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Repellency evaluation of botanical extracts against *Lasioderma serricorne* (Anobiidae: Coleoptera) under laboratory condition

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Abstract
To investigate the percent repellent effects of chosen botanical extracts verses *Lasioderma serricorne* adults in laboratory settings. Native botanical extracts were extracted from three important plants namely *Luffa aegyptiaca* (Sponge Gourd), *Carum copticum* (Ajwain) and *Curcuma longa* (Turmeric) were tested to find their repellent abilities against the Cigarette beetle (*Lasioderma serricorne* Anobiidae: Coleoptera) adults. The experiment was carried out in the laboratory and the botanical extracts were used in the concentration of 25, 50 and 75% against the beetles for the exposure period of ten days. Results showed that the botanical extracts possessed the ability of repellency against the tested beetles. As the concentration of the extracts and exposure period of the beetles increased the repellency was also increased. Maximum repellency of 66.67% was achieved at the concentration of 75% by *L. aegyptiaca* during the tenth day of exposure. Similarly, the *C. copticum* and *C. longa* also caused maximum repellencies of 53.35% and 43.33% at the concentration of 75% against the beetles during the tenth day of the exposure period.

Keywords: *Lasioderma serricorne*, botanical extracts, repellency, concentration, time exposure

1. Introduction
Storage commodities are at high risks to the store product pests all over the world and in Pakistan about 10-25% of them are lost by the attack of store product pests [9]. Among the store product pests, the most important and key pest is the cigarette beetle, *Lasioderma serricorne* Fabricius, and cause high damage to all tobacco types [19]. A lot of chemicals are used to control *L. serricorne* such as pyrethroids to control crawling and flying populations and Aluminum phosphide as a fumigant to control its all stages but regular uses of such insecticides create a lot of problems and risks to the environment, users and also produce resistance in the target pests [17] Therefore, it is needed to find harmless and nontoxic agents for the pest control [1, 13]. It has been reported that several botanical extracts have the ability of causing negative impact on insect pests [5, 7, 1]. These extracts have a lot of advantages like harmless to the environment and to man, offer no residual effects, easy degradable and selective to the targeted pests [2, 8]. Several researches have been conducted for studying the potential of botanical extracts (essential oils) against the insect pests in stores [4, 11]. Therefore, this research was conducted for studying the repellent abilities of the selected botanical extracts against the cigarette beetle at different concentrations and exposure period.

2. Materials and Methods
This research was conducted at the University of Haripur in the department of Agriculture during the year 2015.

2.1 Botanical Materials, Extraction and Concentration Preparation
Botanical materials and their parts used in the research were *Luffa aegyptiaca*, *Carum copticum* and *Curcuma longa* as shown in the table 1. These were obtained from the Haripur local market and then rinsed and dried. After complete drying these materials were grounded and sieved by the help of blender and strainer. Extraction was done by the help of distilled water.

Final extracts (residue) were then collected after the evaporation of the solvent and then stored in glass vials. Concentrations of 25, 50 and 75% of test materials were obtained by taking 25, 50 and 75g of each extract in 100ml of acetone to make 100 percent solution.

Table 1: List of Botanical Materials Used in the Research work

Plant Material	Family	Part Used
Luffa aegyptiaca	Cucurbitaceae	Mature fruit
Carum copticum	Umbelliferae	Seed
Curcuma longa	Zingiberiaceae	Root

2.2 Insect Collection
The tested insects were collected from different warehouses in District Swabi KP Pakistan.

2.3 Insect Rearing and Maintenance
Insects culture obtained from the laboratory were placed in the incubators at the temperature of 32±2 ˚C and relative humidity of 75±5%. The source of food for the insects was wheat flour. Insect eggs were collected from the filter paper by keeping the adult beetles for 45 hours on the filter papers. After hatching the larvae were shifted to cages and when they become adults of seven days old then the adults were taken in petri dishes (10 adults per petri dish) for the repellency test.

2.4 Percent Repellency Determination
Percent repellency was determined by taking a filter paper fitted disk and dividing this filter paper into two half parts. One half parts was treated with the prepared extract concentration and the other was treated with acetone only (control part). Then the filter papers were kept in the open air so that the acetone is evaporated. Then thirty adult beetles were released in the middle of the filter papers fitted disks. Also, some food source was kept in each side of the disks to avoid death of the beetles due to starvation. Percentage repellency was calculated by counting the beetles in both control and the extract concentration treated half over the exposure period of ten days. Percentage repellency (PR) values were calculated by using the formula showed by Hassan *et al.*, [3].

$PR\ (\%) = [(N^*_C - N^*_{t)} / (N^*_C + N^*_t)] \times 100$

N*c represents the numbers of beetles at untreated area and N^*_T at treated area.

2.5 Statistical analysis
The experiment was laid out in completely randomized design (CR, design) with four replications. Collected data were statistically analyzed using computer Statistix ® 8.1 software. The least significant difference (LSD) at 5% level of significance was exploited to compare the treatments means [20].

3. Results
The percent repellency results of the tested botanical extract concentration versus *Lasioderma serricorne* over exposure period of ten days showed that all of them showed repellency over the whole exposure period (1st to 10th day). The results showed that the concentration and exposure period have significant effects on the repellency. As the applied concentration and the exposure period increased the percent repellency results were increased. At the 75% concentration all the botanical extracts showed maximum results followed by 50% and 25% concentrations as shown in the table 2. In the botanical extracts high repellency of 66.67% was caused by *Luffa aegyptiaca* followed by *Carum copticum* and *Curcuma longa* which caused 63.33% and 53.33% repellencies at the concentration of 75% during the tenth day of the exposure period. All the botanical extracts caused minimum repellency at the concentration of 25% at the 1st day of the exposure period i.e. 13.33% by *L. aegyptiaca*, 10% by *C. copticum* and 3.33% by *C. longa* as shown in the table 1. At control (0%) the repellency was zero percent.

Table 2: Percent repellency over exposure period and applied concentration

Days	Extract Concentration	Percent Repellency of the Botanical Extracts		
		Luffa aegyptiaca	***Carum copticum***	***Curcuma longa***
1	0%	0.00 k	0.00 k	0.00 k
1	25%	13.33 hi	10.00 ij	3.33 jk
1	50%	26.66 def	23.33 efg	16.66 ghi
1	75%	36.67 c	33.33 cd	23.33 efg
2	0%	0.00 i	0.00 i	0.00 i
2	25%	16.66 ij	13.33 j	6.66 k
2	50%	30.00 ef	26.66 fg	20.00 hi
2	75%	40.00 c	36.66 cd	26.66 fg
3	0%	0.00 i	0.00 i	0.00 i
3	25%	20.00 ij	16.66 j	10.00 k
3	50%	33.33 ef	30.00 fg	23.33 hi
3	75%	43.33 c	40.00 cd	26.66 gh
4	0%	0.00 k	0.00 k	0.00 k
4	25%	23.33 hi	20.00 ij	13.33 j
4	50%	36.33 hi	33.33 efg	26.67 ghi
4	75%	50.00 bc	43.33 cd	33.33 efg
5	0%	0.00 k	0.00 k	0.00 k
5	25%	26.67 hi	23.33 ij	16.67 j
5	50%	40.00 def	36.67 efg	30.00 ghi
5	75%	53.33 bc	46.67 cd	36.67 efg
6	0%	0.00 k	0.00 k	0.00 k
6	25%	30.00 hi	26.667 ij	20.00 j
6	50%	43.33 def	40.00 efg	33.33 ghi
6	75%	56.67 bc	50.00 cd	40.00 efg
7	0%	0.00 j	0.00 j	0.00 j
7	25%	33.33 gh	30.00 hi	23.33 i
7	50%	46.67 cde	43.33 def	36.67 fgh
7	75%	56.67 b	53.33 bc	43.33 def
8	0%	0.00 j	0.00 j	0.00 j
8	25%	36.67 ghi	33.33 hi	26.67 i
8	50%	50.00 cdef	46.67 defg	40.00 fgh
8	75%	60.00 bc	56.67 cd	46.67 defg
9	0%	0.00 j	0.00 j	0.00 j
9	25%	36.67 ghi	33.33 hi	26.67 i
9	50%	50.00 cdef	46.67 defg	40.00 fgh
9	75%	60.00 bc	56.67 cd	46.67 defg
10	0%	0.00 k	0.00 k	0.00 k
10	25%	43.33 hi	40.00 ij	33.33 j
10	50%	56.67 def	53.333 efg	46.67 ghi
10	75%	66.67 c	63.33 cd	53.33 efg

4. Discussion
All the botanical extracts showed different repellencies at the applied concentrations against the cigarette beetles adults over the whole exposure period. *Luffa aegyptiaca* found to be the most successful botanical extract that caused maximum repellencies in all the applied concentrations over the whole exposure period followed by *Carum copticum* and *Curcuma longa* against the adult beetles. The present result was also matched with Tripathi [16] who assessed different botanical

extract on most harmful stored product beetles and found that tested beetles were high vulnerable to contact actions of botanical extracts. The current results are accordance with the findings of Sahaf and Moharramipour [14] who reported the worth of bio-pesticides that act as a good substitute to high enduring organic pesticides for managing the pests in stores. The present result was also tally with Modraes *et al.* [12] assessed that these botanical extracts significantly repel insects of stored grain pests. Present findings also matched with the results of Singh and Saratchandra [15] who find out the insecticidal actions of different plants extorts i.e Turmeric, ginger and neem on insect pests found in stores and also acknowledged more than 200 species of the families Asteraceae, Fabaceae and Euphorbiaceae having substantial toxic actions. The present results also are in close agreement with the findings of Koul *et al.* [10] who stated that botanical extracts endure a wide range of insecticidal, repellent, oviposition, growth regulatory and anti- vectors abilities against a number of insect pests. Present study is also tally with Uma and Sujatha [18] who assessed the insecticidal results of turmeric and other botanical extracts on insects found in stores. Outcomes confirmed that the tested botanical showed mortal effects on the test insect.

5. Conclusion

It was concluded that all the tested botanical extracts possessed the repellency ability against the cigarette beetles and could be used against the insect pests in the stores. *Luffa aegyptiaca* proved to be the best repellent botanical extract against the tested beetles. It is needed to check the repellency of these botanical extracts against other insect pests in the field. Also, the method of application needs to be properly evaluated.

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7. References

1. Cetin HF, Erler A, Yanikoglu. Larvicidal activity of botanicals natural products, Akse. Bio. against Culexpipiens. Fitot. 2004; 11(75):724-728.
2. Dong ZJ, Cheng DQ, Dong SD, Zhou YH. Botanical pesticide research and application in tobacco pest control. Acta Tabacaria Sinica. 2004; 10:42- 47.
3. Hassan A, Ole-Sitayo LW, Moreka L, Nokoe S, Chapya A. Weevil repellent constituents of *Ocimum suave* leaves & *Eugenia caryophyllata* cloves as grai protectants in parts of Eastern Africa. Discov. Innov. 1990; 2:91-95.
4. Hori M. Repellency of essential oils against the cigarette beetle, *Lasioderma serricorne* (Frbricius) (Coleoptera: Anobiidae). Appl. Entomol. Zool. 2003; 38:467-473.
5. Joey PP, Thomas J, Mathew S, Skaria BP. Medicinal Plants. Int. Trop. Hort. 2001, 449-632.
6. Kem SI, Park C, Ohh MH, Cho, Ahn HC. Contact and fumigant activities of aromatic plant extracts and essential oils against *Lasioderma serricorne* (Coleoptera: Anobiidae). J Stored Prod. Res. 2003; 39:11-19.
7. Kestenholz C, Stevenson, Belmain PC. Comparative study of field and laboratory evaluations of the ethnobotanical *Cassia sophera* L. (Leguminosae) for bioactivity against the storage pests *Callosobruchus maculatus* (F.) (Coleoptera: Bruchidae) and *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae). J Stored Prod. Res. 2007; 43:79-86.
8. Khan I, Afsheen S, Din N, Khattak S, Khalil SK, Lou YHY. Appraisal of different wheat genotypes against angoumois grain moth, *Sitotroga ceralella* (Oliv). Pak. J Zool. 2010; 42:161-168.
9. Koul O, Walia S, Dhaliwal GS. Essential Oils as Green Pesticides Potential and Constraints. Biopestic. Int. 2008; 4(1):63-84.
10. Mojtaba GJ, Ali AP, Mohammad HS. Repellent effect of sirinol (*Garlic emulsion*) against *Lasioderma serricorne* (Coleoptera: Anobiidae) and Tribolium castaneum (Coleoptera: Tenebrionidae) by three laboratory methods. Afr. J. Biotechnol. 2012; 11:280-288.
11. Modraes NS. Damege assessement of stored product pests of wheat and barley in Systane Region Iran. Proceeding of 15th Iranian Plant Protection Congress, 2002, 85-144.
12. Nadra HAM. Use of *Sesbania sesban* (L.) Merr seed extracts for the protection of wheat grain against the granary weevil, *Sitophilus granarius* (L.) (Coleoptera: Curculionidae). J Basic and Appl. Sci. 2006; 7:121-135.
13. Sahaf BZ, Moharramipour S. Comparative study on deterrency of *Carum copticum* and *Vitex pseudo-negundo* essential oils on nutritional behavior of *Tribolium castaneum* (Herbst). Iran. J Med. and Aromatic Plants. 2008; 24:385-395.
14. Singh RN, Saratchandra B. The Development of Botanical Products with Special Reference to Seri-Ecosystem. Caspian. J Environ. Sci. 2005; 1(3):1-8.
15. Ttripathi. Bioactivities of the Leaf Essential Oil of *Curcuma longa* (Var. Ch-66) On Three Species of Stored-Product Beetles (Coleoptera). J Eco. Entomol. 2002; 95(1):183-189.
16. Ukih DA, Birkett MA, Bruce TJA, Allan EJ, Pickett JA, Mordue AJ. Behavioural responses of the maize weevil *Sitophilus zeamais* to Host (maize grain) and non-host plant volatiles. Pest Manag. Sci. 2010; 66:44-50.
17. Uma DM, Sujatha K. Toxic effects of *Curcuma longa* different extracts on biochemical and enzymatic parameters of *Tribolium castaneum*. Intern. J Innov. Res. 2013; 1(2):36-39.
18. USDA. Stored tobacco insects- biology and control. USDA Handbook, 1972, 233.
19. Waller RA, Duncan DB. Abays rule for symmetric multiple comparison problem. Amer. Stat. Assoc. J. 1969, 1485-1503.