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# INSECTICIDAL EFFECT OF AQEOUS SEED EXTRACT OF *Tephrosia vogelii* (FISH BEAN POISON) IN CONTROL OF BROILER CHICKEN ECTO PARASITE

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**ABSTRACT**

*Tephrosiavogelii is a plant species reported to be used widely for its medicinal, insecticidal, and soil enrichment potential in tropical Africa. The study aimed at determining the insecticidal effect of aqueous seed extract of Tephrosiavogelii in control of broiler chicken ecto-parasites. One hundred and sixty (160) parasites were collected and were divided into 4 groups containing 40 parasites per group. The parasites were subjected to aqueous extract treatment at different concentration levels (200mg/ml, 400mg/ml, 600mg/ml and 0.00mg/ml), as T1, T2, T3, and T4 respectively. Conditions of parasites were observed and recorded at time interval of 30 minutes 1, 2, 4, 12 and at 24 hours. the photochemical composition of aqueous extract of Tephrosiavogelii seed which consist of Saponins, Flavonoid, Glycoside, Alkaloids, Tannin, Steroids,Terpens and Anthraquinones. The result revealed highest mortality in the highest concentration used in this study (600mg/ml) where almost all the parasites (35) were dead which is an indication that with*

*increasing concentration the peak of the insecticidal effects of T. Vogelii seed extract will be explored. It was concluded that T. Vogelii aqueous seed extract is effective against ecto-parasites of broiler chicken.*

**Key words: insecticidal, aqueous seed extract, *Tephrosia vogelii,* broiler chicken, ecto-parasites**

## Introduction

Tephrosia plants are found in many tropical countries where they are used as a hedge, as a nitrogen-fixing plant in the soil, as a shade, as an insecticide, especially against aphids and in grain post-harvest preservation against weevils. It has been observed that because of these disadvantages associated with commercially available chemical acaricides products in circulation, the adoption of alternative methods could minimize such problems (Wharton, 2016). It will befurther noted that because of these disadvantages associated with commercially available chemical acaricides products currently in circulation, the adoption of alternative methods could minimize such problems (Wharton, 2018). The synthesis of new chemical acaricides in view of the development of tick resistance poses a serious threat to most farmers worldwide.

Tephrosiavogelii (Leguminosae) is a plant species reported to be used widely for its medicinal, insecticidal, and soil enrichment potential in tropical Africa. Specifically, research on T. vogelii reported medicinal properties such as anti-cancer activity and efficacy as an ecto-parasite treatment for domestic animals including poultry (Gbadamosi*et al.,* 2016). A number of studies have sought to validate the reported use of T. vogelii as a botanical insecticide under laboratory and field conditions and have reported its effectiveness for crop protection and reduced impacts on beneficial ecosystem services. Likewise, Tephrosia is reported to have high biomass and is therefore important as a soil amendment and is compatible with food crops when intercropped in addition to its nitrogen fixing property (Mhango*et al.,* 2013). Hence, using T. vogelii for small scale farmers may support reduced industrial fertilizer and synthetic pesticides application all of which bear cost and safety implications.Deguelin will bereported to be the major active compound in T. vogelii occurring in all plant parts along with the minor components of tephrosinand rotenone (Wang *et al.,* 2018). However, a previous study reported that some T. vogelii did not contain rotenoids, and will beless effective as an insecticide (Belmain*et al.,* 2012). This highlighted the need to ensure that effective chemotypes of pesticidal plants will be available when promoting their use to farmers to ensure effective control of pests.It has further been suggested that intensive tick control in a multipurpose livestock system such as the one existing in Zambia is not justified in the absence of other serious TBD's policies (Lane and Crosskey, 1996; Pegram*et al*., 1986).

In many countries of tropical and subtropical regions, control of insects and acarines is a priority (Lodos*et al*., 2000). The escalating insect and insect borne diseases of poultry, which mainly attack blood and the lymphatic systems have created an increase in the demand for alternative control strategies in order to reduce livestock losses (George *et al*., 2004; Rajput *et al*., 2006). Care of traditional animals by traditional livestock farmers is to some extent based on their knowledge, skills, methods, practices and beliefs in the indigenous knowledge passed on from generation to generation (McCorkle *et al*., 1996). Many livestock owners complement dipping and spraying with other tick control measures including herbal

preparations, old motor oil, household disinfectant, paraffin, pour on acaricides and manual removal of the insects and sometimes smearing animal dung (Hlatshwayo and Mbati, 2005).

## MATERIALS AND METHODS

### The Study area

This research was carried out in the biology laboratory while plant extraction and phytochemical analysis was done in the Biochemistry laboratory of the College of Animal Health and Production Technology, National Veterinary Research Institute Vom, Jos South Local Government Area. Jos South Local Government Area is divided into four districts mainly, Du, Vwang, Gyeland Kuru, it is located on latitude $9^{O}$ 4800 N and 5200 E, and has a total land area of 510km$^2$. It has an annual rainfall of 131.75mm and temperature range $12^{O}$C – $33^{O}$C ($54^{O}$F – $91^{O}$F).

### Sample Collection

### Collection of the plant seed

The plant seedswere obtained from K/Vom Village, Jos South, and Plateau State. The seed was plucked by hand and put in a bowl in readiness for extraction at the Biochemistry Laboratory of the FCAH&PT.

### Collection of the parasites

The researcher raised Forty (40) birds which were grouped into four (4)and each group is made up of ten (10)chicken. Therefore, forty 40 ecto-parasite (lice) was collected from each group. Sum total One hundred and sixty (160) ecto-parasites (lice)were collected from the raised birds. The parasites were placed in a perforated container to allow space for inflow of air. The container containing the parasites was taken to the Biochemistry Laboratory of FCAH&PT for the experiment.

### Processing the *TephrosiaVogelii*seed for extraction.

Plants seed obtained werepartially dried at room temperature for 7days and then pounded using pestle and mortar into a coarse powder. 100g of the powder was weighed and poured in a conical flask.

### Aqueous extraction

*Tephrosiavogelii* seeds were collected and cleaned, after cleaning the seeds were finely ground using a mortar and pestle to increase the surface area for extraction. Distilled water was heated in a pot until it reached a gentle simmer. The ground *Tephrosiavogelii* seeds were added to the simmering water in a ratio of 1 part seeds to 5 parts water (e.g., 50 grams of seeds to 250 mL of water). The mixture was stirred continuously for about 30 minutes to ensure proper extraction of the bioactive compounds from the seeds. After the extraction period, the heat was turned off, and the mixture was allowed to cool down. Once cooled, the aqueous extract was filtered using a fine-mesh strainer to remove the solid particles or residues. The obtained extract was then used for the experiment.

### Determination of Phytochemicals of *Tephrosiavogelii*

### Test for Alkaloids

0.5g of sample into test tube, 5mls of 10% aqueous Hydrochloride was added and filtered. Few drops of Draggendroffs reagent to 1ml portion of the filtrate, a precipitate is an indication of the presence of alkaloid (Sofowara, 2002).

### Test for Anthraquinones

5ml of extract + few ml of $H_2S_4$ + 1ml of diluted ammonia. The appearance of rose pink confirms the presence of Anthraquinones.

### Test for Flavonoid

0.5g of the plant extract was dissolved in 2ml of dilute sodium hydroxide. A few drops of concentrated tetraoxosulphate (VI) acid ($H_2SO_4$) was then added. Presence of colourless solution indicates

the presence of Flavonoid (Sofowara, 1993).

**Test for Saponin**

0.5g of sample added into test tube, few ml of distilled water was added to cover the plant sample, covered with the tip of thumb and shook thoroughly. Frothin which persisted on warming was the evidence that Saponin is present (Sofowara, 1993).

**Test for Glycosides**

5ml of extract treated with 2ml of glacial acetic acid containing one drop of ferric chloride solution. This was underplayed with 1ml of concentrated $H_2SO_4$. A brown ring of the interface indicates a deoxysugar characteristic of cardinolides. A violet ring may appear below the brown ring, while in the acetic acid layer, a greenish ring may form just gradually throughout thin layer.

**For Tannins**

0.5g of samples into test tube, 5mls of distilled water added, stirred and filtered. Few ml of ferric chloride solution was added to the filtrate, a deep green coloration shows the presence of tannin (Trease and Evans, 1993).

**Test of Steroids**

0.5g of samples into test tubes, 2ml of chloroform tetraoxosulphate (VI) acid added carefully from the side of the tube to form a layer. A reddish-brown colour at the interface indicates the presence of steroids (Sofowara, 1993).

**Determination of concentration**

The samples were prepared at a concentration of 200mg/ml, 400mg/ml, 600mg/ml and a negative control of distilled water, 0mg/ml.

**Experimental Designand Layout**

One hundred and sixty (160) parasites (lice) were collected and were divided into 4 groups containing 40 parasites per group. The parasites were subjected to aqueous extract treatment at different concentration levels of 200mg/ml, 400mg/ml, 600mg/ml and 0.00mg/ml, as T1, T2, T3, and T4 respectively. Conditions of parasites were observed and recorded at time interval of 30 minutes 1, 2, 4, 12 and at 24 hours.

**Data Analysis**

All data collected wasdescriptively analyzed using percentage afterward, all data was subjected to One-way Analysis of Variance (ANOVA) using of (13) software package. Significant means was separated using Duncan multiple range test of the same package.

## RESULTS

**Photochemical composition of aqueous extract of *TephrosiaVogelii* seed**

Table 1 shows the phytochemical composition of Aqueous extract of *TephrosiaVogelii* seed consisting of Saponin, Flavonoid, Glycoside, Alkaloids, Tannin, Steroids and Terpens, and Anthraquinones all present in different concentrations.

**Table 1:** Phytochemical composition of aqueous extract of *TephrosiaVogelii* seed

| **Phytochemical** | **Result** |
|---|---|
| Saponin | + |
| Flavonoid | ++ |
| Glycoside | + |
| Alkaloids | ++ |
| Tannin | ++ |
| Steroids and Terpens | + |
| Anthraquinones | + |

KEY: + = present in low concentration, ++ = present in moderate concentration.

**Insecticidal effects of aqueous extract of *Tephrosiavogelii* seed**

Table 2 shows the insecticidaleffect of aqueous extract of *Tephrosiavogelii* seed on the ecto-parasites of poultry chicken in different concentrations (200, 400 and 600mg/ml), number of dead parasites and the time of death. The death pattern recorded significantly increasing number of death parasites (P-Value<0.05) with increasing concentration and increasing death with more time given.

**Table 2:**Insecticidaleffects of aqueous extract of *Tephrosiavogelii* seed.

| Treatment | 1 hour | 2 hours | 4 hours | 12 hours | 24 hours |
|---|---|---|---|---|---|
| 200mg | 10 (4) | 17.5 (7) | 30 (12) | 32.5 (13) | 55 (22) |
| 400mg | 15(6) | 22.5 (9) | 40 (16) | 55 (22) | 75 (30) |
| 600mg | 17.5 (7) | 27.5 (11) | 60 (24) | 77.9 (31) | 87 (37) |
| Control | 0 | 0 | 0 | 0 | 0 |
| LSD ($p<0.05$) | 4.8 | 4.07 | 4.08 | 4.46 | 4.08 |

**RULE:**When the difference between two means is equal or greater than LSD value at 5% ($p< 0.05$) then, there is significant difference.

## DISCUSSION, CONCLUSION AND RECOMMENDATIONS

### Discussion

This study aimed at evaluating the efficacy of different concentrations of *Tephrosiavogelii* aqueous seed extract as a natural insecticidal to control ecto-parasite of poultry chicken in-vitro. The results of the study demonstrated the reductions in ecto-parasite counts after application of the *T. Vogelii*seed extract which reveals its insecticidal effect. These reductions were found to be statistically significant ($p < 0.05$) at some concentrations although there is a slight difference in efficacy among themselves. *T. vogelii* traditionally used by farmers in different parts of Africa to control insects on livestock. As a result of its interest, several African authors have conducted in-vitro and in-vivo evolutional studies on the insecticidal effect of this plant against various parasitespecies. In these investigational studies, the mortality induced by the plant extracts was often reported to be very high and therefore highly effective against parasites as in the case of this findings.

At concentration of 200mg/ml a total of (22) parasites were recorded dead after 24 hours followed by(30) at concentration of 400mg/ml. The highest mortality recorded was in the highest concentration used in this study (600mg/ml) where almost all the parasites (35) were dead. This is indicative that with increasing concentration the peak of theinsecticidaleffects of *T. Vogelii*seed extract will be explored. Theinsecticidaleffect of *T. Vogelii*seed extract observed in this study may be due to the phytochemical compounds found in the plant extract such as Steroids and Tannins which is known to have insecticide and insecticidal effects according to Adesina and Rajashekar, (2018). The overall 100% mortality effect of the extract is comparable with 91.16% against *A. variegatum*as reported from Makoni district in ZimbabwebyNdava et al., (2018). This overall finding is lower than the report of Kalume*et al*., (2012) from Congo who revealed mortality of 25% and 40% using 10 and 20 mg/ml of leaves of two varieties of *T. Vogelii*against *R. appendiculatus*which is slightly in agreement with 90% efficacy of 30% extract at day 7. This research is in agreement with Dougnon*et al*., (2014) which ethanolic extract of *T. Vogelii*seed resulted in 98.51% mortality of *A. variegatum*. The findings of this research also support the observations made by Matovu and Olila, (2007) who investigated high insecticidal activity of *T. Vogelii* methanol extracts on nymph and adult ticks in Uganda in their in-vitro study which 25% extract killed 100% exposed ticks.

In addition, the study of Kaposhi, (1993) in Zambia supports the insecticidal effect of this plant indicating that a 10% w/v concentration of aqueous seed extract can adequately protect cattle from *Boophilusdecoloratus*. The observations in this research further revealed the absence of significant difference between the effectiveness of *T. Vogelii*and diclovos which is not in agreement with the reports of Gadzirayi*et al.,* (2009) who tried to compare the effectiveness of *T. Vogelii*with conventional Triatix dip in the control of ticks on dairy animals among small scale dairy farmers in Zimbabwe. The result of their study demonstrated that there was no significant difference in the effectiveness of *T. vogelii*andTriatix dip in controlling ticks. A similar observation was made in Congo by kalume*et al.,* (2012) in which no significant differences were observed between the positive control (amitraz) and the plant extract. Furthermore,Siame*et al.*,(2019) from Zambia evidenced that the application of aqueous seed extract at concentration of 5 to 40% w/v significantly reduced tick numbers without significant difference in the observed

efficacies between low and high concentrations which is not in agreement with the findings of this research that showed statistically difference effectiveness at all levels of the tested concentrations with timing.

**Conclusion**

Phytochemical composition of Aqueous extract of *TephrosiaVogelii* seed consisting of Saponins, Flavonoid, Glycoside, Alkaloids, Tannin, Steroids, Resins and Anthraquinones in different concentrations. The seed extract was observed to exhibit significant insecticidal activities in cidal, paralysis and repellent effects in ecto parasites of poultry chicken. In view of the present finding, it could be concluded that *T. Vogelii*aqueous seed extract is effective against ecto parasites of poultry chicken at 600mg/ml preceded by 400mg/ml compared to 200mg/ml within the treatments.

**Recommendations**

From the findings of this research it is recommended that;

- *TephrosiaVogelii* seed aqueous extract is effective and promising natural alternative for parasite control especially by resource-limited rural poultry farmers where commercial veterinary drugs are not easily accessible and unaffordable.
- T. vogelii at 600mg/ml and 400mg/ml show more positive result than 200mg/ml in the effect of controlling ecto parasitic pest of poultry birds
- Domestic birds and other bird type should not be allowed to lay eggs or scavenge for food around poultry houses as they are a good source of infestation of ecto-parasite pest of hybrid birds.
- T. vogeliiaqueous seed extract should be prepared in an organic form and accessible by local poultry farmer in the control of ecto parasite.

**Suggestion to further study.**

The following suggestion were made to further studies

- The photochemical compounds of *TephrosiaVogelii* seed can be further researched and isolated by researchers for more effective insecticidaland insecticidal effects at minimal concentrations.
- Further studies should also be conducted to investigate the phytochemical constituents and their exact mechanisms of action behind theinsecticidalproperties so as to develop herbal based drug formulations.

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