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Gliricidia (Gliricidia sepium) and Neem (Azadirachta indica) Responses in the Control of Poultry Lice (Menopon gallinae)

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ABSTRACT

Neem and Gliricidia sepium plants were evaluate for insecticidal value in the control of common poultry lice. Chickens infested with lice were selected and divided into four groups. Aqueous extract of Neem and Gliricida sepium plans in varying concentration such as of 0 ml 10 ml, 20 ml and 50 ml was prepared as treatment and water was used as the control. The results for the mean percentage mortality of lice exposed to various concentrations of Gliricidia sepium, Gliricidia sepium + Neem, and Neem plant extracts showed that Gliricidia sepium achieved the highest average percentage mortality of 100% in a 50 ml leaf extract. This was followed by Gliricidia sepium + Neem with a mortality rate of 93.02% at 50 ml and Neem with 78.05% mortality at 50 ml. In contrast, the control group exhibited 0% mortality. Additionally, the results revealed that the highest mortality rate of 100% was recorded after a 2-minutes exposure to Gliricidia sepium, followed by Gliricidia sepium + Neem with 93.02% at 50 ml in 5 minutes, and Neem extract with 78.05% in 6 minutes. However, the lowest percentage mortality was observed with 0 minutes of exposure in the control group, across different concentrations.

Keywords: *Gliricidia, neem, extracts, poultry*

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INTRODUCTION

Poultry production is important in livestock industry as it provides source of meat and eggs for human population (Angyiereyiri *et al.,* 2015) and it droppings serves as organic manure for agriculture processes. In Nigeria, commercial poultry production is a thriving business enterprise providing a reasonable source of income for its rearers. However, poultry production faces challenges such as; poor management, predation and disease control constituting disease outbreaks and parasite infestation which at times culminate in high bird mortality (Ogada *et al.*, 2016). Ectoparasites are of great economic importance and constitute a major constraint in indigenous chicken production system (Sychra *et al.*, 2011). Some of the ectoparasites which have been reported in chicken are mites, lice, fleas and ticks; notable among them are lice and mites, which are most common and widely spread (Ikpeze *et al.*, 2008; Ogada *et al.*, 2016).Poultry lice (*Menopon gallinae*) is one of the lice found in the body of poultry birds especially in their chest regions. This is because the chest region is the region with the most feathers, *Menopon gallinae* prefers to occupy regions that are overgrown by feathers. In addition, the chest region is also difficult to reach by the birds during biting or itching by the lice (Setiawan 2013). Poultry lice (*Menopon gallinae*) usually infect chicken, turkey, and duck and can be found worldwide. Morphologically, *Menopon gallinae* has small palps and a pair of four-segmented antennae, folded into grooves in the head. Ectoparasite issues are common in poultry even though they are very small and not easily noticed,

they can cause problems for caretakers as well as the poultry themselves. Heavily infested poultry flocks can suffer substantial economic losses as a result of reductions in egg production, reduced weight gains, lower hatchability, and increased mortality. For the control of insects, synthetic chemicals are continuously used, and their toxicity endangers health of farm operators, animals and food consumers. The adverse impacts of synthetic insecticides on human health and the environment have sparked renewed interest in botanical insecticides, which offer cost-effective and eco-friendly solutions. This growing demand for sustainable alternatives has positioned plants as a promising resource in pest management strategies. Natural plant-derived products offer promising potential as bio-pesticides for managing poultry pests, presenting an effective and sustainable alternative to conventional chemical pesticides. These solutions align with the growing demand for environmentally friendly and safer agricultural practices, addressing both pest control challenges and ecological concerns. By leveraging the bioactive properties of plant-based compounds, these products contribute to integrated pest management strategies while minimizing harmful impacts on ecosystems and human health. Further research and development in this field could enhance their efficacy and adoption in modern poultry farming systems. Several plants have been tested for pest and disease control, and numerous horticultural mineral oils, botanicals, plant essential oils, and detergents are now utilized for pest and disease control around the world (Owolabi *et al*., 2009). Among the numerous bio-pesticides and disease-control plants, Neem has been discovered as the finest option. Neem (*Azadirachta indica)* products include insecticides, pesticides, pest fumigants, fertilizers, manures, compost, urea coating agents, and soil conditioners (Kumari *et al*., 2020). The active element in Neem is azadiractin, which repels and kills many caterpillars, thrips, and whitefly species (Egwu *et al,* 2019). Neem's pest-control properties have been known for ages in Indian for combating storage and soil borne pests (Roychoudhury 2016, Rahim 2014). *Gliricidia sepium* is an exotic plant belonging to the family Fabaceae. The plant parts (tree barks, roots and leaves), have ethno-medicinal properties and are used as mosquito repellant, fumigants, treatment of dysentery, antibacterial, antifungal, antiviral as well as central nervous system depressant (kumar and simon 2012). *Gliricidia sepium* has been reported to have larvicidal activity, insecticidal, nematicidal and antibacterial activity (Rahila *et al.,* 2008).

MATERIALS AND METHODS

Experimental site

The experiment was conducted in the field and in the laboratory. The field experiment was carried out in a poultry farm where infected chicken with lice were selected at random and taken to the laboratory for identification while the laboratory experiment which include preparation of plant extracts and extermination of the lice from the birds body was conducted at the animal farm (house) in the Department of Genetics and Biotechnology, Faculty of Biological Sciences, University of Calabar, Calabar, Nigeria.

Plant collection

The leaves of Neem and *Gliricida sepium* were harvested from University of Calabar environment and taken for identification at the Department of Plant and Ecological Studies, University of Calabar, Calabar, Cross River State, Nigeria.

Preparation for extraction

Fresh leaves of *Gliricidia sepium* and Neem (*Azadiracta indica)* were washed thoroughly with water and then distilled water to clean dust or any particle stuck to them. The fresh leaves were ground using a mortar and pestle and then soaked in ethanol. Thereafter, the extract were filtered separately using a cheese cloth and squeeze to separate the liquid and the solid extracts into the containers with different samples formulations. Thereafter, the solid filtrate were dried under sunlight to obtain powdered form and stored in dry bottles. 20g of the dried powdered samples of both Neem and *gliricidia sepium* was extracted with 2000ml of solvent such as water in a Soxhlet method of extraction. The resultant filtrate was concentrated into a powdered form through complete evaporation of extract using rotary evaporator. The solid residue that was obtained was designed as the extract and stored in a bottle.

Collection of Lice

The head, comb, eyelids, wattles, neck, feathers, breast, back, wings, shafts and legs of poultry was thoroughly examined for the presence of lice. Lice collection was aided with a hand lens while parting the hairs or feathers and gently brushing with a fine-soft brush to avoid injuries. The lice were carefully removed into a petri dish where the extracts were applied.

Sample population

The sample population of the study was in a poultry farm, having over 2500 chickens with an estimate of 30% of chicken affected with lice.

Sampling technique

The sampling technique was by random selection of chickens in an unbiased manner. Chicks and matured birds already showing signs of lice infestation were selected and taken to the animal house of the Department of Genetics and Biotechnology, University of Calabar, Calabar, Cross River State, Nigeria. Lice where isolated from their host by exposing the vent feathers and lice were carefully removed into a beaker.

Application of extracts on chicken

200g of the dry plant extracts was measured, mixed with water and apply to the chicken body via spraying in order to confirmed the efficacy of the plant extracts on the lice on the chicken body and left for 24 hours

Data collection

Data was collected 2 days after application of the plant extracts. The parameter will be on the death mortality rate of lice after application of the extracts. The rate of mortality was calculated in percentage.

$$\text{Mortality \%} = \frac{\text{Number of dead lice}}{\text{Number of lice introduced}} \times 100$$

Data analysis

All data obtained were subjected to one-way analysis of variance (ANOVA) using MINITAB version 22 software and the means were separated using Turkey test at ($P<0.05$) significance level.

RESULTS AND DISCUSSION

Determination of Lice mortality rate and its duration with/without application of plant extracts (Control, *Gliricidia sepium*, Neem and *Gliricidia* + Neem)

The insecticidal value of the plant extracts, *Gliricidia sepium*, and Neem for the control of poultry lice is shown on (Table 1). The recorded parameters for lice mortality include; average initial lice count, final lice count, percentage mortality rate, and mortality duration. Initially, all treatment groups (Control, *Gliricidia sepium, Gliricidia sepium* + Neem, Neem plant) had a consistent level of infestation, with an average of 45 lice per specimen. This suggests uniform initial infestation levels among the groups. However, following the application of various plant extracts, the Analysis of Variance (ANOVA) test indicated that there were no significant differences ($P > 0.05$) in the initial lice count across the different treatment groups (Table 2). On the other hand, the statistical analysis revealed significant differences ($P > 0.05$) in the final lice count among different extract concentrations. The highest number of mortality rate of lice after treatments was observed in *Gliricidia sepium* extract followed by *Gliricidia sepium* + Neem, while the lowest mortality rate was observed in the Neem plant, with mean values of 45, 42, and 33 lice pieces, respectively (Table 1).The results for the mean percentage mortality of lice exposed to various concentrations *of Gliricidia sepium, Gliricidia sepium* + Neem, and Neem plant showed that *Gliricidia sepium* achieved the highest average percentage mortality of 100% in a 50 ml leaf extract. This was followed by *Gliricidia sepium* + Neem with a mortality rate of 93.02% at 50 ml and Neem with 78.05% mortality at 50 ml Fig 2, 3 and 4 respectively. In contrast, the control group exhibited 0% mortality (Figures 1). Additionally, the results revealed that the highest mortality rate of 100% was recorded after a 2-minute exposure to *Gliricidia sepium*, followed by *Gliricidia sepium* + Neem with 93.02% at 50 ml in 5 minutes, and Neem extract with 78.05% in 6 minutes Fig 2, 3 and 4 respectively. However, the lowest percentage mortality was observed with 0 minutes of exposure in the control group, across different concentrations (Figure 1). The Analysis of Variance (ANOVA) for the mortality rate in the experiment and the duration until mortality indicated that there was a significant difference (P-value = 0.05) in mortality concerning the increase in leaf extract concentration (ml) and exposure time, at a 5% level of significance (Table 2).

The result showed that the aqueous extract of *Gliricidia sepium,* had the highest mortality rate, having 100% rate of mortality against poultry lice across various concentrations followed by the mixture of *Gliricidia* and Neem plant with 92% mortality rate and Neem plant having the least mortality rate of 73%. The insecticidal value of *Gliricidia sepium* and Neem has been widely studied by various authors. Many have acknowledged its potential as a natural pesticide due to the presence of secondary metabolites with insecticidal properties. Researchers have reported that extracts from different parts of *Gliricidia sepium*, such as leaves, stems, and seeds, have shown significant insecticidal activity against various pests (Raja *et al*., 2005). Although, in this study, oral administration of liquid form of *Gliricidia sepium* extract to the chicken was not effective as compared to the application of the powdered form on the skin of the chicken. It showed a significant effect under 3 days, as there were no lice recorded on the body of the chicken. Williams and Mansingh (1998) studied crude ethanol extracts of 60 plant species against *Tribolium confusum* in a laboratory experiment and found that Neem inflicted 53% mortality, and *G. sepium* 60% mortality. Similarly, Miah *et al.,* (2010) observed 60 % control of early shoot borer in sugarcane by spraying aqueous extract of Neem

Table 1: Mean± SE of Lice mortality rate and its duration with/without application of plant extracts (Control, *Gliricidia sepium*, Neem and *Gliricidia*+Neem).

	Concentration Levels				
Parameters	**Plants**	**Control**	**10 mL**	**20 Ml**	**50 mL**
Average Initial Number of Lice (Pcs)	Control	45.00 ± 3.46[a]	45.00 ± 3.46[a]	45.00 ± 3.46[a]	45.00 ± 3.46[a]
	Gliricidia sepium	45.00 ± 0.58[a]	45.00 ± 0.58[a]	45.00 ± 0.58[a]	45.00 ± 0.58[a]
	Gliricidia sepium + Neem plant	45.00 ± 1.15[a]	45.00 ± 1.15[a]	45.00 ± 1.15[a]	45.00 ± 1.15[a]
	Neem plant	45.00 ± 2.31[a]	45.00 ± 2.31[a]	45.00 ± 2.31[a]	45.00 ± 2.31[a]
Average Final Number of Lice (Pcs)	Control	45.00 ± 0.00[a]	45.00 ± 0.00[a]	45.00 ± 0.00[a]	45.00 ± 0.00[a]
	Gliricidia sepium	45.00 ± 0.58[a]	45.00 ± 0.58[a]	45.00 ± 0.58[a]	45.00 ± 0.58[a]
	Gliricidia sepium + Neem plant	41.00 ± 0.58[b]	41.00 ± 0.58[b]	41.00 ± 0.58[b]	41.00 ± 0.58[b]
	Neem plant	33.00 ± 0.58[c]	33.00 ± 0.58[c]	33.00 ± 0.58[c]	33.00 ± 0.58[c]
Average percent mortality (%)	Control	00 ± 0.00[d]	00 ± 0.00[d]	00 ± 0.00[d]	00 ± 0.00[d]
	Gliricidia sepium	00 ± 0.00[a]	100.00 ± 0.00[a]	100.00 ± 0.00[a]	100.00 ± 0.00[a]
	Gliricidia sepium + Neem plant	00 ± 0.00[b]	91.17 ± 1.05[b]	91.17 ± 1.05[b]	91.17 ± 1.05[b]
	Neem plant	00 ± 0.00[c]	73.58 ± 2.5[c]	73.58 ± 2.50[c]	73.58± 2.50[c]
Average mortality Time (Min.)	Control	0.00 ± 0.00[c]	0.00 ± 0.00[c]	0.00 ± 0.00[c]	0.00 ± 0.00[c]
	Gliricidia sepium	0.00 ± 0.00[c]	6.00 ± 0.58[b]	4.00 ± 0.58[b]	2.00 ± 0.58[b]
	Gliricidia sepium + Neem plant	0.00 ± 0.00[c]	7.00 ± 0.58[b]	6.0 ± 0.58[ab]	5.00 ± 0.58[a]
	Neem plant	0.00 ± 0.00[c]	10.00 ± 0.58[a]	8.00 ± 0.58[a]	6.00 ± 0.58[a]

"abcd" Means that do not share a letter across row are significantly different (P<0.05).

Table 2: Analysis of Variance results showing Lice mortality rate and its duration with/without application of plant extracts (Control, *Gliricidia sepium*, Neem and *Gliricidia*+Neem).

Parameters	**Sources of variations**	**d.s.**	**s.s**	**m.s**	**v.r**	**F pr.**
Average initial number of lice (Pcs)	Plant Exract	3	00.000	0.0000	0.00	1.000
	Residual	8	8114.00	14.2500		
	Total	11	114.000			
Average final number of lice (Pcs)	Plant Exract	3	288.00	96.000	128.00	<0.000
	Residual	8	6.000	0.7500		
	Total	11	294.000			
Mortality rate (%)	Plant Exract	3	18722.6	6240.87	12481.73	<.000
	Residual	8	4.0	0.04		
	Total	11	18726.6			
Variance Mortality duration (min)	Plant Exract	3	945.000	315.000	420.00	<.000
	Residual	8	6.000	0.750		
	Total	11	951.000			

Figure 1: Survival Curve of Poultry Lice in control.

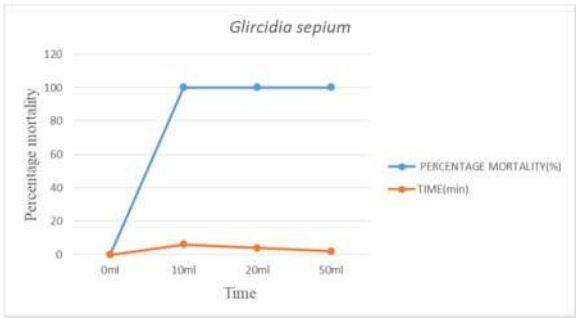

Figure 2: Survival Curve of Poultry Lice in addition of Gliricidia

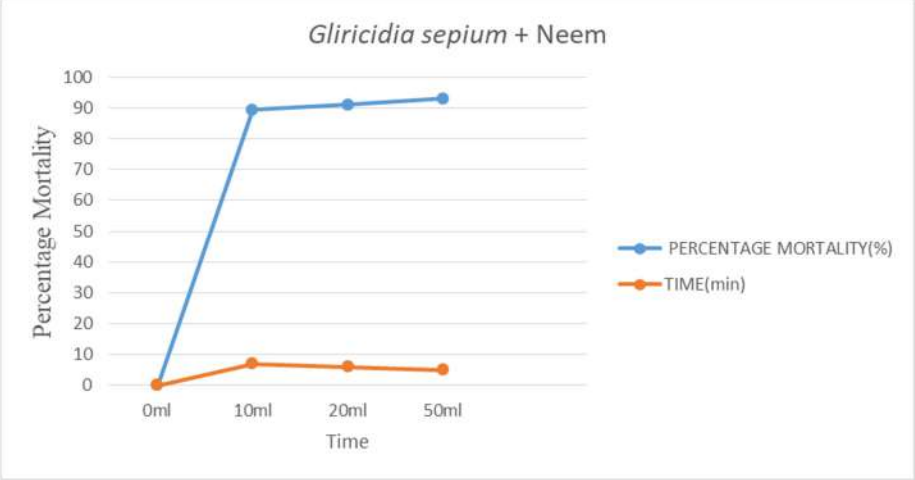

Figure 3: Survival Curve of Poultry Lice in addition of Gliricidia sepium + Neem

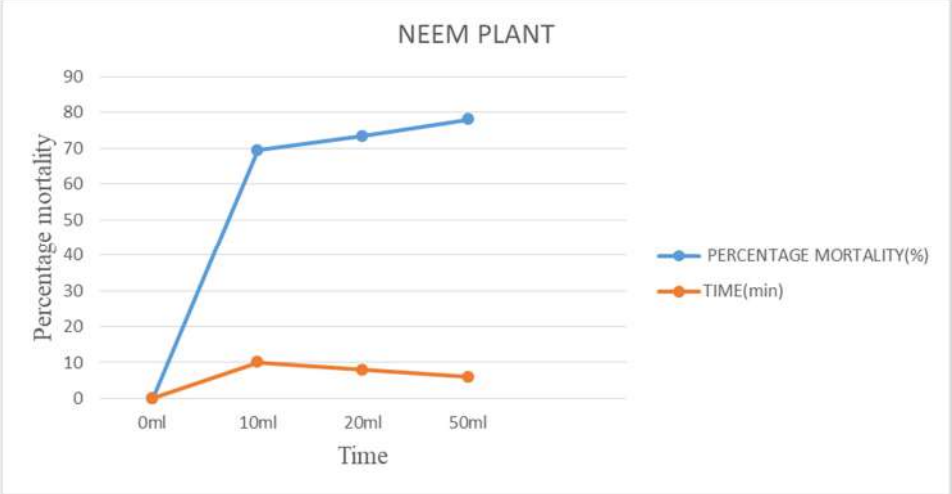

Figure 4: Survival Curve of Poultry Lice in addition of Neem plant extract.

plant at 20:1 concentration. Pavela (2009) reported 100 % mortality while using *Gliricidia sepium* oil against *Tetranychus urticae* at 1% and 3% concentrations.

Conclusion

Lice are important vectors of devastating insects on poultry and their hazardous effects are far beyond eradicating. The occurrence of lice in poultry and other birds has led to extensive use of synthetic chemicals to control transmission of live borne disease. With the increase of resistant lice, biodegradable alternatives have been considered to replace conventional lice control strategies. Phytochemical have gained importance to overcome lice control problems as being considered natural, environmentally safe, less toxic and inexpensive. Variety of plant extracts have been reported to have insecticidal or repellent activity against poultry lice, mostly depending on laboratory assays, but there are limitations for their efficacy and applicability in the field. Problems associated with their formulation and commercialization and non-standardization in evaluation of their bioactivities should be resolved for development of effective and sustainable methods for their usage.

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Conflict of interest

The authors do not have any conflict of interest to disclose.

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Authors contribution

All authors contributed to the study conception and design. Material preparation were performed by [Covenant, Ije Egbaji and Isong Emem Monday], data collection was performed by [Abu, Gabriel Inaku] and analysis were performed by [Isong Emem Monday]. The first draft of the manuscript was written by [Covenant, Ije Egbaji] and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

REFERENCES

Angyiereyiri, E., Sackey, I. and Bonu-Ire, M. (2015). Survey on Arthropod Ectoparasites on Goats and Domestic Fowls in Vunania, Navrongo, Ghana. Canandian *Journal of Pure and Applied Sciences,* 9: 3371-3377.

Egwu, O. C., Dickson, M. A., Gabriel, G. A. I. and Amanabo, R., (2019). "Risk assessment of heavy metals level in soil and jute leaves (Corchorus olitorius) treated with azadirachtin neem seed solution and organochlorine pesticides," International Journal of Environment, Agriculture and Biotechnology (IJEAB), 4 (3): 756–776,

Ikpeze, O., Amagba, I. and Eneanya, C. (2008). Preliminary survey of ectoparasites of chicken in Awka, SouthEeastern Nigeria. *Animal Research International,* 5(2): 848-851.

Kumari, P., Geat, N., Maurya, S. and Meena, S. (2020). "Neem: role in leaf spot disease management," *Journal of Pharmacognosy and Phytochemistry*, 9 (1): 1995–2000.

Kumar, S., Raman, R. P., Kumar, K., Pandey, P. K., Kumar, N., Mohanty, S., and Kumar, A., (2012). In vitro and in vivo antiparasitic activity of Azadirachtin against Argulus spp. in Carassius auratus (Linn. 1758). *Parasitol resource*, 110: 1795-1800.

Mansingh, A. and Williams, L. A. D. (1998) Pesticidal potential of tropical plants II. Acaricidal activity in the leaf extract of several plants. *International Journal of Tropical Insect Science Application*, 18, 149–155. https://doi.org/10.1017/S1742758400007797

Miah, M.N.A., Rahman, M.A., Rahman, M.M., Amanullah, A.S.M. and Ara, M.I. 2010. Effects of some plant extracts in controlling sugarcanepests. Bangladesh Research Publications Journal, 3(3): 1007-1011.

Ogada, S., Lichoti, J. and Oyier, P. (2016). A survey on disease prevalence, ectoparasite infestation and chick mortality in poultry populations of Kenya. Livestock *Research for Rural Development,* 28(12): 1-5.

Owolabi, M. S., Oladimeji, M. O., Lajide, L., Singh, G., Marimuthu, P. and Isidorov, V. A. (2009). Bioactivity of three plant derived essential oils against the maize weevils Sitophilus zeamais (Motschulsky) and cowpea weevils *Callosobruchus maculatus* (Fabricius). *Journal of Agriculture Food Chemistry*, 8: 828-835.

Pavela, R. (2009). Effectiveness of some botanical insecticides against Spodoptera littoralis Boisduvala (Lepidoptera: Noctuidae), Myzus persicae Sulzer (Hemiptera : Aphidae) and Tetranychus urticae Koch (Acari : Tetranychidae). *Plant protection Science*. 45(4): 161-167.

Rahila, N., Mussarat, A., Shagufta, A., Abdul, H.S. and Nighat, S. (2008). Insecticidal , nematicidal and antibacterial activities of Gliricidia sepium. *Parkistan Journal of Botany*, 40(6):2625-2629.

Rahim, A. (2014). Chemical control of yellow stem borer in Sindh. *Pakistan Journal of Agricultural Research*; 13(4):380.

Raja, N., Jeyasankar, A., Venkadesan, S. J. and Ignacimuthu, S. (2005). Efficacy of Hyptis suaveolensis against Lepidoptera pest. *Current Science*. 88: 220-222

Roychoudhury, R. (2016). "Neem products," in Ecofriendly Pest Management for Food Security Academic Press, Cambridge,MA, USA. 33p.

Setiawan, Y. Y., (2013). Efektivitas sipermetrin terhadap kutu *Menopon gallinae* dengan metode penyemprotan pada ayam petelur. Institut Pertanian Bogor.

Sychra, O., Literak, I., Podzemny, P., Harmat, P., Hrabak, R. (2011). Insect ectoparasites on wild birds in the Czech Republic during the prebreeding period. *Parasites,* 18: 13-19.