KHAPRA BEETLE **WHEAT**

LC_{50} AND OVICIDAL EFFECT OF DIFFERENT BIO-PESTICIDE (PLANT OILS) AGAINST KHAPRA BEETLE, *Trogoderma granarium* EVERTS IN WHEAT, *Triticum aestivum* L.

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ABSTRACT

Laboratory experiments were conducted during 2003-04 and 2004-05 with wheat, *Triticum aestivum* L. to determine the LC_{50} and ovicidal effect of different bio-pesticide (plant oils) against khapra beetle, *Trogoderma granarium* Everts. Ovicidal effect of different plant products arranged in descending order were karanj > neem > cardamom > linseed > lemongrass > juniper berry > castor > eucalyptus > mustard > groundnut > sesamum > palm > sunflower oils. The egg hatch inhibitions in different plant product (oils) were ranged from 29.83 to 64.49 per cent. Karanj oil was significantly superior in reducing the hatchability (64.49%) of eggs and least effective oils were sunflower (29.83%). The percentage of eggs hatch inhibition in all the treatments increased with the increase in concentration. The LC_{50} value increased than decrease the effectiveness of different plant products were observed. The LC_{50} ranged from 1.1025±0.3918 to 4.2190 ± 0.7560 of different treatments. The minimum LC_{50} values (1.1025±0.3918) in karanj oil and maximum (4.2190±0.7560) in sunflower oil were observed.

KEY WORD: **Plant oil, *T. granarium*, Ovicidal.**

Introduction

Khapra beetle, *Trogoderma granarium* is a major pest of stored grains reported from India (Cotton, 1952). Khapra beetle, *Trogoderma granarium* is a very serious pest of wheat, but also found feeding on bajra , jowar, rice, gram, maize, and pulses in storage. Only larval stage is destructive, adults being harm lees. The larvae start feeding on the germ portion of the grains and feed deep in to them. This cause great economic approaches to keep the stored food grains free from insects attack, would be using the plant oils as grains protectants. There are encouraging reports on the use of certain indigenous plant products as grains protectants (Bhargava and Meena, 2001).

Material and Methods

The experiment was conducted under laboratory conditions during 2003-04 and 2004-05 with wheat, *Triticum aestivum* L. to evaluate the LC_{50} and ovicidal effect of different biopesticide (plant oils) as grain protectant against khapra beetle, *Trogoderma granarium* Everts in increasing the stability of wheat. Stock solutions of different plant oils were prepared in acetone.Aliquos of stock solution were than diluted to 0.5, 1.0, 2.0, 3.0 and 5.0 per cent solution for treating the eggs of known age group (0-24hrs).Ten ml solution of 1.0, 5.0 and10.0 per cent concentration of test oils were mixed with 100g seeds in such way to get a uniform coating, which would give the doses of 0.1, 0.5 and 1.0 ml/100g seeds. Control seeds were treated with acetone only. To test the ovicidal effect, the freshly laid eggs (0-24hrs old) of text insect were taken out. There were three replications and 40 eggs were treated in each replication by dipping method. A sample of 40 eggs was placed in the cavity slide, sufficient amount of solution was poured in the cavity and eggs were allowed to dip for 10 seconds. The excess solution was removed with the help of blotting paper and slides were covered with cello tapes to prevent

Table 1

Ovicidal effect of different bio-pesticide (plant oils) against *T. granarium* in wheat

Conc. (%)	Per cent egg hatch inhibition*														
	Neem oil	Castor oil	Linseed oil	Eucalyptus oil	Groundnut oil	Karanj oil	Mustard oil	Palm oil	Sunflower oil	Sesamum oil	Juniper-berry oil	Cardamom oil	Lemon Grass oil	Clove oil	Mean
0.5	33.33 (35.26)	26.66 (31.09)	28.33 (32.16)	20.00 (26.56)	17.50 (24.73)	38.33 (38.25)	21.66 (27.74)	14.16 (23.00)	8.33 (16.76)	13.33 (21.41)	25.83 (30.54)	30.00 (33.21)	27.50 (31.63)	29.16 (32.68)**	23.86 (28.93)
1.00	44.16 (41.65)	39.16 (38.74)	40.83 (39.72)	38.33 (38.25)	33.33 (35.26)	49.16 (44.51)	38.33 (38.25)	25.00 (30.00)	19.16 (25.96)	24.16 (29.44)	40.00 (39.23)	41.66 (40.20)	40.83 (39.72)	43.33 (41.17)	36.96 (37.29)
2.00	65.83 (54.23)	55.00 (47.87)	56.66 (48.83)	47.50 (43.57)	43.33 (41.17)	67.50 (55.24)	53.33 (46.91)	35.00 (36.27)	28.33 (32.16)	39.16 (38.74)	54.76 (47.38)	63.33 (52.73)	55.83 (48.35)	59.16 (50.28)	51.72 (45.98)
3.00	76.66 (61.11)	71.66 (57.83)	72.50 (58.37)	63.33 (52.73)	61.66 (51.74)	81.66 (64.64)	68.33 (55.75)	49.16 (44.51)	40.83 (39.72)	50.00 (45.00)	70.00 (56.79)	73.33 (58.91)	74.16 (59.45)	75.00 (60.00)	66.30 (54.75)
5.00	84.50 (66.09)	80.00 (63.44)	81.66 (64.64)	76.66 (61.11)	69.16 (56.26)	85.83 (67.88)	75.00 (60.00)	58.33 (49.80)	52.50 (46.43)	59.16 (50.28)	80.83 (64.03)	83.83 (65.58)	81.66 (64.64)	83.33 (65.90)	75.67 (60.95)
Control	4.16 (11.71)														

	SE m±	C.D. at 5%	C.V.%
Treatment	0.36	1.01	
Dose	0.22	0.60	3.11
Treatment x Dose	0.81	2.26	

* *Data based on 120eggs (Three replications of 40 in each).* ** *Percentage transformed to angular; outside values are its back transformation to percentage.*

the escape of newly emerged larvae. Eggs in control were treated with acetone. The observations on the hatched and unhatched eggs were recorded till last egg hatched under binocular microscope. The LC_{50} values of all the test oils in relation to egg hatch inhibition were determined by maximum likelihood estimation (Finney, 1971).

Results and Discussion

The percentage of eggs hatch inhibition in all the treatments increased with the increase in concentration. The mean per cent ranged from 23.86 to 75.67, while in control only 4.16 per cent egg hatch inhibition was recorded. In karanj oil, the egg hatch inhibition was 38.33 per cent at the initial concentration of 0.5 per cent, which increased to 85.83 per cent at the highest concentration of 5.0 per cent. Similar trend of reduction of egg hatchability was recorded in other plant oils.The per cent egg hatch inhibition in other treatments at the highest concentration level of 5.0 per cent were 84.50, 83.83, 83.33, 81.66, 81.66, 80.83, 80.00, 76.66, 75.00, 69.16, 59.16, 58.33 and 52.50 in neem, cardamom, linseed, lemongrass, juniper berry, castor, eucalyptus, mustard, groundnut, sesamum, palm and sunflower oils, respectively. The present finding are also in accordance with Sharma and Bhargava (2001) who reported that neem oil at different concentration ranging from 0.5 to 5.0 per cent caused significant egg hatch inhibition in *C. cephalonica*. Similarly, ovicidal activities of other plant oils viz., linseed oil(Verma *et. al., 1983*), mustard oil (Ali *et. al.*, 1983), sunflower and sesamum oils (Kachare *et. al.*, 1994) and eucalyptus oil (Tunc *et. al.*, 2000) have been reported on different insect pests and thus, present findings are corroborated. The reduction in hatchability of eggs treated with different plant oils may be due to the fact that the oil entered in the eggs through its micropyle and stopped the protoplasmic movement of freshly laid eggs. Similar observations were also reported in *C. maculatus* (Singh *et. al.*, 1978) and in *S. cerealella* (Verma *et. al.*, 1983).

The LC_{50} value increased than decrease the effectiveness of different plant products were observed. The LC_{50} ranged from 1.1025 ± 0.3918 to 4.2190 ± 0.7560 of different treatments. The minimum LC_{50} values (1.1025 ± 0.3918) and maximum (4.2190 ± 0.7560) were observed in karanj oil and sunflower oil, respectively. The present investigation corroborates the study of Sharma *et. al.* (1997) and Sharma and Bhargava (2001).

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Table 2

LC_{50} of different bio-pesticide (Plant oils) against eggs of *T. granarium*

Plant oils	Regression equations (Y = a + bx)	LC_{50} ± S.E.	Fiducial Limit** (Lower – Upper)
Neem oil	Y = 3.184 + 1.4357x	1.2180 ± 0.969	0.7139 - 2.7560
Castor oil	Y = 2.9192 + 1.8139x	1.736 ± 0.0412	1.7027 - 3.2060
Linseed oil	Y = 3.0261 + 1.4593x	1.5490 ± 0.1657	1.4950 - 2.2600
Eucalyptus oil	Y = 2.5835 + 1.5963x	2.4330 ± 0.1931	2.0923 - 4.9239
Groundnut oil	Y = 2.4397 + 1.3587x	2.7413 ± 0.3917	2.1550 - 5.0874
Karanj oil	Y = 3.3751 + 1.6131x	1.1025 ± 0.3918	0.6168 - 1.9780
Mustard oil	Y = 2.6476 + 1.4892x	2.0490 ± 0.1032	1.8170 - 4.3890
Palm oil	Y = 2.2157 + 1.5753x	3.8179 ± 0.1675	2.5182 - 6.3980
Sunflower oil	Y = 2.0139 + 1.4127x	4.2190 ± 0.7560	2.8038 - 7.9850
Sesamum oil	Y = 2.2698 + 1.4897x	3.1501 ± 0.1398	2.4625 - 5.5900
Juniper berry oil	Y = 2.8395 + 1.5798x	1.8060 ± 0.0979	1.7500 - 3.8020
Cardamom oil	Y = 3.1162 + 1.5314x	1.4060 ± 0.1497	1.0508 - 2.6290
Lemongrass oil	Y = 3.0179 + 1.5729x	1.6680 ± 0.1090	1.6680 - 3.2900
Clove oil	Y = 3.0985 + 1.7936x	1.4850 ± 0.0502	1.2840 - 2.9100

LC_{50} values determined by Maximum Likelihood Estimation (Finney, 1971).
***Fiducial limits were calculated by normal equivalent deviate (P=0.05), 1.96.*

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Fire ants love a disturbance

The red fire ant, *Solenopsis invicta*, a major invasive pest, is found in areas where the natural environment has been disturbed. But is it the human-caused disturbance that makes *S. invicta* have such a negative impact on other ants, or something about the ant itself? One school of thought holds that the reason many invasive species succeed is that they are superior to other species and can outcompete them no matter what the situation.

A large study by Joshua R. King and Walter R. Tschinkel of Florida State University shows that for fire ants, at least, human disturbance of the environment is the main force behind their negative impact. They demonstrated this by introducing fire ants into forest plots that were mowed and plowed.

In *The Proceedings of the National Academy of Sciences*, they report that plowing by itself reduced the number and diversity of native ants greatly. Fire ants by themselves had less of an effect.

The researchers suggest that fire ants may not be so much an invasive species but a "disturbance specialist," and that other species may fit that description, too.