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EFFECT OF *JATROPHA CURCAS* (LINN) STEM-BARK EXTRACT ON CONTROL OF CATTLE TICKS

Okeke-Agulu K.I.^{1*}, Onuwa G.C.¹, Adeniyi O.O.², Mailumo S.S.¹,
Bayo D.I.², Kyaharle B.S.³

¹Department of Agricultural Extension and Management, Federal College of Forestry, Jos, Nigeria

²Montane Forest Research Station, Jos, Nigeria

³Department of Pest Management Technology, Federal College of Forestry, Jos, Nigeria

*E-mail: okekeaguluki@gmail.com

ABSTRACT

The use of *Jatropha curcas* leaf extracts in the control of ticks that infest cattle and other large farm animals was studied in the bid to developing environmentally safer acaricides and their attendant deleterious effects on other organisms. Stem-bark of *Jathropha curcas* was collected from the premises of Federal College of Forestry Jos, air dried, pulverised, sieved and the powder was dissolved in distilled water for 24 hours and then filtered. The filtered solution was used to test for presence phytochemicals. Completely Randomized Design was used to distribute Seven hundred and twenty (720) ticks in petri dishes with tissue papers soaked with the extract; of 4 treatments (length of time of stem-extract storage) and 3 replications. Result showed the presence of the following phytochemicals; glycosides, saponins, alkaloids and tannins in high quantities. Ticks treated with extract at zero hour of storage, resulted to 93% mortality, after 6 hours of storage 84% mortality, after 12 hours of storage, 66% mortality and after 18 hours of storage, 57% mortality. From the finding, as the length of storage increases, the rate of mortality of the ticks decreases. The analysis of variance showed that there are significant differences in mortality existing between the various treatments. Therefore, it is suggested that farmers may use fresh extracts in controlling ticks while further research is being carried out to increase the mortality rate. More research should also be carried out in the area of toxicity or possible side effect, if any on animals.

KEY WORDS

Jatropha curcas, ticks, acaricides, stem-bark extract, phytochemicals, mortality.

The traditional livestock management system in Nigeria has always been the practice of rearing cattle in grass lands and forests in search of food and water. This practice exposes them to infestation by the three tick genera known in Nigeria. These include, Amblyomma, Hyalomma and Rhipicephalus spp. (Dipeolu, 1975; Awogbade, 1979; Pullan, 1980; Bayer and Maina, 1984).

Farmers in the bid to control the ticks rely heavily on the use of chemicals known as acaricides for effective tick control (Lorusso *et al.*, 2013). The need to have non-chemical methods and products with different mode of action in the control of ticks can never be over emphasised especially in the bid to solve the problem of ticks' resistance to synthetic acaricides (Graf *et al.*, 2004). Regrettably, tick control with synthetic acaricides has been observed to leave deleterious residues, environmental pollution, and more importantly, they are very expensive (Ghosh *et al.*, 2007). Gionetto and Chavez (2000) in their work noted that metabolites of plant origin reduce the persistence and accumulation of pesticides in the environment, since they are biodegradable and with no side effects.

Adenubi *et al.* (2016) had noted that *Azadirachta indica*, *Gynandropsis gynandra*, *Lavendula augustifolia*, *Pelargonium roseum* and *Cymbopogon* spp. had good acaricidal effects with 90–100% efficacy, comparable to those of currently used acaricides. However, their list did not include *Jatropha curcas* which is in great abundance in the study area.

Jatropha curcas Linn belongs to the family Euphorbiaceae and are used in ethno

botanic medicine in Africa, Asia and Latin America (Burkill, 1994). The plant is native to North America but has been known to thrive well in Africa and Asia. It is easy to establish as it grows relatively quickly with high yields (Willis, 1967). It is one of the promising biodiesel plants. According to Okujagu et al. (2006), it is traditionally used to cure diseases like cancer, piles, snake bites, paralysis and dropsy. Sanis et al. (2011) had posited the efficacy of *Jatropha Curcas* extract in the control of ticks but their extract was from leaf. Not much research work has been done in the use of stem-bark extracts in the control of ticks. Hence, it becomes pertinent to assess the effect of stem-bark extracts in the control of *Rhipicephalus (Boophilus) decoloratus*.

MATERIALS AND METHODS OF RESEARCH

Jatropha stem-barks collected from Federal College of Forestry, Jos premises, were sun-dried, pulverised, sieved and the powder dissolved in water for 24 hours and then filtered following Damter (2000), at the rate 25g to 250mls of water. The filtrate was then stored at 4°C in a refrigerator, until used.

Phytochemical Analysis. The plant extracts was assayed quantitatively to identify the phytochemicals it contains using the methods of Trease and Evans, (1989) and Sofowora, (1979). An extract of the fresh stem-bark of *Jatropha curcas* was prepared according to the method described by Sofowora (1979). 100g of the fresh stem-bark was pounded in a clean mortar with pestle and macerated with 500ml of redistilled methylated spirit in a blender. This was suction filtered and the process repeated exhaustively with known volumes of redistilled methylated spirit. The filtrate was evaporated to dryness at 50°C and further dried to constant weight at the same temperature in a hot air oven. The yield of residue was $20.52 \pm 1.25g$. This was used to test for the following plant constituents' resins, alkaloids, saponin, tannin, glycosides and flavonoid.

Test for resins. To 0.5g of the stem bark extract was added 5ml of boiling ethanol. This was filtered through Whatmann No.1 filter paper and the filtrate diluted with 4ml of 1% aqueous Hcl.

Test for Alkaloids. 0.5g of the extract was stirred with 5ml of 1% aqueous Hcl on a steam bath. This was filtered and 1 ml of the filtrate treated with a few drops of dragendorffs reagent and a second 1ml formation treated similarly with wagner's reagent.

Test for Saponin. 0.5g of the extract was shaken with water in a test tube. Frothing which persisted on warming was taken as preliminary evidence for the presence of saponin (Wall et al, 1952 and 1954).

In order to remove "false-positive" results, the blood haemolysis test was performed. 0.5g of the extract was boiled with 50ml of phosphate buffer, PH 4 and then allowed to cool and filtered. 5ml of the filtrate was passed for 13 hours through an asbestos disc which has been previously soaked with two or three drops of 1% cholesterol in ether and dried in the air. After filtration, the disc was washed with 0.5ml of distilled water, dried and boiled in 20ml of oxylol for 2 hours to decompose the complex formed between cholesterol and any saponin in the extract. The disc was then washed in ether, dried and placed on a 7% blood nutrient agar. There was Haemolysis of red blood cells around the disc after 6 hours.

Test for Tannin. 5g of the extract was stirred with 10ml of distilled water. This was filtered and a few millilitres of 5% ferric chloride, added to the filtrate. A deep green coloration was seen. A second portion of the filtrate was treated with few millilitres of iodine solution. A faint bluish coloration was also seen.

Test for glycosides. 5g of the extract was stirred with 10ml of boiling distilled water. This was filtered and 2ml of the filtrate hydrolysed with a few drops of conc. HCL and the solution rendered alkaline with a few drops of ammonia solution. 5 drops of this solution was added to 2ml of Benedict's qualitative reagent and boiled. A reddish brown precipitate appeared.

Test for Flavonoid. 0.5g of the extract was dissolved in 2 ml dilute NaOH solution. A few drops of conc. H_2SO_4 was then added. The presence of flavonoid is indicated if the solution becomes colourless (Trease and Evans, 1989).

Collection of Ticks and Grouping. The ticks were collected from Kasuwan Shanu in Jos and were randomly distributed into twelve glass jars with sixty (60) ticks in each separate glass jar. A total number of 720 ticks were used and divided into four (4) treatments and three (3) replicates. Filter papers were soaked with the extract, allowed to partially dry before placing the ticks on them.

The first group (T0) was added the 10% concentration of the extract, fresh without storage (at zero hour). To the second group (T1) was added the 10% concentration of the extract after 6 hours of storage in the refrigerator at 4°C. To the 3rd group (T2) was added 10% of the extract after 12 hours of storage. To the 4th group (T3) was added 10% of the extract after 18 hours of storage. Completely Randomised Design was the experimental design used in the study. Analysis of variance (ANOVA) was used to check if the means of the treatments are significantly different from each other.

RESULTS AND DISCUSION

Jatropha curcas contain glycoside, Saponins, Alkaloids and Tannin all in high quantities while Resin and flavonoid are absent in the plant. This result agrees with the findings of Askira and Sodipo (2002). Test for resins indicates that there was no formation of a heavy resinous precipitate which indicates the absence of resins. Alkaloid was present; there were formation of precipitates as indicated by Trease and Evans, (1989). Test for saponin shows that frothing which persist on warming after shaking 0.5g of the extract with water in a test tube was taken as preliminary evidence for the presence of saponin (wall et al., 1952 and 1954). Haemolysis of red blood cells around the disc after 6 hours was taken as further evidence of presence of saponin (Trease and Evans, 1989). Test for Tannin shows that, there was a deep green coloration which showed the presence of tannin. A faint bluish coloration after treating the filtrate with iodine solution confirmed the presence of tannin (Trease and Evans, 1989). Test for glycosides, showed a reddish brown precipitate which indicates the presence of glycosides (Trease and Evans, 1989). Test for flavonoid revealed that, it was absent, the solution was not colourless as put forward by Trease and Evans, (1989).

Tannins is used in styptic preparations which produces contractions of blood vessels; stopping bleeding having the quality of retaining haemorrhages when applied to the bleeding part (McGraw-Hill, En. 1977). Saponins have the property of Causing haemolysis of cells even at low dilution, tend to be deposited on the surface of cells with which they come in contact and are not absorbed by the normal epithelium of the alimentary canal (Arthur et al., 1941). Alkaloid represents the active principle of vegetable drugs. They are alkaline in reaction and richly combine with acid forming salts soluble in water. All contain nitrogen but some drugs may contain more than one alkaloid and the actions of these may be antagonistic (Russell et al., 1956).

Glycosides have a tendency to block the conduction of the electrical impulse that causes contraction as it passes from the atria to the ventricles of the heart (heart block). Cardiac glycoside also have a tendency to produce an abnormal cardiac rhythm by causing electrical impulses to be generated at points in the heart other than the normal pace maker region, the cells that rhythmically maintain the heartbeat (Encyclopaedia Britannica, 2005).

Table 2 – Showing different Treatments of Aqueous Extract of *Jatropha curcas* on Ticks

	1	2	3	Total %	Mean
T0	60	56	52	168 93	56
T1	48	48	56	152 84	51
T2	36	44	40	120 66	40
T3	40	28	36	104 57	35
Total	184	176	184	GT=544	

Table 2 shows the effect of the plant Extract on ticks at different treatments (length of storage) ranging from zero hour, six hours, twelve hours and eighteen hours all at the same (10%) level of concentration.

From this result, it clearly indicate that when the treatment was applied at zero hour (fresh) it yielded up to (93%) 42 rate of mortality. At six hours length of storage, the mortality rate drops to (84%) 38. At twelve hours length of storage, the mortality rate obtained was (66%) 30 and (57%) 26 mortality at eighteen hours length of storage.

From this result, it shows that as the length of storage of the aqueous extract of the plant increases, the mortality rate decreases there is significant difference in the effect of different treatments of aqueous extract of the *Jatropha curcas* on ticks. The result obtained from fresh use of *Jatropha curcas* extract (93%) is comparable to that obtained by Adenubi et al. (2016) from *Azadirachta indica*, *Gynandropsis gynandra*, *Lavendula augustifolia*, *Pelargonium roseum* and *Cymbopogon* spp., whose acaricidal effects is within 90–100% efficacy.

Possible mode of action of the Phytochemicals on the ticks. Based on table 2, and the method of application used (which was applied on the White-man paper, allowed to partially dry before placing the ticks on it) shows that the possible mode of action of the plant may be through contact with extract or by inhalation. The plant as discussed in table 1 has the following photochemical properties, glycosides, saponins, alkaloids and tannin all in higher quantities. Like saponins for instance have the property of causing haemolysis of cell even at low dilution, tend to be deposited on the surface of cells with which they come in contact and are absorbed by the normal epithelium of the alimentary canal (Arthur et al 1962). Alkaloids, saponins, and tannins have been recorded to have retrogressive effect on micro-organisms (Block, 1985) Tannins are used in styptic preparations which produces contractions of the blood vessels, stopping bleeding, having the quality of retaining haemorrhages when applied to the bleeding part (McGraw-Hill, En. 1977) Alkaloids represent the active principles of vegetable drugs, They are alkaline 'in reaction and richly combine with acid forming salts soluble in water. All contain Nitrogen. Some drugs may contain more than one alkaloid and the actions of these may be antagonistic (Russell et al, 1956).

Worthy of Note is considering the pharmacological value of glycoside which causes cardiac (heart) problems and may be implicated.

It is equally important to note that the effect of the extracts upon treatments on the ticks were acute and rapid in action and not chronic. It is therefore, suggested that glycoside may be implicated, since the encyclopaedia Britanica (2005) reported that glycoside have a tendency to block the conduction of the electrical impulse that causes contraction as it passes from the atria to the ventricles of the heart (heart block). It also have a tendency to produce an abnormal cardiac rhythm by causing electrical impulses to be generated at point in the heart other than the normal pace maker region, the cells that rhythmically maintain the heartbeat. Saponin may also be implicated because of its ability to cause haemolysis of cells even at low dilution tends to be deposited on the surface of cells with which they come in contact and are not absorbed by the normal epithelium of the alimentary canal as reported by (Arthur et al., 1962) however, the effect of the plant extract, on the ticks may be as a result of a synergistic action Of all the phytochemicals.

CONCLUSION

From the results, the plant extract has great potentials in the killing of ticks when the extract is fresh. Mortality decreases as storage time increases. It is possible that its ability to achieve this may be as a result of a synergistic action of its phytochemicals or as a result of the action of individual phytochemicals which have been shown to have a retrogressive effect on organisms. The use of *Jatropha curcas* (Linn) stem bark extract when it is fresh is highly recommended in controlling ticks for best results. Further research should be carried out in the area of toxicity or possible side effects on animals.

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