appl Sci 13(1):133–138

Anjorin, S. T., Salako, E. A., and Ndana, R. W. (2004). In vitro assessment of some plants leaf extracts for the control of *Meloidogyne spp*. and *Rhizoctonia solani*. Zuma. Journal of Pure and Applied Science, 7(1), 2005.

Ashadul, M. I., Hussain, M. A., Shapla, S. A., Mehraj, H., & Jamal Uddin. (2014). Plant extract for the management of brinjal shoot and fruit borer (*Leucinodes orbonalis* Guenee). American-Eurasian Journal of Agricultural and Environmental Science, 14(12), 1409-1414.

Basunia, R.A., Chowdhury, S., Z. Bari, Z., Bachchu, M., Alim, M., Bhuyain, M., MMH & Uddin, M. (2021). Acaricidal and repellent effects of Aloe vera L. leaf extracts against *Tetranychus urticae Koch* (*Acari: (Tetranychidae*). (9) Issue 6, Part A**.**

Benelli, G., Bedini, S., Cosci, F., Toniolo, C., Conti, B., & Nicoletti, M. (2015). Larvicidal and ovideterrent properties of neem oil and fractions against the filariasis vector *Aedes albopictus* (*Diptera: Culicidae*): a bio-activity survey across production sites. Parasitology Research, 114 (1), 227-236.

Chakravarty, G., & Kalita, M. (2011). Comparative evaluation of organic formulations of *Pseudomonas fluorescens* based bio-pesticides and their application in the management of bacterial wilt of brinjal. African Journal of Biotechnology, 10(37), 7174-7182.

Degri, M. M. (2013). Bio–efficacy of Aqueous Plant Extracts and Cyperdicot on Insect Pests Infestation, Growth and Yield of Sweet Pepper (*Capsicum annum* L.) in the Dry Savanna of Nigeria. J Sci Res.1:12-16

Jaber L. R., & Enkerli J. (2016). Effect of seed treatment duration on growth and colonization of *Vicia faba* by endophytic *Beauveria bassiana* and *Metarhizium brunneum*. *Biol. Control.* 103:187–195.

ETCOR Educational Research Center Inc.
SEC Reg. No. 2024020137294-00
Sta. Ana, Pampanga, Philippines
INTERNATIONAL MULTIDISCIPLINARY RESEARCH CONFERENCE
Website: https://etcor.org
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Jagadeesan, G. (2005). Resource recovery of farm refuse", Proceedings – UGC sponsored National Seminar on Waste–Disposal Management and Utilization, Department of Mechanical Engineering Faculty of Engineering and Technology, Annamalai University, Annamalai nagar, India. 22-23.

Khan, J., Anjum, S. I., Khan, I., Rehman, F. U., & Khan, A. (2015). Larvicidal & development retarding effects of hexane crude extract of Otostegia limbata on 3rd instar larvae of Drosophila melanogaster meign (*Diptera: Drosophilidae*). Journal of Entomology and Zoology Studies, 3(1), 06-09.

Kumar, B. L., & Gopal, D. S. (2015). Effective role of indigenous microorganisms for sustainable environment. 3 Biotech, 5(6), 867–876.

Kumar, U. S. U., Paridah, M. T., Owolabi, F. T., Gopakumar, D. A., Rizal, S., Amirul, A. A., & Khalil K. (2019). Neem leaves extract based seaweed bio-degradable composite films with excellent antimicrobial activity for sustainable packaging material. BioResources, 14(1), 700-713.

Martinez-Romero, D., Alburquerque, N., & Valverde, J. M. (2006). Postharvest sweet cherry quality and safety maintenance by Aloe vera treatment: a new edible coating. Postharvest Biol Technol, 39: 93-100.

Morsy, T.A., El-Ela, R.G.A., Nasser, M.M.I., Khalaf, S.A.A., & Mazyad, S.A.M. (2000). Evaluation of the invitro pediculicidal action of four known insecticides and three medicinal plant extracts. Journal of the Egyptian Society of Parasitology, 30, 699-708. [Citation Time(s):1.

Nakano, Y. (2007). Effects of Effective Microorganisms on the Growth of Brassica rapa. http://ebookbrowse.com/effects-of-effective-microorganisms-tm-on-the-growth-of brassica-rapa-pdf-d18075139.

Raizada, R. B., Srivastava, M. K., Kaushal, R. A., & Singh, R. P. (2001). Azadirachtin, a neem biopesticide: subchronic toxicity assessment in rats. Food and Chemical Toxicology, 39(5), 477-483.

Ramesh, P., Singh, M., & Rao, S.A. (2005). "Organic farming: Its relevance to the Indian contex. Curr. Sci., 88 (4): 561-568.

Ravindra, H., Sehgal, M., Pawan, A. S., Archana, B. S., Shruti, S. A., & Narasimhamurty H. B. (2014). Ecofriendly management of root-knot nematodes using acacia compost and bio-agents in brinjal. Pakistan Journal of Nematology, 32(1), 33-38.

Salako, E. A. (2002). Plant protection for the resource-poor farmers: A key note address at the Nigerian Society for Plant Protection. 30th Annual confer-ence. UNAAB. Abeokuta Sept. 1st-4th.

Sangakkara, U. R., & Weerasekera, P. (2012). Impact of effective microorganisms on nitrogen Utilization in Food Crops.

Schmutterer, H. (2002). The neem tree, *Azadirachta in-dica A*. Juss. and other meliaceous plants: sources of unique natural products for integrated pest management, medicine, industry and other purposes, (2nd ed.). Neem Foundation, Mumbai, India

ETCOR Educational Research Center Inc.
SEC Reg. No. 2024020137294-00
Sta. Ana, Pampanga, Philippines
INTERNATIONAL MULTIDISCIPLINARY RESEARCH CONFERENCE
Website: https://etcor.org
iJOINED ETCOR
P - ISSN 2984-7567
E - ISSN 2945-3577
The Exigency
P - ISSN 2984-7842
E - ISSN 1908-3181

Schulz H., & Glaser B. (2012). Effects of biochar compared to organic and inorganic fertilizers on soil quality and plant growth in a greenhouse experiment. J. Plant Nutr. Soil Sci. 175: 410–422.

Skinner M., Parker B.L., & Kim J.S. (2014). Role of entomopathogenic fungi. In: Abrol D.P., editor. Integrated Pest Management. Academic Press; Cambridge, MA, USA: 2014. pp. 169–191.

Thingujam, U., Pati, S., Khanam, R., Pari, A., Ray, K., Phonglosa, A., & Bhattacharyya, K. (2016). Effect of integrated nutrient management on the nutrient accumulation and status of post-harvest soil of brinjal (*Solanum melongena* L.) under Nadia conditions (West Bengal), India. Journal of Applied and Natural Science, 8(1), 321-328.

Valverde, J. M., Valero, D., & Martinez-Romero, D. (2005). Novel coating based on Aloe vera gel to maintain table grape quality and safety. J Agric Food Chem, 53: 7807-7813.

Vega, F. E. (2018). The use of fungal entomopathogens as endophytes in biological control: A review. Mycologia. 110:4–30.

Wei, J., Ding, W., Zhao, Y.G., & Patcharaporn, V. (2011) Acaricidal activity of Aloe vera L. leaf extracts against *Tetranychus cinnabarinus* (*Boisduval*) (*Acarina: Tetranychidae*). Journal of Asia-Pacific Entomology, 14, 353-356.

Yadav, S. P. (2012). Performance of Effective Microorganisms (EM) on growth and yields of selected vegetables. http:// www. futuretechtoday. com/em/background.htm.

Zanardi, O. Z., Ribeiro, L. d. P., Ansante, T.F., Santos, M. S., Bordini, G. P., Yamamoto, P.T., & Djair Vendramim, J. (2015). Bioactivity of a matrine-based biopesticide against four pest species of agricultural importance. Crop Prot 67(1):160–167.