

Repellent effect of Essential oil from *Ocimum basilicum* against *Rhyzopertha dominica* (Coleoptera: Bostrichidae) and *Tribolium castaneum* (Coleoptera: Tenebrionidae)

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Abstract

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The laboratory experiment was conducted to find out the repellent effect of *Ocimum basilicum* against *Rhyzopertha dominica* and *Tribolium castaneum* by paper disk method. Among the tested concentrations maximum repellency 98.20 percent was observed in 3 percent concentration of *Ocimum basilicum* followed by 90.06 and 88.38 percent at 2 and 1 percent concentration respectively against *Rhyzopertha dominica*. The maximum repellency percentage 99.56 recorded at 3 percent concentration of *Ocimum basilicum* followed by 98.69 and 95.96 percent at 2 and 1 percent concentration respectively. The tested essential oil from *Ocimum basilicum* showed strong repellent effect against both stored grain insects.

INTRODUCTION

The continuous increasing pressure of human population, it is very difficult to provide food grain in daily requirements, under this situation a very challenging task to manage insect pests of stored commodities. Several types of chemical insecticides are has been evaluated to save the agricultural produce, but stored product insects has developed resistance against chemical insecticides (Jembere *et al* 1995) and stored grain also contain the high residual limits. Under this circumstances researcher from all over the world searching for alternative methods to manage stored product insect pests. In this way there are several essential oils has been evaluated and most of them are found highly effective against stored product insects. Plant essential oils may possess fumigants, contact, repellents, deterrents and antifeedants, ovicidal, larvicidal properties with complex mode of action (Kumar 2016, 2016a Kumar 2017, Isman, 2000; Shakarami *et al.*, 2004; Negahban *et al.*, 2007). The *Rhyzopertha dominica* (Coleoptera: Bostrichidae) and *Tribolium castaneum* (Coleoptera: Tenebrionidae) is one of the important insect pests of stored commodities. The both insects is considered as secondary pest and able to infest processed products or grains already damaged by primary insect pest of stored grain. In our country chemical fumigants are available to control them under storage condition but they have already developed resistance. Hence there are needs to

develop alternative method to control them and save the environment. The essential oils from medicinal and aromatics plants are well known to enormous source of bioactive natural compounds (Kumar 2016a). The present study was taken to find out the repellent activity of essential oil from *Ocimum basilicum* against *Rhyzopertha dominica* and *Tribolium castaneum*.

MATERIALS AND METHODS

Culture of test insect

The pure culture of test insects was developed in the BOD incubator maintained at 27°C temperature and 70 percent relative humidity. Plastic jars of were used for culture of test insect and to facilitate aeration in the jar, on center of lid a hole of 1.8 cm diameter was made and covered with 30 mesh copper wire net. The adults of *R. dominica* were reared on the whole grain of wheat variety PBW-343 while *T. castaneum* was cultured on its flour fortified with 5 percent yeast powder. Before use, untreated and graded seeds were disinfested in the oven at 60°C for 12 hr. After disinfestation the moisture content of the grain was measured and raised to 13.5 percent by mixing water into the grains (Pixton 1967). First generation adults (3-6 days old) were used for experimental purpose.

Extraction of Essential oil

Fresh leaves of *Ocimum basilicum* were collected from herbal garden, Sabour and essential oils were obtained by steam distillation, using a Clevenger

apparatus, for approximately 3-4 h. Data was analyzed in completely randomized design after suitable transformation with $\log(X + 1)$.

Repellency test

Repellency test was conducted as per method of Talukdar and Howse (1993). Petri dishes 9cm in diameter were used to confine insects during experiment. The essential oils were diluted in ethanol to different concentrations (1.0%, 2.0% and 3.0%) and absolute ethanol was used as control. Whatman filter paper 1 of 9 cm diameter was cut in half and 1ml of each concentration was applied separately to one half as uniformly as possible with a micropipette. Another half was treated with 1ml of absolute ethanol. Both the treated half and untreated half were then air dried to evaporate the solvent completely. A full disc was carefully attached to their opposites using adhesive tape than placed in petri dishes. Twenty newly emerged adults (3-6 days old) of test insect with mixed sex were released in the centre of each filter paper disc. The discs were covered with lid and placed at room temperature. three replication was used for each concentration. The total no of insects present on each half were recorded after one hours of treatment. The separated experiment was conducted for each test insect and whole experiment was replicated twice. The percent repellency was calculated as per formula of

Abbott (1925) and repellent class was categorized as per scale of Roy et al (2005).

RESULTS

Repellent activity of *Ocimum basilicum* oil against *R. dominica*

The mean repellency percentage of *R. dominica* is presented in table 1. Among the tested concentrations maximum repellency 98.20 percent was observed in 3 percent concentration of *Ocimum basilicum* followed by 90.06 and 88.38 percent at 2 and 1 percent concentration respectively. The essential oil of *Ocimum basilicum* is found to have strong repellent against *R. dominica*.

Repellent activity of *Ocimum basilicum* oil against *T. castaneum*

The mean repellency percentage of *T. castaneum* is presented in table 2, which indicate maximum repellency percentage 99.56 recorded at 3 percent concentration of *Ocimum basilicum* followed by 98.69 and 95.96 percent at 2 and 1 percent concentration respectively. The essential oil of *Ocimum basilicum* is found to have strong repellent against *T. castaneum*.

Table 1 Repellency of *Ocimum basilicum* oil against *R. dominica*

Percent Conc.	Percent repellency of <i>Ocimum basilicum</i> oil against <i>R. dominica</i> at different hour interval				Mean	Class
	1	2	3	4		
1	77.12	90.83	92.79	92.79	88.38	V
2	84.03	88.66	92.79	94.74	90.06	V
3	94.54	98.25	100.00	100.00	98.20	V

Table 2. Repellency of *Ocimum basilicum* oil against *T. Castaneum*

Percent Conc.	Percent Repellency of <i>Ocimum basilicum</i> oil against <i>T. castaneum</i> at different hours interval				Mea n	Class
	1	2	3	4		
1	92.59	98.25	96.49	96.49	95.96	V
2	100	98.25	98.25	98.25	98.69	V
3	100	100	98.25	100	99.56	V

DISCUSSION

The concentration of essential oil and duration of exposure are directly correlated with repellency percentage and essential oil from *Ocimum basilicum* showed maximum repellency after four hours of treatment against both tested insects (Kumar 2016a). The essential oils of sage and basil are well known by their insecticidal properties due

to presence of natural bioactive compounds thujone, camphor, linalool, 1,8 cineole and pinene (Regnault 1997, Bazzoni 2002, pythochemical database 2014.).The repellent activity of essential oil of *Artemisia vulgaris* showed strong repellency again stored grain insects(Tripathi 2002).

CONCLUSION

Results conclude that the essential oils *Ocimum basilicum* at 3 percent caused 100 percent repellency against *Rhyzopertha dominica* and *Tribolium castaneum*. After four hours of exposures. So *Ocimum basilicum* essential oils may utilize for the quick repellency of stored grain insect pests.

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