Quest Journals
Journal of Research in Agriculture and Animal Science
Volume 9 ~ Issue 7 (2022) pp: 15-17
ISSN(Online) : 2321-9459
www.questjournals.org

Research Paper

Insecticidal efficacy of plant extracts against *Planococcus citrii* (Risso) (Hemiptera: Pseudococcidae), in Coffee

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ABSTRACT: *Coffee mealybugs Planococcus citrii (Hemiptera:Pseudococcidae) is one of the major pests attacking robusta coffee. Young plants as well as older ones are susceptible to mealybug attack. Infestation usually found during the summer season in low shaded areas. Management of mealybugs on chemicals measures are practicing at present. Considering the health hazards of chemicals and to conserve the ecosystem, an alternative with extracts of few plants which are locally available were evaluated in the laboratory. The plants selected were leaves of Gliricidia sp.and Ocimum sanctum, and fruits of Capsicum frutescence. Laboratory reared P.citrii were collected for the study. Ethanol extracts of the plant parts were sprayed on mealybugs in the laboratory and the efficacy was observed daily upto 15 days. Mortality obtained in all the treatments, but no effect observed for the adults with ovisac and eggs inside that during the study period.*

KEYWORDS: *Planococcus citrii, Coffee, Plant extracts, Mealybug management*

***R**eceived 06 July, 2022; **R**evised 18 July, 2022; **A**ccepted 20 July, 2022 © The author(s) 2022.*
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I. INTRODUCTION

Robusta coffee (*Coffea canephora*) is the cultivar predominantly grown in Wayanad district of Kerala. Small growers, who own the majority of coffee plantations in the District, are highly concerned about pests on this perennial crop. Mealybug is one of the important sucking pests attacking robusta. The two most common species encountered from coffees of India are *Planococcus citrii* (Risso) (Coleman and Kannan 1918; Ayyar 1940) and *P. lilacinus* Ckll. (Sekhar 1964; Bhat and Shamanna 1972). Mealybugs usually attack the coffee plants during summer, particularly in low shaded areas, and it spreads quickly in plantations where ants are active. Both aerial parts and roots are affected by mealybugs. Young plants are more susceptible to infestation than the older ones. Generally, infestation on aerial parts leads to the development of sooty mould (*Capnodium* sp.) on honeydew secreted by Mealybugs, and the infested leaves coated with this fungus hinder photosynthesis. Severe infestation leads to chlorosis, abortion of flower buds and small berries. In a similar manner, root infestation leads to the development of fungus *Diacanthodes* sp. which affects nutrient absorption (Anonymous, 2014).

Widespread adoption of promising management practices that rely on insecticides is occurring, but there is a need of safe alternatives for planting community. In addition, plant based pest management strategies are gaining popularity, since they are eco-friendly; conserve natural enemies and pose low risks to environment. Several plants have been identified for its insecticide properties. Botanical extracts of many plants have been demonstrated to effectively control various phytophagous insect pests including mealybugs. The studies with a variety of botanicals were found effective against sucking insect pest like thrips, aphids, whitefly and mealy bug (Vijayalakshmi *et al*., 1996; Malik *et al*., 2003; Ahmad *et al*., 2009., Dinesh *et al,* 2003). Hence, the present study was attempted to evaluate botanicals with insecticidal characteristics which are locally available and widespread in coffee plantations.

II. MATERIALS AND METHODS

The laboratory study was conducted during 2021-22 at Regional Coffee Research Station, Chundale. The mealybugs (*P. citrii*) reared on pumpkins and sprouted potatoes in the laboratory were used for the experiments. The plants selected for this experiment were Mexican lilac (*Gliricidia* sp.), Tulasi (*Ocimum*

sanctum), Wild chilli pepper (*Capsicum frutescence*). The leaves of *Gliricidia sp., O. sanctum* and fruits of *C. frutescence* were washed in distilled water and dried under shade. Then the dried materials were crushed using pestle and motor until the fine powder was obtained.

Soxhlet's apparatus was used for extraction using ethyl alcohol as solvent. 100 gm of powdered botanicals from each plant was placed in extraction Thimble and extracted separately by adding 200 ml ethyl alcohol as solvent. These materials were extracted at 78^{o} C for 5 hours in a Soxhlet's apparatus and the extracts were decanted from the flask separately. The extract obtained was diluted in equal proportion of water (1:1) and were imposed on adults of *P. citrii*. Four treatments including control (water) was replicated five times with three petriplates each. The petriplates with filter paper was supplied with ten *P. citrii* adults. Treatments were imposed on adults using a hand sprayer and covered with a muslin cloth. The mortality of mealybugs was observed everyday under microscope.

Percent corrected mortality was calculated by following formula described by Schneider-Orelli's (1947) and Puntener (1981), subjected to statistical analysis and presented in Table 1.

$$\text{Corrected \% mortality} = \frac{\text{\% mortality in treatment - \% mortality in control}}{\text{100 - \% mortality in control}} \times 100$$

III. RESULTS AND DISCUSSION

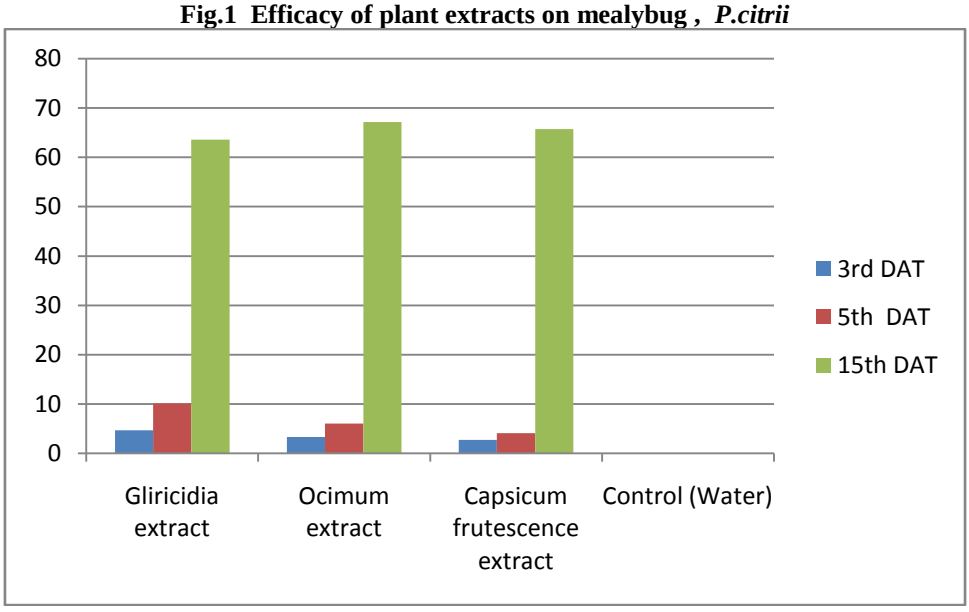
Results of toxicity bioassay performed with different botanical extracts revealed that all botanical extracts caused varied percentage of mealybug mortality over days.

Table 1. Efficacy of plant extracts against *P. citrii*

Treatments	Percentage mortality		
	3rd DAT	5th DAT	15th DAT
Gliricidia extract	4.68 ± 1.69	10.11±1.80 a	63.59±2.77 a
Ocimum extract	3.33 ± 2.10	6.06 ±1.25 b	67.16±1.15 a
C. frutescence extract	2.73 ±2.00	4.06 ± 1.99 b	65.71±2.34 a
Control (Water)	0.00	0.00 c	0.00 b
	NS	CD @ 1% - 5.15 CD@ 5% - 3.67	CD @ 1% - 8.34 CD@ 5% - 5.94

*Means followed by the same letters are not significantly different

Fig.1 Efficacy of plant extracts on mealybug , *P.citrii*



The observations showed that first day after treatment mealybugs were alive but failed to move. On 3rd day after treatment there was no significant difference in the mortality among the treatments with 4.68 % mortality for *Gliricidia* extract followed by *Ocimum* extract (3.33%) and *Capsicum* extract (2.73%).On 5th day after treatment maximum mortality percentage was recorded for *Gliricidia* extract with 10.11%. Even though percentage mortality is low, significant difference was observed between *Gliricidia* and *Ocimum* extracts. *Ocimum* and *C. frutescence* were on par on 5th day after treatment. There was no significant difference between treatments on 15th day after treatment but considerable mortality has been achieved in all the treatments. *Ocimum* extract recorded 67.16% followed by *C. frutescence* with 65.71 % and *Gliricidia* extract with 63.59%.

It was noticed that, adults with ovisac could survive and eggs protected in the ovisac were able to hatch in all the treatments. Figure. 1 shows the comparison of percentage mean mortalities to different plant extracts at 3rd, 5th, & 15th days after treatments.

Various studies conducted with plant extracts against insect pests are in accordance with the results of present study. According to Murugesan *et al* (2021) 5 % methanolic extract of *Ocimum basilicum* (L.) has significant toxicity (66.67% mortality) aswellas repellency (86.88%) against the cigarette beetle, *Lasioderma serricorne*. In another study conducted by Nismah *et al* (2019) shows that the formulation of crude leaf extract of *Gliricidia* was highly potent against papaya mealybugs. Tulsi – bilwa extracts in cow urine recorded 54% mortality of adult mealybugs in a study conducted on *P.citrii* adults in coffee (Dinesh *et al*, 2003).

In a field trial with ethanol extracts of *O.sanctum* resulted adult mortality (39%) and a higher nymphal mortality of 72% (Prishanthini and Vinobaba,2014). Rosulu *et al* (2022) evaluated the aqueous extracts of chilli pepper against thrips, pod borers, pod sucking bugs of cowpea plant and proved significant reduction in the pest population. In another study on *P.citrii* shows 77% mortality of nymphs with the extracts prepared from husks of avocado (Santa *et al.*, 2010).

IV. CONCLUSION

The insecticides are highly promising in the control of mealybugs. But this cannot be advised continuously, as the natural enemies associated with mealybugs as well as the ecosystem needs to be conserved. The botanicals tested in the study were found effective in laboratory trials. Though mortality was low initially, it increased gradually over a period of time. Earlier reports on use of these botanicals have also demonstrated a significant decrease in agricultural pests under field conditions. Hence, this study is a positive cue for the possibility of incorporating botanicals along with other management practices against coffee sucking pests. With these encouraging results, field trials will be conducted in future.

REFERENCES

[1]. Ahmed, B.I., I. Onu, L. Mudi. and B.I. Ahmed. 2009. Field bioefficacy of plant extracts for the control of post flowering insect pests of cowpea (Vigna unguiculata (L.) Walp.) in Nigeria. Plant extracts on cowpea pest management. J. Biopest., 2(1): 37-43.

[2]. Anonymous.2014. Coffee Guide 8th edition. Central Coffee Research Institute, Coffee Board, p.127.

[3]. Ayyar, T.V.R.1940.Handnook of Economic Entomology for SouthIndia. Madras p. 528

[4]. Bhat,P.K. and Shamanna, H.V.1972.Some new collateral hosts of Planococcus lilacinus from South India. Journal of Coffee Research 2(2):27.

[5]. Coleman, L.C. and Kunhi Kannan, K.1918. Some scale insect pests of coffee in India. Entomological Series – Bulletin No. 4., Department of Agriculture, Mysore State,67 p

[6]. Dinesh, K.P., Sachin, M., Veena,B.J., Seetharama, H.G., Sreedharan, K. and Vinodkumar, P.K. 2003. Evaluation of botanicals againstmealybug *Planococcus citrii* Risso and its effect on parasitoid and attended Ants. Journal of Coffee Research, 31(2), 139-152

[7]. Malik, M.F., M. Nawaz. and Z. Hafeez.2003. Efficacy of synthetic insecticide and botanical infusion against onion thrips in Balochistan, Pakistan-I. Asian J. Plant Sci., 2(10): 779-781.

[8]. Naveen, M., Jayaraj,J., Chinniah,C., Mini,M.L., Vellaikumar. S. and Shanthi, M.2021. Insecticidal property of methanolic leaf extract of Sweet Basil, *Ocimum basilicum* (L.) against cigarette beetle, *Lasiodermaserricorne* (Fab. Fab.) (Coleoptera: Anobiidae) . Journal of Entomology and Zoology Studies, 9(1):259-262

[9]. Nismah Nukmal, Gina Dania Pratami, Emantis Rosa, Aprilia Sari. and Mohammd Kaned.2019. Insecticidal Effect of Leaf Extract of Gamal (*Gliricidia* sepium) from Different Cultivars on Papaya Mealybugs (Paracoccus marginatus, Hemiptera: Pseudococcidae). Journal of Agriculture and Veterinary Science. Volume 12, Issue 1 Ser. III PP 04-08

[10]. Prishanthini, M. and Vinobaba.M. 2014. Efficacy of some selected botanical extracts against the Cotton mealybug *Phenacoccus solenopsis*(Tinsley) (Hemiptera: Pseudococcidae).International Journal of Scientific and Research Publications, Volume 4, Issue 3, March 2014.

[11]. Püntener, W. 1981. Manual for field trials in plant protection second edition. Agricultural Division, Ciba-Geigy Limited.

[12]. Rosulu, H. O., Oni, M. O., Ofuya, T. I. and Adebayo, R. A. 2022.Bioefficacy of chilli pepper capsicum frutescens (l.) and it's intercropping on the growth, yield and insect pest management of cowpea vigna unguiculata (l.) walp in the rain forest area of Nigeria. Journal of Global Agriculture and Ecology, 13(2): 7-18.

[13]. Santa-Cecília, L. V. C. ; Santa-Cecília, F. V. ; Pedroso, E. do C. ; Sousa, M. V. de ; Abreu, F. A. ; Oliveira, D. F. ; Carvalho, G. A. 2010. Plant extracts controlling the citrusmealybug, *Planococcus citri* (Risso, 1813) (Hemiptera: Pseudococcidae) in coffee plants. Coffee Science. Vol.5 No.3 pp.283-293.

[14]. Schneider-Orelli, O, 1947. Entomologisches Pratikum. HR Sauerlander and Co, Aarau.

[15]. Vijayalakshmi, K., B. Subhashini and V.K. Shivani, 1996. Plant in pest control : Garlic and Onion. Centre for Indian Knowledge System, Chennai, 1-20pp.