Int.J.Curr.Microbiol.App.Sci (2020) Special Issue-10: 705-711

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-10 pp. 705-711**
Journal homepage: http://www.ijcmas.com

Original Research Article

Repellency Effects of Five Tree Seed Oils and Essential Oils against Brown Planthopper, *Nilaparvata lugens* (stal.)

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A B S T R A C T

Repellency test against freshly emerged BPH adults was carried out with five tree seed oils and essential oils in cage to know repellency/attractancy in laboratory conditions at Indian Institute of Rice Research, IIRR, Hyderabad, Telangana during 2015-2016. Repellency test with Tree seed oils and essential oils against female BPH the obtained data showed that highest repellency percentage was recorded in neem oil and eucalyptus in essential oils and at time interval of 15, 30, 60, 90 and 120 minutes after release of BPH female. The average repellency percentage of BPH with Tree seed oils was 89.50% which is significant repellency compared to control 67.00% followed by Jatropha 86.60%, Pongamia 85.00%, mahua 82.60%. Annona 80.50%.The average repellency percentage of BPH with essential oils eucalyptus was 90.70% which is significant repellency compared to control 57.50% followed by lemon grass 87.00% citronella 84.50%, camphor 83.25%, cedarwod 82.50%.

Keywords

Repellency/ attractancy, Essential oils , Brown plant hopper, Non edible seed oils

Introduction

Rice (*Oryza sativa* L.) (2n = 24) belonging to the family Graminae is the staple food crop for one third world's population and occupies almost one fifth of the total land area covered under cereals. It is grown under diverse cultural conditions and over wide geographical range. More than 90% of the world's production was consumed in Asia, which constitutes more than half of the global population. Approximately 11% of the world's arable land is planted annually with rice, production of 748.0 million tons next to it ranks wheat. In India, area under rice is estimated to be 44.9 million ha with a production of 272 million tons. India ranks 1st in area (44.95 million ha) and 2nd in production (272.61 million tonnes), after China (2nd advance estimate, 2015-16, Department of Agriculture, Cooperation and Farmer's Welfare, Ministry of Agriculture, GOI, Rice, being the staple food for more than 70 percent of the population and the source of livelihood for 120-150 million rural households, is the backbone of the Indian agriculture..

Brown planthopper *Nilaparvata lugens* (Stal.) is one of the most menacing insect pests of rice (*Oryza sativa* L.) among various leafhoppers and plant hopper species. The Brown planthopper was a minor pest in most tropical countries of Asia earlier. Brown

planthopper *N. lugens* is mainly a pest of irrigated rice but it can also become abundant in rain fed environment and upland rice. At low infestation of this insect, plant height, crop vigour, tiller production reduces, whereas heavy infestation turns plants yellow, which dry up rapidly. Under severe infestation, circular patches of hopper burn are evident in the field. Severely affected plants do not bear any grains. The most commonly practical method of controlling BPH is through application of insecticides. It is imperative to evolve and valuate some useful plant products from *Ocimum* species for management of pest, so that quantity of insecticide used to control the brown planthopper can be reduced. Hence, these useful practices could be utilized as the major components of an effective pest management strategy, against the BPH.

Materials and Methods

Repellency/attractancy activity against freshly emerged BPH adults was carried out with five Tree seed oils and essential oils While, studying repellent action of plant derivatives 30 days old TN1 potted plants were used.In this part of study a volume of 2ooµml/ 100 ml seed oils was prepared and sprayed with various plant derivatives at same concentrations *viz* Tree seed oils neem oil (*Azadirachta indica*),Mahua oil (*Madhuca longifolia* machor.), karanj oil (*Pongamia glabra* L.), Jatropha (*Jatropha curcas*), Annona (*Annona squamosa*).and Essential oils Eucalyptus, lemon grass, Ceder wood, Camphor oil, Citronella oil. One plant sprayed with emulsified triton x-100 and another plant used as control sprayed with plain water. These 3 different treatments were placed in wooden mesh at the periphery.

These adults were starved for 2 hours before releasing. Settling behavior of BPH populations were observed on treated as well as untreated TN1 plants at 15, 30, 60, 90 and 120 minutes after treatment. 7 treatments and 4 replications were used during the experiment.

Statistical analysis

In olfactory repellency test obtained data converted into percentage followed t test and CRD design obtained data analyzed by using arc sine transformation.

Results and Discussion

Repellency with five tree seed oils

Result of the olfactory test carried out to know the repellency of tree seed oils to BPH, *Nilaparvata lugens* (Stal.) after fifteen minutes release of female adult in a cage are presented in Table 1. All seed oils showed significant repellent action to BPH when compared to control (Fig. 1). The repellency of treatments varied from 82.50% to 98.75%. The highest per cent repellency to BPH was observed in the treatment neem oil (98.75%) which was statistically at par with Pongamia oil (97.50%), jatropha oil (95.00%) mahua oil (95.00%), annona oil (95.00%) but differed significantly from control (82.50%).

Data on response of BPH to seed oils after thirty minutes of release revealed that all seed oils significantly repelled BPH adults and the repellency varied from 72.50% to 92.50% when compared with Tritonx-100 (76.25%) and control (72.25%). The highest per cent repellency to BPH was recorded in the treatment neem oil (92.50%) followed by jatropha oil (87.50%).

Effect of seed oils on response of BPH adults after sixty minutes release showed significant repellent action to hopper adults when compared to control .The repellency of oil treatments varied from 67.50% to 88.75%.

Neem oil continued to show highest per cent repellency (88.75%) to BPH which was statistically at par with pongamia, jatropha, mahua and annona oils which were significant in their efficacy when compared with control (67.50%).

After ninty minutes of release, BPH *N. lugens* adults exhibited significant olfactory response 57.50 % to 83.75% repellency to seed oils as compared to control (57.50%). Even after 90 minutes the highest per cent repellency to BPH was observed in the treatment neem oil (83.75%). The efficacy of other oils was statistically at par with neem oil.

Behavior of *N. lugens* to non edible seed oils one twenty minutes after release also reflected the same trend. The repellency of oil treatment varied from 47.50 % to 83.75%. The highest per cent repellency of BPH was observed in the treatment neem oil (83.75%) followed by, jatropha oil (81.25%), pongamia oil (77.00%), mahua oil (71.25%) annona oil.(68.70%) which were significantly different as compared to tritonx-100 (47.50%) and control (47.50%).

The results of present study are in agreement with the findings of Bhimrao (2005) who tested different plant derivatives, against brown planthopper. Neem oil @ 2% had the highest repellent action to *Nilaparvata lugens* repelling 90% of the population from the treated area. Telan *et al.* (1994) they have reported that extracts of *Azadirachta indica, Annona reticulata,* and *Tinospora rumphii* showed the repellent effects against *Nilaparvata lugens.*

Repellency with five essential oils

The data on repellent action of essential oils against BPH, *N.* lugens various time periods after releasing of female adult are presented in table 2. All essential oils showed significant repellence to BPH as compared to control (Fig. 2). After fifteen minutes of release the repellency of oil treatments varied from 72.50% to 100.00%. The highest repellency (100.00%) was observed in treatment eucalyptus oil it was statistically at par with other oil but significantly differ from control in efficacy.

Response of BPH to essential oil, all essential oil showed significant repellent actions were observed as compared with control. The highest per cent repellency to BPH was observed in the treatment eucalyptus oil (93.75%), 30 mins after release which was statistically at par with other oil range 73.70%) to 93.75% but significant from control (63.75%)

The repellence of essential oil Sixty minutes after release, repellency due to essential oils varied from 63.70% to 90.00% as compared to control (60.00%). The highest repellency to brown planthopper pest was observed in the treatment Eucalyptus oil (90.00%) followed by lemon grass (87.50%).

The orientation of female adult of BPH *N. lugens* to essential oils treated plants after ninety minutes of release. The highest per cent repellency of BPH was observed in the treatment eucalyptus oil (86.20%). Followed by lemon grass (83.70%), citronella oil (81.20%) camphor oil (77.50%), cedar wood oil (81.25%).

Behavioral response of BPH *N.lugens* to essential oils after one twenty minutes after release, significant repellent action as compared with control. Which varied from 41.20% to 83.70%. Eucalyptus oil continued to show the repellent action after 120 min which was statistically differ significantly from other oils, except lemon grass.

Table.1 Repellent action of Non edible seed oils against BPH

		Per cent population of BPH repelled					
S.NO	**Treatment**	**15 min**	**30 min**	**60 min**	**90 min**	**120min**	**Avg**
1	**Neem @ 1%**	*98.75% (86.7)	92.50% (76.1)	88.75% (70.4)	83.75% (66.2)	83.75% (66.2)	89.50% (72.0)
2	**Jatropha @ 1%**	95.00% (78.9)	87.50% (69.3)	86.25% (69.3)	82.50% (65.2)	81.25% (64.3)	86.60% (58.2)
3	**Pongamia @ 1 %**	97.50% (83.7)	87.50% (69.3)	85.00% (67.3)	80.00% (63.4)	77.50% (61.6)	85.00% (68.4)
4	**Mahua @ 1 %**	95.00% (80.7)	85.00% (67.3)	85.00% (67.3)	76.25% (61.0)	71.25% (57.5)	82.60% (66.0)
5	**Annona 1%**	95.00% (80.7)	82.50% (65.6)	81.25% (64.5)	75.00% (60.3)	68.75% (56.0)	80.50% (64.5)
6	**Triton x-100**	85.00% (67.3)	76.25% (60.8)	67.50% (55.2)	58.75% (50.1)	47.50% (43.5)	67.00% (55.5)
7	**Control**	82.50% (65.2)	72.50% (58.3)	67.50% (55.2)	57.50% (49.3)	47.50% (43.5)	67.00% (55.5)
	SEm	2.09	2.40	1.54	2.32	1.26	3.50
	CD	6.20	7.12	4.56	6.88	3.75	10.40

*Figures in the parentheses are arc sine transformed value.

Table.2 Repellent action of essential oils against BPH

		Per cent population of BPH repelled					
S.NO	**Treatment**	**15 min**	**30 min**	**60 min**	**90 min**	**120 min**	**Avg**
1	**Eucalyptus oil @ 0.2%**	100% *(90.0)	93.75% (77.53)	90.00% (71.5)	86.25% (68.2)	83.70% (66.7)	90.70% (74.2)
2	**Lemon grass oil @ 0.2%**	95.00% (78.9)	87.50% (69.3)	87.50% (69.3)	83.75% (66.2)	81.25% (64.4)	87.00% (69.2)
3	**Citronella oil @ 0.2%**	95.00% (80.7)	86.25% (68.2)	82.50% (65.2)	81.25% (64.3)	77.50% (61.6)	84.50% (67.2)
4	**Cedar wood oil 0.2%**	97.50% (85.3)	80.00% (63.6)	81.25% (64.3)	77.50% (61.6)	76.25% (60.8)	82.50% (66.2)
5	**Camphor oil @ 0.2%**	93.75% (77.5)	85.00% (67.3)	83.75% (66.2)	77.50% (61.6)	76.25% (60.8)	83.25% (66.2)
6	**Triton x-100**	67.50% (56.2)	73.75% (59.3)	63.75% (53.0)	57.50% (49.3)	48.75% (44.2)	62.25% (52.1)
7	**Control**	72.50% (58.3)	63.75% (53.0)	60.00% (50.7)	48.75% (44.2)	41.25%(39.9)	57.50% (49.2)
	SEm	2.00	2.40	1.50	2.30	1.20	3.10
	CD	6.2	7.1	4.5	6.8	3.7	9.0

*Figures in the parentheses are arc sine transformed value.

Fig.1 Repellency of tree seed oils against brown planthopper

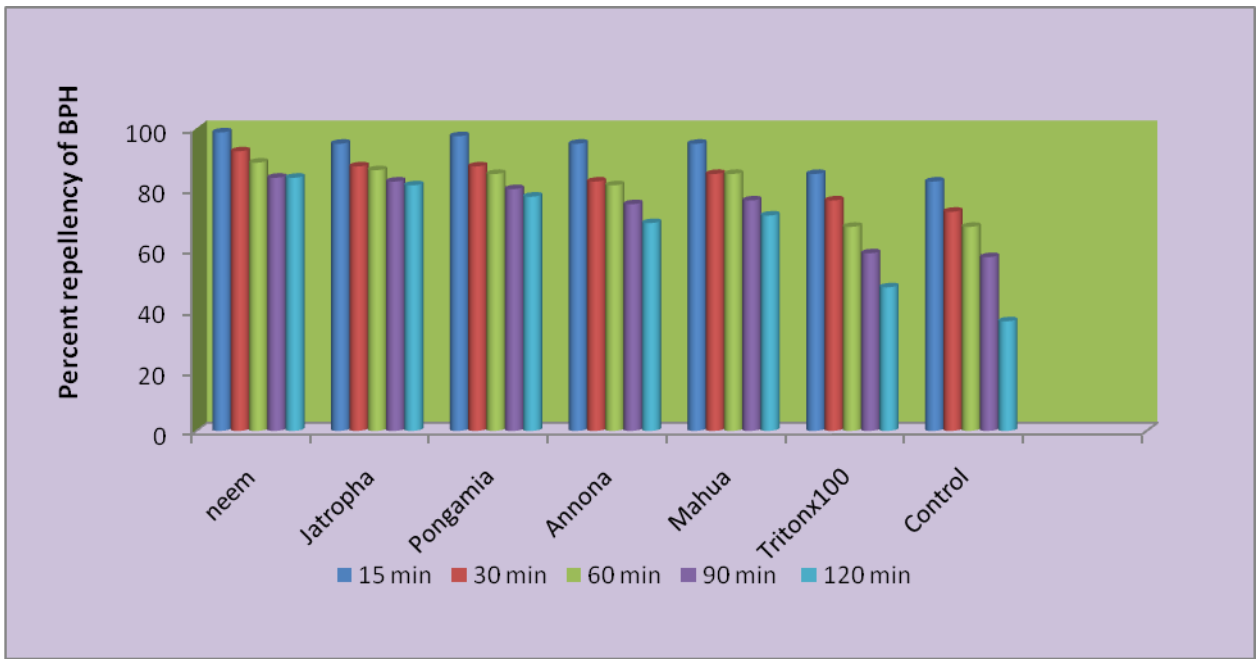
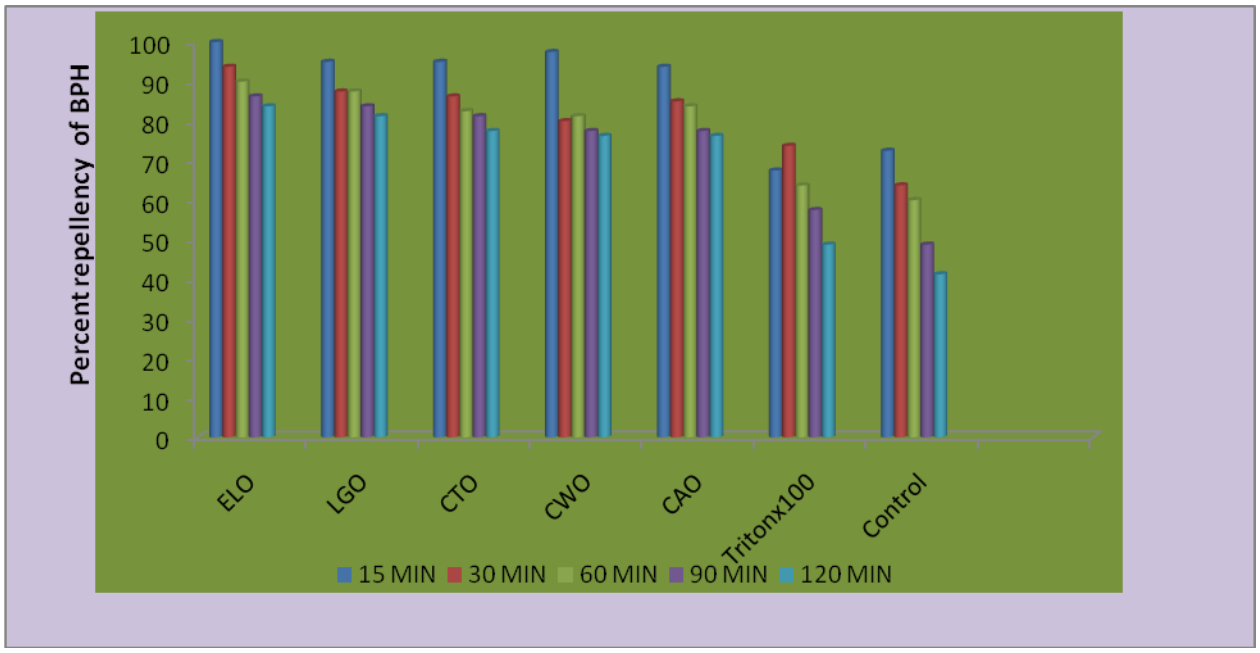


Fig.2 Repellency of essential oils against brown planthopper



The results are closely confirmed with the finding of the Mishra *et al.*, 2012 who studied the repellent action of two essential oils against *Tribolium castaneum* and *Sitopillus oryzae*, the essential oil of *Eucalyptus globulus* at *0.4 %* exhibited repellent action *i.e.* 9.16 ± 0.30 and 8.66 ± 0.33 against *T. castaneum* and *S. oryzae*,

respectively. Similarly, at highest concentration 0.40% the *Ocimum basilicum* 0.4% showed strong repellent action to boath the pest. Essential oil showed (8.50 ± 0.22) and (8.16 ± 0.30) against *T. castaneum* and *S. oryzae*, respectively. The repellent activity of *E. globulus* and *O. basilicum* progressively increased with increase in concentration against both stored-grain insect pests.

The results showed that repellent activity of different tree seed oils against female brown planthoppers highest repellency percentage was recorded in Neem seed oil treatment only 89.50% followed by Jatropha 86.60%, Pongamia 85.00%, Mahua oil 82.60% then in Annona 80.50% against BPH all treatments showed significant highest repellency percentage compared with control 67.50%. Repellent activity of five essential oils of Eucalyptus oil was showed maximum repellency 90.70% followed by Lemon grass 87.00 %, Citronella oil 84.50%, Camphor oil 83.20% then Cedarwood oil 82.50% compared with control 57.50%. Repellency percentage with both Tree seed oils and essential oils against BPH Eucalyptus oil treatment was recorded with highest percentage of repellency compared with control.

Acknowledgement

The authors are thankful to Indira Gandhi Krishi Vishwavidyalaya, IGKV, Indian Institute of Rice Research, IIRR, for providing financial help during the course of study.

References

Anonymous. International Rice Research Institute, Annual Reports 2015, Los Banos, Philippines, 2015, 131-148.

Bhimrao KG. Studies on the relative degree of damage by brown planthopper *Nilaparvata lugens* (Stal.) on rice genotypes and its management through plant derivatives, Department of Entomology, I.G.K.V., Raipur, 2005, 87.

Chiitra S, Subhash C, Sinha SR, palta RK. Indian Agricultural Research Institute, 2009; 79(12):1003-6,

Esther NM, Ahmed H, Suliman E, Edward ML, Mark K. Repellent and acaricidal properties of *Ocimum suave* against *Rhipicephalus appendiculatus* tick. Experimental and Applied Acarology, 1995; 19:11-18.

Hassanli A, Iwande W, Ole-Sitayo N, Moreka L, Nokoe S. Weevil repellent constituents of *Ocimum* suave leaves and *Eugenia caryophyllata* cloves used as grain protectant in parts of Eastern Africa. Discovery Innovation, 1991; 2:91-95.

Linquist BA, Sengxua P, White bread A, Schiller J, Lathvilayvong P. Evaluating nutrient deficiencies and management strategies for low land rice in Lao. PDR, processing of the international work shop on nutrient research in lowlands Ubon Ratchathani, Thailand, Manila (Philippines) International Rice Research Institute, 1998, 59-73.

Luckwa N, Masidza C, Nyazema NZ, Curtis CF, Mwaiko GL. Efficacy and duration of activity of *Lippia javanica* Spreng, *Ocimu can*um and a commercial repellent against *Aedes aegypti*. International organization for chemistry in science and development (IOCD). 1996, 321-325.

Manzoor F, Beena W, Malik S, Naz N, Naz S, Syed WH. Preliminary evaluation of *Ocimum sanctum* as toxicant and

repellent against termite, *Heterotermes indicola* (wasmann) (Isoptera:Rhinotermitidae). Pakistan Journal of Science. 2011, 63.

Sogawa K. Feeding behavior and damage mechanism of the rice planthoppers. Elings A, Rubia EG, editors. SARP research proceedings, analysis of damage mechanisms by pests and diseases and their effects on rice yield. Wageningen: DLO-Research Institute for Agro biology and Soil Fertility. 1994, 143-54.