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Insecticidal activity of different *Ocimum* L. spp extracts against brown planthopper, *Nilaparvata lugens*, (Stal.) (Delphacidae: Homoptera)

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Abstract
Methanol, ethyl acetate, hexane, chloroform, acetone extracts of four *Ocimum* L. spp*viz. Ocimumsanctum, O.basilicum, O.americanum, O.gratissimum* were tested for insecticidal activities against the 3rdinstar nymphs of brown planthopper *Nilaparvatalugens*, (Stal.) by using 40 days old TN1 rice stems treated by following dipping method with respective *Ocimum* plant extracts in laboratory conditions at Indian Institute of Rice Research, IIRR, Hyderabad, Telangana during 2016-2017.The mortality percent of BPH nymphs at a dose of 1.0% concentration of different *Ocimum* L. spp extracts showed significant insecticidal activity. The mortality percentage was evaluated with different *Ocimum* spp of five solvent extracts were *viz*. in methanol extracts of *O.gratissimum* showed significant insecticidal activity 73.92% followed by *O.sanctum* 63.91%, *O.basilicum* 53.57%, *O.americanum* 51.52% compared to control 15.57%.In ethyl acetate extracts *O.gratissimum*65.88%, *O.basilicum* 62.32%, *O.sanctum* 53.48%, *O.americanum* 53.28% and 10.76% in control. In hexane extracts *O.gratissimum* 57.00%, *O.basilicum* 50.64%, *O.sanctum* 46.80%, *O.americanum* 42.16% and 14.12% incontrol. Inchloroform extracts *O.gratissimum* 57.24%, *O.americanum* 46.20%, *O.basilicum* 41.72%, *O.sanctum*31.32% and 11.24% in control. In acetone extracts *O.gratissimum* 58.96%, *O.sanctum*45.40%, *O.americanum* 45.36%, *O.basilicum* 44.84% and in control 16.92 percent.

Keywords: Mortality test, methanol, ethyl acetate, hexane, chloroform, acetone extracts, brown planthopper, *O. sanctum, O. basilicum, O. americanum, O. gratissimum*, TN1 rice plan

1. 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 [1]. 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 [2]. 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.

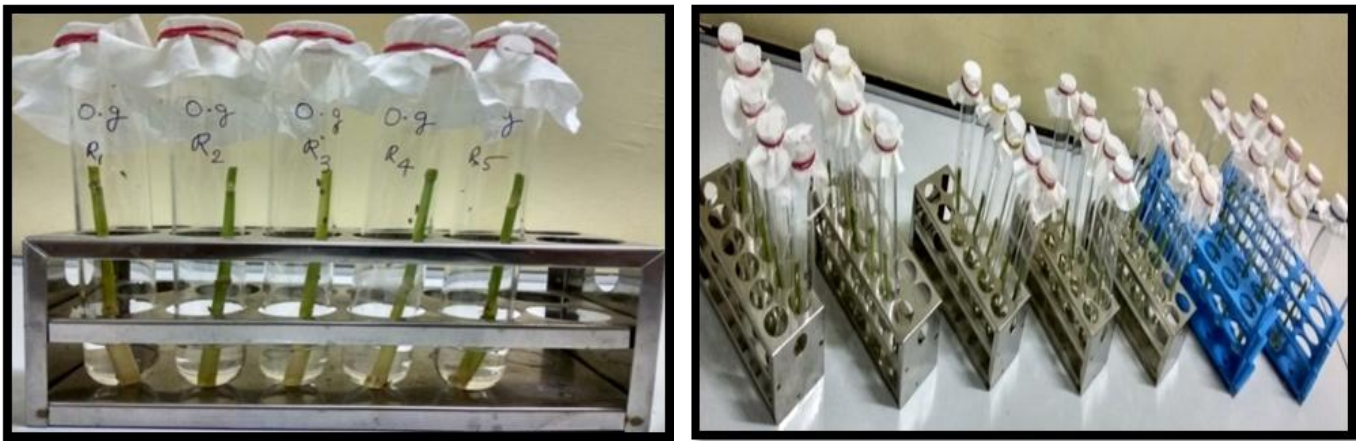
Brown planthopper *Nilaparvata lugens* (Stal.) is one of the most menacing insect pests of rice (*Oryza sativa* L.) among various leafhoppers and plant hopper species. The Brown planthopper was a minor pest in most tropical countries of Asia earlier. Brown planthopper *N.lugens* is mainly a pest of irrigated rice but it can also become abundant in rain fed environment and upland rice [3]. 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 [4]. 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.

2. Objective of the study

To evaluate insecticidal activity of extracts from different *Ocimum* L. spp against BPH, *Nilaparvata lugens*, (Stal.)

3. Materials and methods

Insecticidal activity of different *Ocimum* spp extracts against third instar nymphs of BPH was conducted at Indian Institute of Rice Research, IIRR, Hyderabad, Telangana in November month, 2016. Bioassays were undertaken using the rice-stem dipping method [5]. Weighed 500mg of extract and dissolved in 1 ml of solvent then added with 10ml of distilled water shook it thoroughly and made up volume to 100ml. Stems were cut from rice plants at tillering stage and washed thoroughly. Stems were cut in to pieces of about 10 cm long just below the node region. Five stem cuttings were dipped in 1.0% extract solution for 30 seconds air dried and then placed in a glass tubes (tube size 20x3cm) taken with 10 ml of water in to test tube [6]. Second and third instar nymphs of BPH collected from culture maintained in glasshouse and released into each test tube using a aspirator then the tube were plugged with nonabsorbent cotton. Along with extracts, an emulsifier (triton x-100) treatment, solvent and the control (plain water) were also maintained. Experiment designed with seven treatments and five replication (Plate.b). Data on number of nymphs dead was recorded at 1,3,5,7 and 10 days after treatment. Tests were conducted in laboratory where temperature of 26±1 ºC and RH of 60±5% were maintained. Toxicity test done separately for all four *Ocimum*spp*viz. Ocimum sanctum, Ocimum basilicum, Ocimum americanum,* and *Ocimum gratissimum* solvent extracts. (Methanol, ethyl acetate, acetone. hexane and chloroform).



(a) **(b)**

Plate 1: Toxicity test with solvent extracts of different *Ocimum*s pecies. (a).Toxicity test showing seven treatments and five replications (b). Showing single treatment

4. Statistical analysis

The nymphal mortality was corrected by Abbott's formula. Mortality data converted into percentage mean values then trans- formed into arc sine for one- way ANOVA in toxicity test follow t test and CRD design, obtained data analyzed by using arc sign transformation.

5. Results and discussion

Mortality percentage of 3rd instar BPH nymphs was evaluated with different *ocimum*spp *viz. O.sanctum, O. basilicum, O. americanum, O. gratissimum* with five solvents *viz*. methanol, ethyl acetate, hexane, chloroform, acetone. In methanol extracts of *O. gratissimum* showed significant insecticidal activity 73.92% followed by *O. sanctum* 63.91%, *O. basilicum* 53.57%, *O. americanum* 51.52%, methanol 30.05%, triton x-100 26.78% and compared to control 15.57%. In ethyl acetate extracts *O. gratissimum* 65.88%, *O.basilicum* 62.32%, *O. sanctum* 53.48%, *O. americanum* 53.28%, ethyl acetate 3.44%, triton x-100 21.84% and 10.76%in control. In hexane extracts *O. gratissimum* 57.00%, *O. basilicum* 50.64%, *O.sanctum* 46.80%, *O. americanum* 42.16%, hexane 26.93%, triton x-100 19.64 and 14.12% in control. In chloroform extracts *O. gratissimum* 57.24%, *O. americanum* 46.20%, *O.basilicum* 41.72%, *O. sanctum* 31.32%, chloroform 26.00%, triton x-100 21.68% and 11.24% in control. In acetone extracts *O. gratissimum* 58.96%, *O.sanctum*45.40%, *O. americanum* 45.36%, *O. basilicum* 44.84%, acetone 25.35%, triton x-100 18.88% and in control 16.92 percent. In all solvents extracts significantly highest mortality was recorded in *Ocimum gratissimum* followed by *Ocimum sanctum* compared with control.

The results are confirmed with Mayabini, J [7] mortality of BPH, *N. lugense* with chloroform extracts of *Polygonum hydropiper* were next in the order of effectiveness showing 73.3 percent killing against 5th instar nymphs and 80.0 percent against adults respectively.

The results are confirmed nearer with finding of Sainath G, [8] mortality of BPH, nymphs with essential oils of eucalyptus, lemongrass, cedar wood, citronella and camphorwood oil, maximum mortality was showed by eucalyptus oil 84.40% followed by citronella 64.40%against BPH.

In all solvents *O.gratissimum* shows highest mortality percentage due to presence of eugenol, Limonene1, 8-Cineole, eugenol, methyl chavicol and thymol Abhay, K.*et al*., [9]

Table 1: Effect of methanol extracts of different *Ocimum* spp on mortality of BPH, *N. lugens*

SI.No	Treatments	Percent mortality					Average
		1DAT	3DAT	5DAT	7DAT	10DAT	
1	*O.sanctum*	44.40 a (26.35)	67.93ab (42.77)	56.60ab (34.46)	65.80a (41.13)	84.80a* (57.97)	63.91ab (40.54)
2	*O.basilicum*	41.60 a (24.57)	52.87bc (31.90)	47.20bc (28.15)	55.60b (33.77)	70.60**b (44.89)***	53.57bc (32.66)
3	*O.americanum*	38.50b a (22.63)	57.20cd (34.88)	41.00c (24.20)	53.60b (32.40)	67.20b (42.20)	51.50bc (31.26)
4	*O.gatissimum*	52.00 a (31.32)	66.60a (55.67)	78.00a (41.28)	79.80a (52.92)	89.20a (63.10)	73.92a (48.86)
5	Methanol	21.00b (12.11)	27.27de (15.81)	29.20d (16.97)	34.80c (20.35)	38.40c (22.32)	30.05cd (17.48)
6	Triton X-100	20.20b (11.64)	24.40e (14.11)	27. 00d (15. 65)	27.33c (15. 85)	35.00c (20.47)	26.78d (15.52)
7	Control	3.60c (2.06)	10.67f (11.92)	13.40e (7.70)	17.00d (9.78)	23.20d (13.41)	15.57e (8.97)
	SEm±	9.52	9.56	11.08	9.89	10.38	11.75
	CD(0.05%)	5.31	5.17	4.61	3.30	3.39	7.03

*Mean followed by same letter are not significantly different at P=0.05
**Figures are average means of five replications
***Figures in the parenthesis are arc sine transformed values

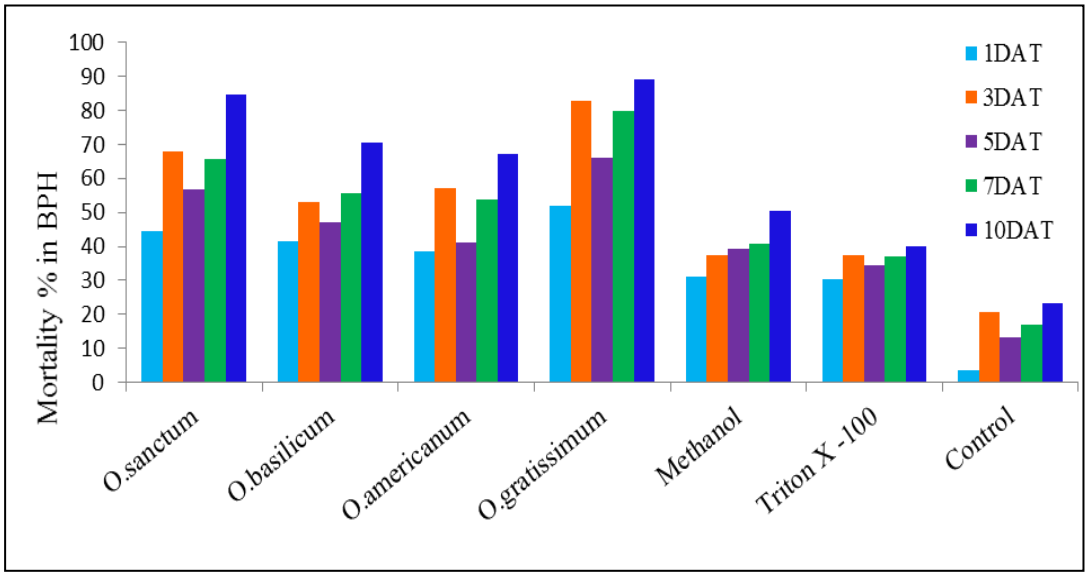


Fig 1: Effect of methanol extracts of different *Ocimum* spp on mortality of BPH, *N. lugens*

Table 2: Effect of ethyl acetate extracts of different *Ocimum* spp on mortality of BPH, *N.lugens.*

SI. No	Treatments	Percent mortality					Average
		1DAT	3DAT	5DAT	7DAT	10DAT	
1	*O.sanctum*	33.00ab (19.26)	38.60abc (22.70)	55.40b (33.63)	64.80b (40.37)	75.60b* (49.09)	53.48a (33.01)
2	*O.basilicum*	37.40ab (21.95)	43.00ab (25.46)	70.80a (45.05)	77.80a (51.06)	82.60**a (55.67)***	62.32a (39.84)
3	*O.americanum*	30.60ab (17.81)	36.00bc (21.09)	57.20ab (34.88)	67.80b (42.67)	74.80b (48.40)	53.28a (32.97)
4	*O.gatissimum*	44.40a (26.35)	50.60a (30.39)	66.80ab (41.90)	80.00a (53.11)	87.60a (61.14)	65.88aa (42.58)
5	Ethyl acetate	26.40b (15.30)	30.20c (17.57)	33.60c (19.62)	36.60c (21.46)	40.42c (23.81)	33.44b (19.53)
6	Triton X-100	13.20c (7.58)	15.60d (8.97)	20.80c (12.00)	28.60c (16.61)	31.00d (18.05)	21.84b (12.64)
7	Control	1.60d (0.92)	4.80e (2.75)	9.60d (5.51)	16.80d (9.67)	21.00e (12.12)	10.76c (6.19)
	SEm±	9.35	9.89	13.37	12.44	12.00	14.49
	CD(0.05%)	5.09	5.62	6.50	3.46	3.68	7.07

*Mean followed by same letter are not significantly different at P=0.05
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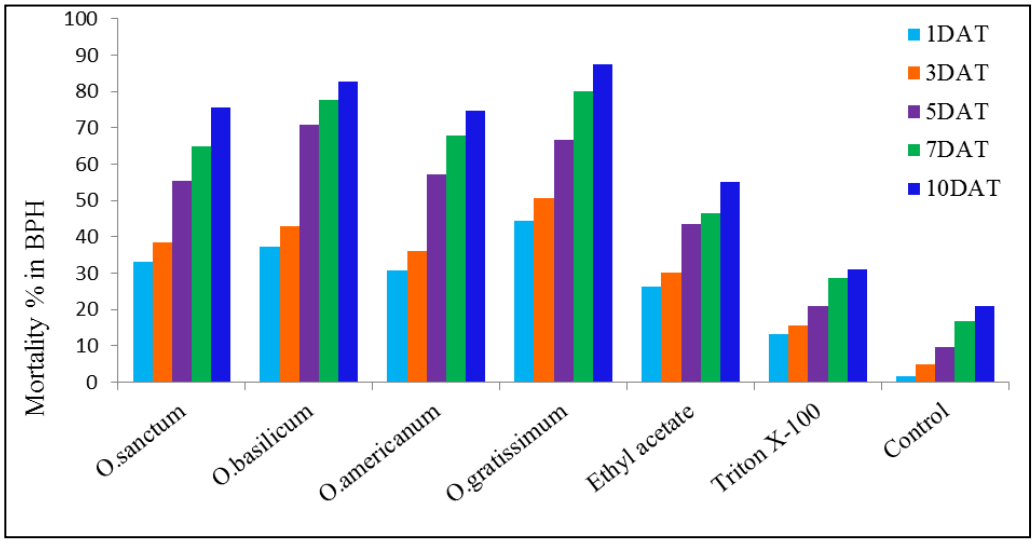

Fig 2: Effect of ethyl acetate extracts of different *Ocimum* spp against BPH, *N.lugens*

Table 3: Effect of hexane extracts of different *Ocimum* spp on mortality of BPH, *N.lugens.*

SI. No	Treatments	Percent mortality					Average
		1DAT	3DAT	5DAT	7DAT	10DAT	
1	*O.snctum*	22.80ab (13.17)	34.00a (19.87)	42.40ab (25.08)	63.00b (39.03)	71.80b* (45.87)***	46.80ab (20.66)
2	*O.basilicum*	23.00ab (13.29)	36.60a (21.46)	44.40ab (26.35)	72.60ab (46.53)	76.60**b (49.98)	50.64ab (31.52)
3	*O.americanum*	15.20b (8.74)	29.60a (17.21)	36.00bc (21.09)	61.80b (38.15)	68.20b (42.98)	42.16abc (25.64)
4	*O.gatissimum*	26.60a (15.42)	41.00a (24.20)	53.20a (32.13)	78.80a (51.98)	85.60a (58.85)	57.0a (36.51)
5	Hexane	14.60b (8.39)	16.20b (9.32)	24.60cd (14.24)	38.80c (22.82)	40.40c (23.81)	26.93bcd (14.92)
6	Triton X-100	6.20c (3.55)	11.20b (6.43)	14.40de (8.28)	31.60c (18.41)	34.80cd (20.35)	19.64cd (11.32)
7	Control	1.60d (0.92)	3.20c (1.83)	9.60e (5.51)	18.80d (16.13)	28.40d (16.49)	14.12d (7.81)
	SEm±	5.87	8.47	10.50	11.41	12.70	13.45
	CD(0.05%)	5.33	4.82	5.74	6.57	5.28	11.37

*Mean followed by same letter are not significantly different at P=0.05
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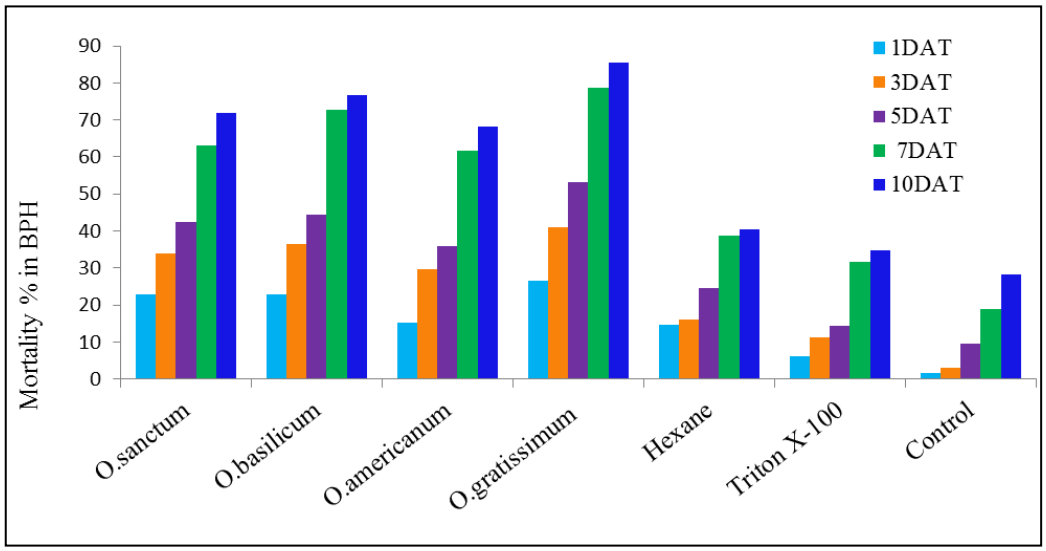

Fig 3: Effect of hexane extracts of different *Ocimum* spp on mortality of BPH, *N.lugens.*

Table 4: Effect of chloroform extracts of different *Ocimum* spp against mortality of BPH, *N.lugens*

SI.No	Treatment	Percent mortality					Average
		1DAT	3DAT	5DAT	7DAT	10DAT	
1	*O.sanctum*	12.00abc (6.89)	18.00bc (10.37)	27.40bc (15.90)	38.00cd (22.32)	61.20c* (37.72)	31.32bc (18.64)
2	*O.basilicum*	22.20ab (12.82)	30.20ab (17.57)	31.60ab (18.41)	52.80b (31.86)	71.80**b (45.87)***	41.72ab (25.30)
3	*O.americanum*	24.20ab (14.00)	37.80a (22.20)	48.60a (29.07)	53.80b (32.53)	66.60bc (41.74)	46.20ab (27.91)
4	*O.gratissimum*	26.40a (15.30)	46.20a (27.51)	56.20a (34.18)	71.40a (45.54)	86.00a (59.29)	57.24a (36.36)
5	Chloroform	12.20bcd (7.00)	19.80bc (11.42)	24.40bc (14.12)	35.60bc (20.51)	38.20c (22.45)	26.0bc (15.08)
6	Tritan X-100	10.00cd (5.74)	13.60c (7.81)	14.60cd (8.39)	33.60d (19.63)	36.60d (21.46)	21.68c (12.51)
7	Control	1.60d (0.92)	5.20d (2.98)	6.60d (3.78)	16.60e (9.55)	26.20d (15.18)	11.24d (4.31)
	SEm±	6.27	9.36	11.43	12.21	14.20	13.71
	CD(0.05%)	5.18	5.28	5.32	5.32	3.98	9.94

*Mean followed by same letter are not significantly different at P=0.05
**Figures are average means of five replications
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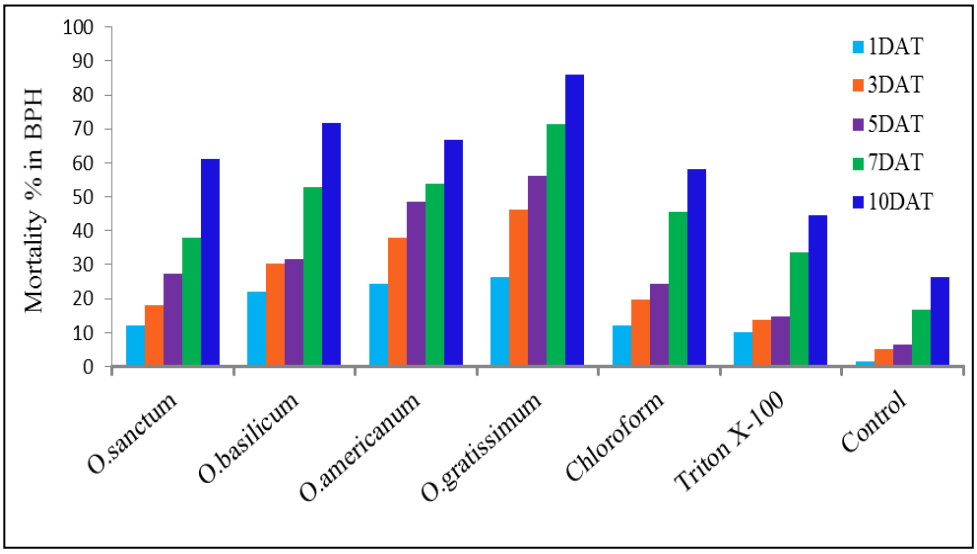

Fig 4: Effect of chloroform extracts of different *Ocimum* spp against mortality of BPH, *N.lugens*

Table 5: Effect of acetone extracts of different *Ocimum* spp on mortality of BPH, *N.lugens*

SI. No	Treatment	Percent mortality					Average
		1DAT	3DAT	5DAT	7DAT	10DAT	
1	*O.sanctum*	20.80ab (12.00)	30.20bc (17.57)	42.40b (25.08)	56.80b (34.60)	74.80b* (48.40)***	45.40ab (27.78)
2	*O.basilicum*	24.40a (14.12)	40.20ab (23.69)	44.40b (26.35)	49.60b (29.72)	67.20**b (42.20)	44.84ab (27.12)
3	*O.americanum*	21.80ab (12.59)	36.20abc (21.21)	36.00b (21.09)	52.60b (31.72)	72.80b (46.70)	45.36ab (27.58)
4	*O.gratissimum*	29.60a (17.21)	47.60a (28.41)	53.20a (32.13)	73.20a (47.04)	86.00a (59.29)	58.96a (37.53)
5	Acetone	12.58b (7.22)	24.60cd (14.24)	24.60c (14.24)	29.60b (17.21)	35.40c (20.72)	25.35bc (14.67)
6	Triton X-100	3.80c (2.18)	14.40d (8.28)	18.60cd (10.72)	25.80c (14.94)	31.80c (18.53)	18.88c (10.87)
7	Control	1.60c (0.92)	7.40e (4.24)	9.60d (5.51)	27.20d (15.78)	28.00c (17.45)	16.92c (9.79)
	SEm±	6.54	8.84	10.50	11.76	13.36	14.25
	CD(0.05%)	5.10	5.38	5.76	5.30	4.88	11.90

*Mean followed by same letter are not significantly different at P=0.05
**Figures are average means of five replications
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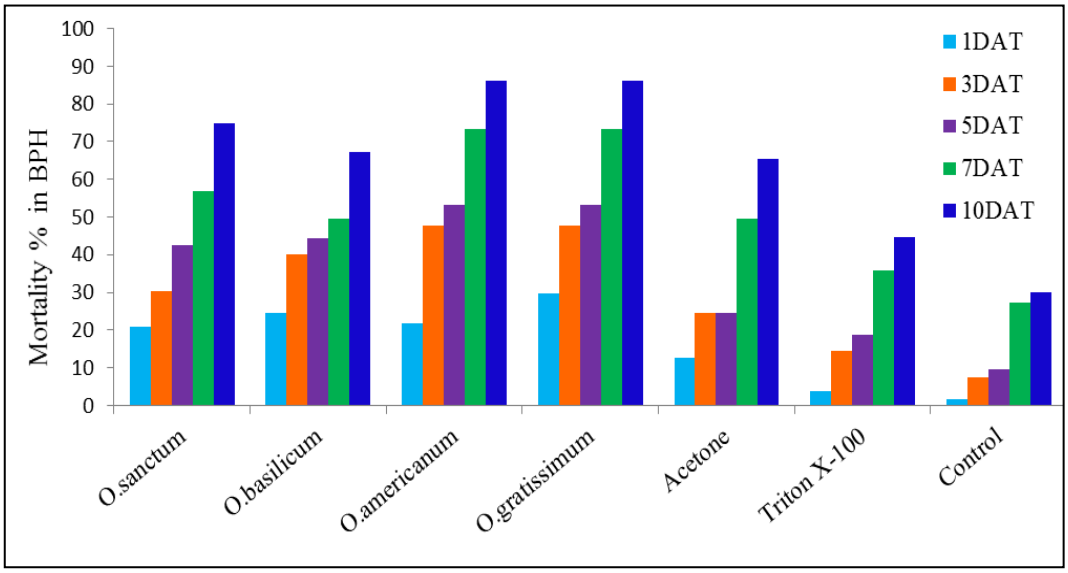

Fig 5: Effect of acetone extracts of different *Ocimum* spp on mortality of BPH, *N,lugens*

6. Conclusion

The results showed that in methanol extracts of different *Ocimum* spp *O. gratissimum* elucidated significantly highest percentage of nymphal mortality 73.92% compared to control 15.57%, in ethyl acetate extracts of different *Ocimum* spp *O. gratissimum* showed significant highest mortality percentage 65.88% comapred to control 10.76%, in hexane extracts *O. gratissimum* recorded with highest percent mortality 57.00% compared with control 14.12%, in chloroform extracts *O. gratissimum* showed maximum percentage of nymphal mortality 57.24% significantly higher compared with control 11.24% and in acetone extracts of different Ocimum spp again *O.gratissimum* showed highest percentage of mortality 58.92% compared with control 16.92%. Among all solvent extracts of different *Ocimum*spp *O. gratissimum* was recorded with highest nymphal mortality percentage compared other *Ocimum* species.

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8. References

1. 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.
2. Annonymus. International Rice Research Institute, Annual Reports 2015, Los Banos, Philippines, 2015, 131-148.
3. Chiitra S, Subhash C, Sinha SR, palta RK. Indian Agricultural Research Institute. 2009; 79(12):1003-6.,
4. Sogawa K. Feeding behavior and damage mechanism of the rice planthoppers. In: 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.
5. Zhuang G, Shen Y, Chen JZ. The influence of triazophos on the productivity of the different wing-form brown planthopper, *Nilaparvata lugens* (Stål). Journal of Nanjing Agricultural University. 1999; 22:21-24.
6. Park BS, Lee SE, Choi WS, Jeong CY, Song C, Cho KY. Insecticidal and acaricidal activity of piperonaline and piperoctadecalidine derived from dried fruits of *Piper longum* L. Crop Protection. 2002; 21:249-251.
7. Mayabini J. Efficacy of the plant, *Polygonum hydropiper* against rice brown planthopper *Nilaparvata lugens (*Stal.). scientific correspondence. Central Rice Research Institute, 2000.
8. Sainath G. Bio-efficacy of tree seed oils and essential oils against brown planthopper, *Nilaparvata lugens* (Stal.), Journal of Agricultural science, 2016.
9. Abhay K, Pandey PS, Nijendra NT. Chemistry and bioactivities of essential oils of some *Ocimum* species: an overview**.** Asian Pasific Journal of tropical Biomedicine. 2014; 4(9):682-694.