



Research Article

INFLUENCE OF PLANT EXTRACT ON GROUND NUT SEED BEETLE IN STORED GROUND NUT

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Abstract- Ground nut seed beetle (*Caryedon serratus*) is a serious pest in the stored ground nut. Study on management of ground nut seed beetle by taking eleven sprayable form of plant extract was conducted. After one month, no such infestation was shown. After two months of storage the beetle damage varied from 0.8% to 8.23% and best protection was afforded by Argeratum (0.8%) followed by Lanatana (0.96%) in comparison to control (8.23%) in control. After three months of storage there was variation in residual toxicity of plant products against the pest damage. Lantana, Econeem and mustard oil proved excellent protection of beetle damage and recorded only 2.1% pod damage as comparison to 27.43% in control treatment.

Keywords- Plant extract, Ground nut seed beetle, Lantana, Econeem and mustard oil

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Introduction

Out of the total oil seed area (24 million hectare) 34% is under Groundnut and contributes nearly 40% of the total oil seed production (20 million tonnes) [1]. Groundnut (*Arachis hypogaea* L.) is a leguminous crop grown primarily for its seeds. The use of seeds are in various manners such as eaten raw, salted and roasted, chopped into confectioneries or ground into peanut butter. In storage, groundnut pods/seeds are attacked by several stored products pests including the groundnut borer *Caryedon serratus* (Olivier) which is a major pest [2-3]. Reasonable losses of between 20 – 50% have been reported on stored groundnut due to attack by groundnut bruchid (*Caryedon serratus*) and may sometimes reach 100% if not controlled [4]. The borer not only damage the grain directly but also losses occur as a result of contamination with the insect waste materials such as faeces, and exuviae [5], *Caryedon serratus* (Olivier) is the only insect species known to infest kernels and intact pods and is thus potentially the most important pest of kernels [6]. It is known that more than 100 species of insects are capable of infesting stored groundnuts [7-8].

Materials and Methods

Studies were conducted on the biology of groundnut seed beetle *Caryedon serratus* (Oliv.) and management of these beetles by various methods on the stored groundnut in the laboratory. Attempts have also been made to screen out the popular groundnut cultivars against the pest attack and factors of resistance contributed by those cultivars.

Test insect = *Caryedon serratus* (Oliv.), (Bruchidae : Coleoptera)

The groundnut seed beetle is one of the obnoxious pest and under suitable climatic conditions, it multiplies rapidly causing damage both in the larval and adult

stages. The insect has very broad hind femur, serrated antenna and elytra that do not completely cover the last part of the abdomen.

Some plant products [Table-1], which have insecticidal value, were tested against these pests in the form of extract leaves of Vitex, Argeratum and Lantana were distilled with ethanol and final products were tested against the pest. NSKE (neem seed kernel extract) prepared after grinding neem seed kernel, product was allowed to soak for overnight and strained through a muslin cloth and this extract taken as standard. The dose of neem seed kernels was 20mg/ lit of water. Oils like mustard oil, coconut oil and neem oil also tried against the pest. Few other marketed neem products and the chemical insecticide like malathion were tried against the pest. In respect of marketed neem products, the doses were used as per the specification of Directorate of Rice Research (DRR), Hyderabad for rice pests. Thirty-gram pods of groundnut were spread under Potters's tower and dried for 6 hours and subjected to infestation by 3 pairs of beetle. Finally after release of adult insects, these were covered by muslin cloth with the help of rubber band and kept in the dark place. The observation of adult emergence and pod damage were recorded after 30, 60 and 90 days separately. Thereafter, observations on number of adult emergence, number of holes, weight loss etc., were subjected to statistical analysis.

Results

Plant products are the richest source of organic chemicals, which provide protection to the insect pest. Due to presence of unpalatable substance, application of insecticides or fumigants to the groundnut pods lead the pollution, health hazards and high cost involvement. On the contrary, locally available known plant products are harmless, low* cost, eco-friendly may also provide comparable result in respect of chemical used.

To find out the relative efficiency of the plant product admixture to protect

groundnut pods from *Caryedon serratus* (Oliv.) attack, chemically synthesized some of the neem products, oils, plant extract and chemical insecticides were sprayed on the pods at the rate of 0.01 to 2 percent to compare the

efficacy of these materials up to 3 months and observations on beetle emergence were recorded at one month interval.

Table-1 List of plant products and concentrations used

Sl.No.	CommonName	Scientific Name	Family	Preparationused	Concentration(%) w/wt
1.	Neem	<i>Azadirachta indica</i> (fuss)	Meliaceae	Kernel extract	2.0
2.	Begunia	<i>Vitex negiindo</i> (Linn)	Verbenaceae	Leaf extract	2.0
3.	Lantana	<i>Lantana camera</i>	Verbenaceae	Leaf extract	2.0
4.	Pokosungha	<i>Argeratum conyzoides</i>	Compositae	Leaf extract	2.0
5.	Econeem	-	-	Formulations	2.0
6.	Neem gold	-	-	Formulations	2.0
7.	Fortune Aza	-	-	Formulations	1.0
8.	Nivaar	-	-	Formulations	1.0
9.	Mustard Oil	-	-	Formulations	1.0
10.	Coconut oil	-	-	Formulations	1.0
11.	Neem oil	-	-	Formulations	1.0
12.	Malathion	-	-	-	0.01
13.	Control	-	-	-	-

Ethanol extracts of some plant products, different marked neem products and some oils were tried to evaluate the relative toxicity against *C. serratus*. These products were sprayed on dry test groundnut pods at the rate of 1 to 2% under potter's tower. After releasing beetles, observations were recorded on adult emergence and weight loss of pods at one month interval. Malathion @ 0.01% was also taken for comparison [Table-2]. After one month of storage with these products, beetle emergence recorded 0.0 to 1.66 beetles, which differed significantly among the treatments. In first month of storage Argeratum, Fortune Aza, mustard oil and malathion treated pods did not record any beetle. In correspondence to the emergence of beetle, weight loss after one month varied from 0.03 to 3.1% and least weight loss i.e. 0.03% was recorded in malathion treated pods followed by 0.06% and 0.1% in mustard oil and Fortune Aza respectively.

After 2 months, beetle emergence in different treatments were varied from 0.0 to 11.16 beetles was observed on malathion treated pods followed by 0.33 in Argeratum in comparison to 11.66 beetles on untreated pods. After 2 months storage all the products used recorded satisfactory protection in comparison to application of dry powders to beetle attack. In respect to weight loss after the

damage was varied from 0.06 to 8.23% and differed significantly among the treatments. Lowest weight loss was recorded in malathion (0.06%) followed by Econeem (0.8%) and Lantana (0.96%) in comparison to 8.23% loss in untreated pods. After 3 months, beetle emergence in different treated pods varied from 0.0 to 24.3 beetles and showed much variation in residual toxicity of the products used. There was no beetle recorded in malathion treated pods. Sprayable plant products like Argeratum recorded only 0.33 beetle followed by Fortune Aza 0.66 beetle even after 3 months of recorded only 0.33 beetle followed by Foitune Aza 0.66 beetle even after 3 months of storage in comparison 24.3 beetles in untreated pods. Excellent protection by Argeratum, Econeem, neem gold, Fortune Aza and mustard oil was observed as these treatments recorded not more than two beetles even after 3 months, of storage. Corresponding to beetle emergence, weight loss after 3 months varied from 0.06 to 27.43% beetle damage and varied significantly. Lowest weight loss recorded 0.06% in case of malathion. Among the botanicals used lowest weight loss i.e., 2.1% was recorded in Lantana, Econeem and mustard oil followed by *Vitex negimdo* (2.76%) which were much more superior to other treatments.

Table-2 Emergence of *C. serratus* (Oliv.) and weight loss of groundnut at different storage periods at sprayable forms of plant products.

Sl. No	Admixture	Adult Emergence								Weight loss of pod (%)			
		After 1 month	After 2 months	After 3 months						After 1 month	After 2 months	After 3 months	
1.	NSKE	(2.0%)	1.66	(1.46)	10.3	(3.29)	9.66	(3.18)	1.70	(1.47)	6.23	(2.58)	18.16
2.	Vitex	(2.0%)	0.66	(1.04)	4.33	(2.18)	9.0	(3.07)	0.13	(0.78)	1.50	(1.40)	2.76
3.	Lantana	(2.0%)	0.33	(0.87)	1.33	(1.34)	4.0	(2.11)	0.16	(0.80)	0.96	(1.20)	2.10
4.	Argeratum	(2.0%)	0.0	(0.70)	0.33	(0.87)	0.33	(0.87)	0.40	(0.94)	1.96	(1.56)	2.16
5.	Econeem	(2.0%)	0.33	(0.87)	1.33	(1.34)	2.0	(1.58)	0.20	(0.83)	0.80	(1.13)	2.10
6.	Neem gold	(2.0%)	1.0	(1.22)	1.66	(1.46)	2.0	(1.58)	0.16	(0.81)	1.20	(1.30)	3.16
7.	Fortune Aza	(1.0%)	0.0	(0.70)	0.33	(0.87)	0.66	(1.04)	0.1	(0.76)	2.2	(1.64)	2.13
8.	Nivaar	(1.0%)	1.33	(1.34)	2.33	(1.67)	3.33	(1.95)	0.33	(0.90)	2.76	(1.80)	5.93
9.	Mustard oil	(1.0%)	0.0	(0.70)	0.66	(0.99)	1.0	(1.16)	0.06	(0.74)	1.86	(1.53)	2.1
10.	Coconut oil	(1.0%)	0.66	(1.04)	3.66	(2.03)	4.66	(2.26)	1.13	(1.27)	3.43	(1.98)	14.96
11.	Neem oil	(1.0%)	1.0	(1.22)	3.66	(2.11)	5.0	(2.34)	0.90	(1.18)	3.0	(1.86)	7.1
12.	Malathion	(0.01%)	0.0	(0.70)	0.0	(0.70)	0.0	(0.70)	0.03	(0.72)	0.06	(0.74)	0.06
13.	ControlSEm (+) CD (0.05)		1.66	(1.46)	11.6	(3.48)	24.3	(4.97)	3.10	(1.88)	8.23	(2.94)	27.43
				0.115	0.141	0.412		0.122		0.030	0.019	0.095	0.013
				0.336	0.412			0.357		0.152			0.069

Discussion

Control of groundnut seed beetle

Various indigenous plants having insecticidal properties are being used in different forms against the insect pests of stored grains. In view of this some of the popular indigenous plant products have been evaluated to study the efficacy of protectants against the seed beetle, *Caryedon serratus*. The experiments were carried out by mixing of six botanicals including leaf, seed, rhizome and fruit and @2.0% in form of power, sprayed formulations of three extracted Lantana, Argeratum, Vitex and neem in the form of required formulations prescribed by different companies and oils like coconut, mustard and neem were sprayed in potters tower @1.2%. Malathion was also taken @ 0.01% to compare the results.

Sprayable formulations

Sprayable formulations of different neem products viz. ethanol extract of *Vitex*, *Lantana*, *Argeratiim* and oils like mustard, coconut and neem showed satisfactory control of *C. serratus* up to three months of storage. Result showed that upto one month there was no beetle recorded in *Argeratiim*, Fortune Aza, mustard oil and malathion. Corresponding to weight loss of pods was negligible only due to drying of pods. After two or three months of storage only malathion recorded no beetle emergence, but *Argeratiim*, Fortune Aza and mustard oil noted up to one beetle each only. Satisfactory control of beetle was observed in Nivaar, Neemgold, Econeem, *Lantana*, coconut and neem oil recorded less than five beetles as compared to 24.3 beetles in control after three months of storage. NSKE and *Vitex* could not keep residual effects upto three months of storage against this pest [table-2]. Corresponding weight loss in these treatments also quite satisfactory except NSKE, coconut oil and nich were recorded 14.96 to 18.16 pod damage in comparison to 27.43% in control. Extracts of neem for controlling *C. chinensis* on green gram proved quite effective [9]. [10]found that the neem seed oil prevented oviposition of *C. chinensis* on *Vignaradiata*. [11]noted mat *C. chinensis* was well protected with sesamum, palm, coconut and groundnut oil on green gram. [12] tried with leaf extracts of *Lantana*, *Vitex* and neem and reported that the toxic effect of leaf extracts were most effective to restrict the *C. serratus* emergence and weight loss of pods.

Effect of plant extract against pest was revealed from different studies. D. Arborea was repellent to *Callosobruchus maculatus*[13] while it was toxic to both *C. maculatus* and *Sitophilus zeamais* [14]. Methanol extracts of related species of *V. grandifolia* viz *V. negundo*, *V. Peduncularis*, *V. altissima* and *V. trifolia* have been shown to possess varying levels of toxicity against the larvae of a mosquito, *Culexquinque fasciatus* [2]. It is possible that the plant factors conferring protection on the seeds against *T. Castaneum* may have repellent, antifeedant and toxic properties. If repellent and antifeedant, the larvae would not be inclined to bore into the seeds to feed. If toxic, the larvae may not do more than scarify the seeds before dying. If death does not occur immediately, the factor(s) may have a debilitating effect on the larvae, and their lifecycle may be unusually prolonged. Whatever is the case, the resultant effect is fewer number of holes and/or scarifications on the seeds. Plant materials that have been reported to be efficacious against insect pests include powders from the seed of neem (*Azadirachta indica* A. Juss) [15] and neem leaf extracts [9], leaf powders of the Dragon tree (*Dracaena arborea*) and *Vitex grandifolia*., and methanol leaf extracts of *Vitex negundo*, *V. trifolia*, *V. peduncularis* and *V. Altissima* [2]. Others are vegetable oils from groundnut, palm kernel, coconut [16], rhizomes of ginger [17], leaf extracts of *Teprosiavogelii* [18], oil from fresh garlic [19], leaves and seeds of *Ocimum basilium* [20] and leaves of *Dracaena arborea*. The results of present study showed the superiority of using mustard oil, Fortune Aza, *Argeratum* extract and Econeem & Neemgold over than botanicals used, which agreed with the results [12]. Therefore, plant products like extracts of *Argeratum* and neem products like Fontune Aza, Econeem may be recommended to control the *C. serratus* attacking groundnut pods in store.

Conflict of Interest: None declared

References

- [1] Sahayaraj K. & Amalraj A. (2006) *Journal of Agricultural Technology*, 7(5), 1265-1273.
- [2] Kannathasan K., Senthilkumar A., Chandrasekaran M. and Venkatesalu V. (2007) *Parasitol. Res.*, 101(6), 1721-1723.
- [3] Panday G., Bhatt P., Kanaujia S., Kanaujia K.R., Jyothi K.N. and Prasuna (2011) *Journal of Agricultural Technology*, 7(5), 1265-1273.
- [4] Alabi O.Y., Odebiyi J.A. and Jackai L.E.N. (2003) *International Journal of Pest Management*, 49 (4), 287-291.
<http://dx.doi.org/10.1080/0967087031000123706>
- [5] Emosairue S. O., Nwofia G.E. and Umuetok S.B.A. (2004) *Journal of Sustainable Agricultural Environment*, 6(1), 38-43.
- [6] Rama Devi D. & Venugopal Rao N. (2005) *Legumeresearch*, 28(3), 229-230.
- [7] Ofuya T.I., Lale N.E.S. (2001) *Pests of Stored Cereals and Pulses in Nigeria*. Dave Collins Publications.p. 174. Grainge M, Ahmed S (1988) *Handbook of Plants with pest- controlling properties*. New York, USA, Wiley and sons
- [8] Redlinger L.M., Davis R. (1982) *Insect control in postharvest peanuts*. In Pattee HE, Young CT eds., *Peanut Science and Technology*, Yoakum, Texas, USA, American Peanut Research and Education Society Inc., pp. 520-571.
- [9] Epiidi T.T., Alamene A., Onuegbu B.A. (2005) *Nig. J. Plant Prot.*, 22, 65- 67.
- [10] Yadav T.D. (1985) *Neem newsl.*, 2(1), 5-6.
- [11] Sujatha A. and Punnaiah K.C. (1986) *Indian J. agric. Sci.*, 55 (7), 475-477.
- [12] Biswas M. and Maity B.K. (1996) *Pest management of stored ground nut wit special references to ground nut seed beetle (Caryedon serratus)*. Msc.(Ag) Thesis:52.
- [13] Boeke S.J., Baumgart I.R., Vanloon J.J.A., Van Huis A., Dicke M., Kossou D.K. (2004) *J. Stored Products Res.*, 40(4), 423-438.
- [14] Epiidi T.T., Nwani C.D. and Udoh S. (2008) *Int. J. Agric. Biol.*, 10, 588-590.
- [15] Ivbijaro M.F. (1983) *Prod. Ecol.*, 5, 353-357.
- [16] Hall J.S., Harman G.E. (1991) *Crop Protection*, 10, 375-380.
- [17] Vijayalakshmi K., Subhashini B., Koul S. (1997) *Plants in Pest Control: Turmeric and Ginger*. Centre for Indian Knowledge Systems, Chennai/India.
- [18] Lale N.E.S. (1995) *An overview of the use of plant products in the management of stored product Coleoptera in the tropics*. *Postharvest News and Information* 6:69N-75N
- [19] Ho S.H., Ma Y., Tan H.T.W. (1997) *Pest Manage. Stored Food and feed*, 59, 209-215
- [20] Grainge M., Ahmed S. (1988) *Handbook of Plants with pest- controlling*.