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Control of Insect Pests of Cowpea in the Field with Allelochems from *Tephrosia vogelii* and *Petiveria alliacea* in Southern Guinea Savannah of Nigeria

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Abstract: The study evaluated the effectiveness of botanical pesticides Tephrosia vogelii and *Petiveria alliacea* for the control of insect pests in cowpea field. Extracts from the plants were compared with a synthetic insecticide, decis. The extract of *Tephrosia vogelii* was the most effective of the botanicals and ranked equal to that of synthetic insecticide decis in reducing the population density and damage caused by the insects prevalent in many experimental sites in southern Guinea Savannah of Nigeria. The importance of using botanicals as insecticides in developing countries is discussed in the study.

Key words: *Tephrosia vogelii*, allelochems, *Petiveria alliacea*, botanical, Nigeria

INTRODUCTION

In West Africa and in many parts of the world, cowpea (*Vigna unguiculata* L. Walp) is an important grain legume (Singh *et al*., 2002). The crop is very unique in that it produces food, cash and fodder. It has high potential to increase income of both farmers and traders being widely consumed and traded outside the producing localities (Owolade *et al*., 2004).

The grain is valued for its nutritive contents and the plant is especially favoured by farmers because of itsability to maintain soil fertility through nitrogen fixation (Blade *et al*., 1997). However, farmers obtains low yields averaging 200-300 Kg ha^{-1} in Nigeria (Alghali, 1992) and 150-400 Kg ha^{-1} in Uganda (Sabiti *et al*., 1994) whereas yield greater than 2000 kg ha^{-1} are achievable under research conditions (Rusoke and Rubaihayo, 1994) and in developed countries of the world such as southern USA (Singh and Jackai, 1985). The low yield obtained in most cowpea producing areas of West Africa is largely due to field insect pests and these pests feed on reproductive plant parts causing most economic damage thereby necessitating appropriate control (Karungi *et al*., 2000). The most important being Aphis craccivora koch, Megalurothrips, Sjostedti Trybom, Maruca Vitrata Fabricius and a complex of pod sucking bugs especially Clavigralla tomentoscollies stat and Riptortus dentipes (Karungi *et al*., 2000).

Effective control of insect pests' infestation on cowpea can be achieved through use of conventional insecticides. However, conventional insecticides are expensive and they have resulted in ecological pollution, health hazard and have caused insect population to increase in the development of development of resistance to pesticides and the destruction of natural antagonist of the pests to mention a few.

Although many plants have been reported to have insecticidal properties (Adebayo *et al*., 2004; Adebayo and Olaifa, 1994; Adebayo and Gbolade, 1994) their efficacy in the control of pest infestation in various crop remains largely unknown. A study was therefore conducted to compare the effectiveness of two botanicals *(Tephrosia vogelii* and *Petiveria alliacea)* and one conventional insecticide (decis) against field insect pests of cowpea.

MATERIALS AND METHODS

The study was conducted at the Teaching and Research Farm, Ladoke Akintola University of Technology (LAUTECH) Ogbomoso situated in southern guinea Savanna region of Nigeria for three seasons: Early and late season of 2005 and early season of 2006.

A cowpea variety Ife brown was procured from International Institute of Tropical Agriculture (IITA) Ibadan while *T. vogelii* and *P. alliacea* were harvested from established botanical garden on the University campus. The experimental layout was a randomized complete block design with three replicates. Each experimental plot measured 3×3 m^2 with 1m and 2m between plots and blocks, respectively to prevent pesticide drift and inter-plot interference. The cowpea

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variety was planted at spacing of 60 and 30 cm between and within rows, respectively and to ensure proper stand four seed were planted at each hill and a week after germination, thinning was done to 2 plants per hill.

Crude extracts of botanicals (*T. vogelii* and *P. alliacea*) were prepared separately by harvesting the green leaves of *T. vogelii* and roots of P. *alliacea* respectively. Both the leaves and roots were pounded into pastes and 200 g of each paste was placed into 21 plastic buckets to which 1 1itre of clean cold water was added. The solution was stirred until a solution was formed. The solution was filtered using a muslin cloth and the filtrate stored in plastic containers for bioassay almost immediately.

The critical point at which economic damage is due on cowpea is at the second stage of the phenology of the crop that is, flowering and pudding where insect bites leads to flower abortion and shiverling of the pods. Since the pods are the required materials, spraying commenced when at least one flower opened in any of the plots and continue until 80% of the pods had turned yellow.

- *T. vogelii* at 0.2g cm^{-3}
- *P. alliacea* at 0.2g cm^{-3}
- Decis at 200 mc ha^{-1}
- No spraying (control).

Population densities of *Maruca testulalis* were estimated by random picking 20 flowers per plot depending on the growth stage of the crop. The flower buds/flowers were placed in glass vials containing 50% ethanol solution (preservatives). Nymphs and adults of *Maruca testulalis* were separated from the plant parts and their numbers counted and recorded. This was done once every 10 days starting from 30 DAE till 50 DAE.

Population densities of *Ootheca mutabilis* and *Zonocerus variegatus* were recorded weekly for three weeks starting from 21 DAE from each plot. Population densities of *A.Varium* and *Riptortus dentipes* were counted and recorded weekly for three weeks starting from 49 DAE from each plot. At crop maturity, pods from each plot were harvested and kept separately in labeled polythene bags. Data were also collected on the growth parameters, number of seeds per pod, seed weight per pod, mean pod weight, pod weight, pod weight per plant, mean seed weight and seed weight and seed yield. Data analysis was carried out using the statistical analysis software means separation was done using the Duncan Multiple Range Test at 5% probability level.

RESULTS

The effect of the various treatments on some growth parameters (Fig. 1) indicates that generally application of synthetic insecticide is not significantly different from application of *T. vogelii* extracts. There was no significant difference in the number of levels per plant, number of flowers per plant. These parameters were higher both in the plant extracts and synthetic insecticide than that of control. The number of defoliated leaves was highest in the untreated (control) plot.

All the yield components of the cowpea variety were significantly higher in all the treated plots compared to the control (untreated) experiment (Fig. 2). However, the degree of effectiveness between the extracts varied ($p<0.05$) with respect tothepod weight per plant, mean pod

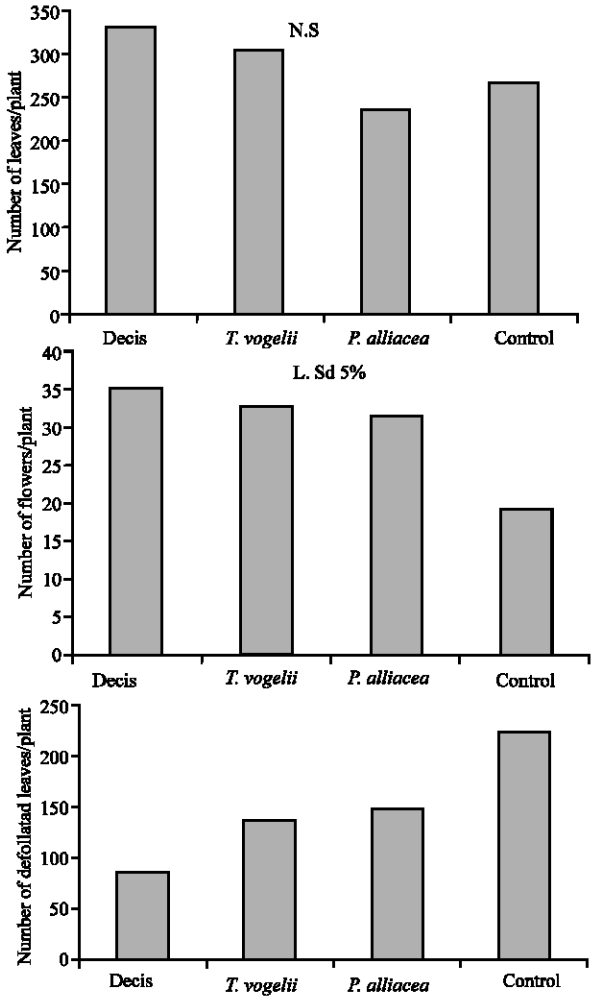

Fig. 1: Effects of insecticide treatment on some growth parameers of cowpea var. Ife brown

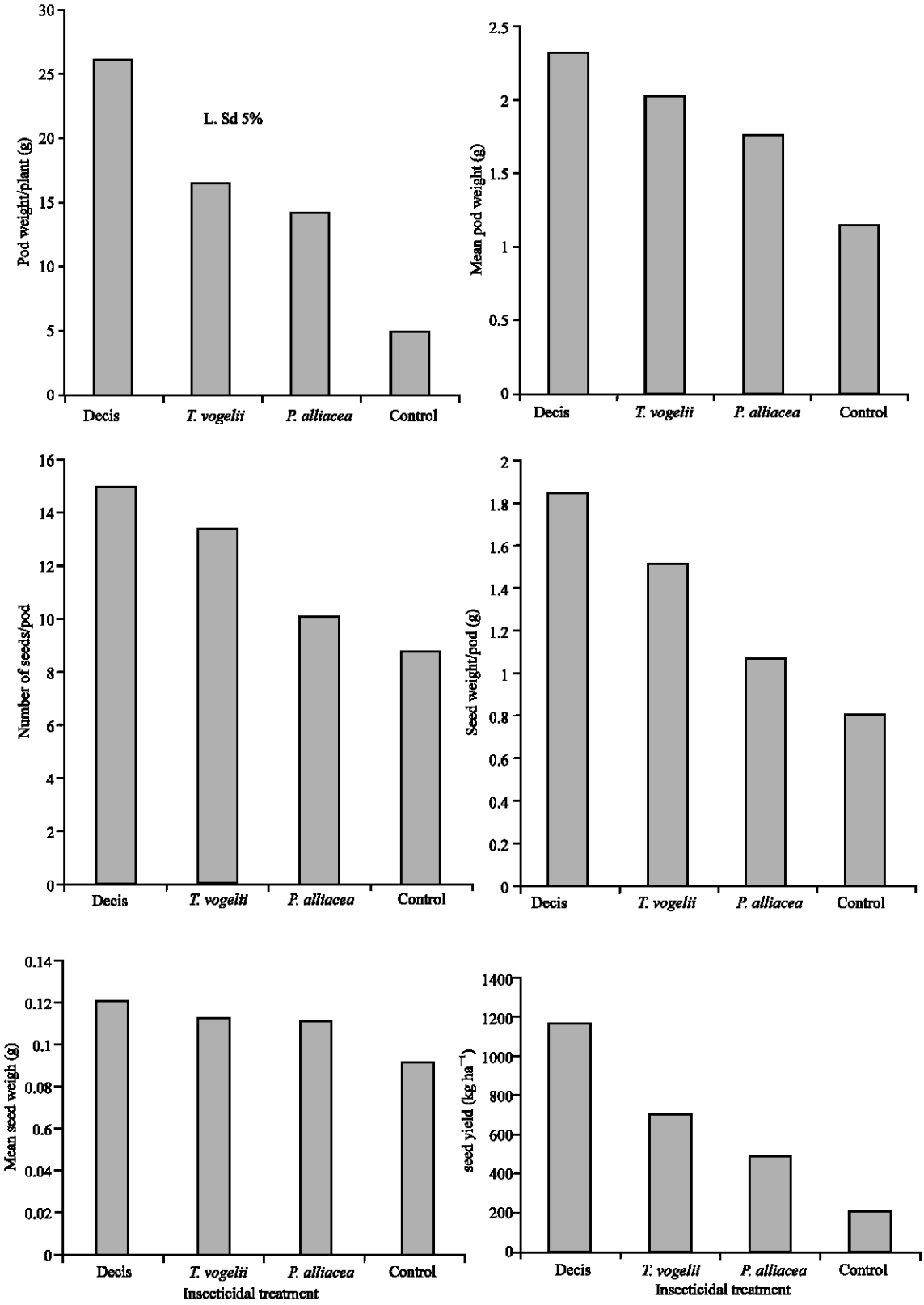

Fig. 2: Effect of insecticide treatment on seed parameter and yield of cowpeavar. Ife brown

Table 1: Effects of insecticide treatments on *O. mutabilis, R. dentipes* and *A. varium* population

	Weeks after treatment		
Treatments	1	2	3
O. mutabilis			
Decis	1.00b	0.67b	0.00c
T. vogelii	1.00b	0.67b	0.00c
P. alliacea	1.67b	1.33b	0.33b
Control	4.00a	2.67a	2.33a
R. dentipes			
Decis	0.33c	0.00c	0.00c
T. vogelii	0.27c	0.20c	0.00c
P. alliacea	1.67b	1.00b	0.33b
Control	2.67a	2.33a	1.33a
A. varium			
Decis	0.00c	0.00c	0.00c
T. vogelii	0.00c	0.00c	0.00c
P. alliacea	0.67b	1.00b	0.67b
Control	1.33a	1.33a	1.33a

Mean followed by the same letters along the column are not significant different using DMRT at 5% probability level

Table 2: Effects of insecticide treatments on *M. testulalis* and *Z. variegatus* population

	Weeks after treatment		
Treatments	1	2	3
M. testulalis			
Decis	0.00c	0.00b	0.00b
T. vogelii	0.33b	0.00b	0.00b
P. alliacea	0.33a	1.00a	0.67ab
Control	1.00a	1.00a	0.68a
Z. variegatus			
Decis	1.00	0.33c	0.00c
T. vogelii	1.33	0.33c	0.00c
P. alliacea	2.00	1.33	0.67b
Control	4.00	3.00a	2.00a

Mean followed by the same letters along the column are not significant different using DMRT at 5% probability level

per plant, mean seed weight and seed yield. All were significantly higher with the extract from *T. vogelii*. Plants treated with *T. vogelii* had comparable yield component with synthetic insecticide treated plants except in the seed yield.

The results also showed that the plant extracts significantly ($p<0.05$) reduced the incidence and severity of the field insect pests of cowpea (Table 1 and 2). The plant extracts significantly controlled insect pest compared to the control however, *T. vogelii* was more effective compared to *P. alliacea*.

Ootheca mutabilis, Maruca testulalis, Zonocerus variegatus Riptortus dentipes and *Apunth varium* were insects' pest of cowpea observed in this trial.

DISCUSSION

Pesticides both synthetic and botanical no doubt markedly reduce pest infestations and increase seed yield of crops. In this investigation, efforts were made to evaluate the efficacy of leaf extract of *T. vogelii* and root extract of *P. alliacea* in controlling the insect pests of cowpea. In this study, spraying with synthetic insecticides controlled the insect pests and increased cowpea seed yield tremendously as compared to spraying with botanical insecticides. These results is in line with earlier works by Agona *et al.* (2001, 2002) and Opolot *et al.* (2006) where synthetic were adjudged to be more effective than the botanical pesticides. Adebayo and Olaifa (1994, 2004), Owolade *et al.* (2004) and Stoll (2001) reported that there many crude extracts of plants are known to be effective in controlling insect pests of various crops. Most of these findings are at experimental stage or at screen house stage. This present study was tried on pilot scale on the field.

This study revealed certain facts about the inherent insecticidal properties of botanicals. It was discovered that these extracts significantly control the pod sucking bugs and flower thrips of cowpea. Adebayo (2003) had earlier reported the possibility of using *T. vogelii* to control the menace of *podagrica* on okra. *T. vogelii* leaves and seeds have been reported to contain to contain tephrosine (Adebayo, 2003). Rotenoids and rotenone have long been used as insecticides and picscicides which are important non-residual insecticide. Natural insecticides are low cost, locally available, safe for the environment and non target organisms. The use of plant extracts in cowpea production is a significant contribution to knowledge particularly because peasants farmers which form the major percentage of food producers in the third world, have most of these bioactive plants on their farms and can easily procure them if and when their importance are made known by researchers. Besides benefits to basic science, accumulation of this knowledge may provide us with a more rational and scientific approach to insect pest control in developing countries where many farmers cannot afford high cost of procuring synthetic insecticides.

REFERENCES

Adebayo, T.A. and J.I. Olaifa, 1994. Laboratory evaluation of *petiveria alliacea* (phytollaccaea) as an ovocide and oviposition defferent to mosquitoes. Pak. J. Entomol. Karachi, 8: 29-35.

Adebayo, T.A., 2003. Efficacy of mixture formulations of synthetic and botanical insecticides in the control of insect pests of okra and cowpea. Ph. D. Thesis, Department of Agronomy, Ladoke Akintola Uni. Tech. Ogbomoso, Nig., pp: 114.

Adebayo, T.A., J.I. Olaifa, A.J. Akintola and A.O. Ojo, 2004. Field control of peridomestic mosquitoes of medical importance with extract of *Petiveria alliacea* L. Ife J. Sci., 6: 6-9.

Adebayo, T.A and J.I. Olaifa, 2004. Efficacy of the extract of Tephrosia vogelli in the control of insect pests of cowpea. Sci. Focus, 7: 47-52

Agona, J.A., E. Owera-Odom, S. Kyamanywa, M. Silim-Nahdy and H.R. Wilson, 2001. Field management of bruchids on beans using selected photochemical, insecticides and entomopathogen. Afr. Crop Sci. Conf. Proc., 5: 153-157.

Agona, J.A., S. Kyamanywa, J. Nakkazi, M. Silim-Nahdy and H.R. Wilson, 2002. Fieldmanagement of post-podding pests and bruchids on cowpea using selectedsynthetic and botanical insecticides. In: Integrated Pest Manage. Conf. Proc. Kampala, Uganda, pp: 81-87.

Alghali, A.M., 1992. Insecticide application schedules to reduce grain yield losses caused by insect pests of cowpea in Nigeria. Insect Sci. Applied, 13: 725-730.

Blade, S.F., S.V.R. Shetty, T. Terao and B.B. Singh, 1997. Recent Development in Cowpea Cropping System Research In: Singh, B.B., Moham Raji, D.R. Dashiell, K.E., Jackai. L.E.N. (Eds.), Advances in cowpea Research. Copub. IITA and JIRCAS, IITA, Ibadan, Nigeria.

Karungi, J., E. AdIpala, M.W. Ogenga-Latigo, S. Kyamanywa, N. Oyobo and L. E. N. Jakai, 2000. Pests Management in cowpea. Integrating planting times, plant density and insecticide application for management of cowpea field insect pests in Eastern Uganda. Crop Protect., 19: 237-245.

Opolot, H.N., A. Agona, S. Kyamanywa, G.N. Mbata and E. Adipale, 2006. Integrated field management of cowpea pests using selected synthetic and botanical pesticides. Crop Protect., 25: 1445-1152.

Owolade, O.F., B.S. Alabi, Y.O.K. Osikanlu and O.O. Odeyemi, 2004. On farm evaluation of some plant extracts as biofungicide and bioinsecticide on cowpea in southern west Nigeria. Food Agric. Environ., 2: 237-240.

Rusoke, D.G. and P. Rubaihayo, 1994. The influence of some crop protection management practices on yield stability of cowpea. Afr. Crop Sci. J., 2: 143-148.

Sabiti, A., E. Nsubuga, E. Adipala and D.S. Ngambeki, 1994. Soc. Econ. Aspects of Cowpea Prod. Sci., 2: 29- 38

Singh, S. R. and L.E.N. Jackai, 1985. Insect Pests of Cowpea in Africa: Their Life Cycle, Economic Importance and Potential for Control. In: Singh,S.R., Rachie, K.O. (Eds.), Cowpea Research, Production and utilization. Wiley, New York, pp: 217-232.

Singh, B.B., J.D Ehlers, B. Sharma and F.R. Freire Filho, 2002. Recent Progress in Cowpea Breeding. In Fatokun, C.A., Tarawali, S.A., Singh , B.B., Kormawa, P.M., Tamo, M (Eds.), Challenges and Opportunity for Enhancing Sustainable Cowpea Production. Proceedings of the World Cowpea Conference III held at International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria, IITA, Ibadan, Nigeria.

Stoll, G., 2001. Natural Crop Protection in the tropics. Letting information come to life. F and T. Millerbader Fildstadt Publishers, Germany, pp: 208.