



Efficacy of edible and non-edible oils on orientation and oviposition of *Callosobruchus maculatus* infesting green gram (*Vigna radiata*)

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Abstract : Efficacy of edible and non-edible oils of sesame, coconut, groundnut, soybean, mustard, mahua, castor, karanj, neem and linseed on *Callosobruchus maculatus* infesting green gram, was investigated under free choice conditions. The green gram seed were treated with @ 2.5ml, 3.5ml, 4.5ml and 5.5ml per kg. seeds. All the oil treatments recorded significantly higher effective repelling the adults of the pulse beetle over control at 60, 90, 120 and 150 day's after treatment. The minimum orientation (6.19 adults) was recorded in mahua oil with the treatment (5.5 ml/kg seed) and Significantly higher orientation (8.09 adults) was recorded in treatments of mustard oil (2.5 ml/kg seed) than rest of the treatments. Significantly effective in reducing the egg deposition (5.35 to 55.78 eggs) over control (85.29 eggs) under neem oil. Where as mustard oil was found least effective in reducing the egg deposition.

Key Words : Edible and non-edible oils, *Callosobruchus maculatus*, *Vigna radiata*

View Point Article : Katara, Subhash and Sharma, Ashok (2012). Efficacy of edible and non-edible oils on orientation and oviposition of *Callosobruchus maculatus* infesting green gram (*Vigna radiata*). *Internat. J. agric. Sci.*, 8(1): 150-153.

Article History : Received : 03.06.2011; Revised : 24.09.2011; Accepted : 13.11.2011

INTRODUCTION

The pulse beetle, *Callosobruchus maculatus* (Fab.) is major insect pest of green gram and other storage pulses causing substantial damage in the storage. In seed by infestation due to improper storage in India have been reported to be 50 per cent, after only three months of storage (Hussain and Abdel-Al, 1982). The vegetable oils have been reported to inhibit oviposition, which results reduction in multiplication of bruchids (Invijaro, 1990 and Reddy *et al.*, 1994). During present investigations influence some edible and non-edible oils on oviposition and orientations under free choice condition were studied.

MATERIALS AND METHODS

The homogenous culture of pulse beetle *Callosobruchus maculatus* was maintained on green gram at

27.5°C ± 1°C in incubator on variety K-851 (as per procedure described by Strong *et al.* (1968). A key given by Raina, (1970). The seed of green gram were treated with the different vegetable oils *viz.*, sesame, coconut, groundnut, soybean, mustard, mahua, castor, karanj, neem and linseed oils @ 2.5, 3.5, 4.5 and 5.5 ml/kg seed in bulk and kept in polythene bags for further experiment. Hundred grains treated with each oil and untreated grains (control) were arranged in circular glass trough (45 x 15 cm). Fifty pairs of freshly emerged beetles were released in the center of the trough and the glass trough was then covered with the muslin cloth. The experiment was repeated three times. The adults oriented in each treatment were counted at 72 hours after their release. All adults were removed after 72 hours. The number of eggs laid on grains treated with different oils was counted to record their effect on oviposition.

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Table 1 : Orientations of pulse beetle on different oil treatments

Treatments	Dose (ml/kg)	Number of adult oriented								Mean		
		Seed exposed days after treatment (DAT)										
		60 DAT	90 DAT	120 DAT	150 DAT	60 DAT	90 DAT	120 DAT	150 DAT	11	12	
	1	2	3	4	5	6	7	8	9	10	11	12
Control	0.00	19.00	4.35*	17.00	4.10*	18.00	4.23*	17.00	4.12*	17.75	4.20*	
Sesame oil	2.50	7.25	2.69	6.87	2.62	6.95	2.64	7.29	2.70	7.09	2.66	
	3.50	7.15	2.67	6.81	2.61	6.73	2.59	7.17	2.68	6.97	2.64	
	4.50	7.04	2.65	6.11	2.47	6.65	2.58	6.99	2.64	6.70	2.59	
	5.50	6.98	2.64	5.97	2.44	6.14	2.47	6.43	2.53	6.38	2.52	
Mahua oil	2.50	6.14	2.48	6.52	2.55	6.55	2.56	6.53	2.55	6.44	2.53	
	3.50	6.02	2.45	6.37	2.52	6.41	2.53	6.39	2.53	6.30	2.51	
	4.50	6.06	2.45	6.29	2.51	6.34	2.52	6.31	2.50	6.25	2.49	
	5.50	5.93	2.43	6.23	2.50	6.28	2.51	6.31	2.51	6.19	2.49	
Coconut oil	2.50	6.50	2.55	6.92	2.63	6.58	2.56	9.13	3.01	7.28	2.69	
	3.50	6.42	2.53	6.83	2.61	6.44	2.53	8.98	2.99	7.17	2.67	
	4.50	6.35	2.52	6.78	2.60	6.35	2.52	8.85	2.97	7.08	2.65	
	5.50	6.28	2.50	6.67	2.58	6.29	2.51	8.73	2.95	6.99	2.64	
Mustard oil	2.50	9.23	3.04	7.72	2.77	8.46	2.91	6.95	2.64	8.09	2.84	
	3.50	8.47	2.91	7.53	2.73	8.39	2.89	6.83	2.61	7.81	2.79	
	4.50	8.34	2.89	7.30	2.69	8.03	2.82	6.74	2.59	7.60	2.75	
	5.50	8.00	2.82	7.10	2.65	7.89	2.81	6.65	2.58	7.41	2.71	
Groundnut oil	2.50	6.86	2.62	6.56	2.56	7.31	2.70	6.57	2.55	6.83	2.61	
	3.50	6.77	2.59	6.56	2.56	7.14	2.67	6.46	2.54	6.73	2.59	
	4.50	6.70	2.59	6.42	2.53	7.08	2.66	6.37	2.52	6.64	2.58	
	5.50	6.62	2.57	6.33	2.52	6.99	2.64	6.28	2.50	6.56	2.56	
Soybean oil	2.50	7.24	2.69	7.25	2.69	5.48	2.34	6.96	2.62	6.73	2.59	
	3.50	7.16	2.67	7.17	2.68	5.39	2.32	6.81	2.61	6.63	2.57	
	4.50	7.09	2.65	6.99	2.64	5.33	2.31	6.77	2.60	6.55	2.55	
	5.50	6.99	2.64	5.61	2.36	5.25	2.29	6.61	2.57	6.11	2.46	
Castor oil	2.50	8.21	2.86	7.24	2.69	6.37	2.52	6.77	2.60	7.15	2.67	
	3.50	8.13	2.85	7.17	2.68	6.16	2.48	6.51	2.55	6.99	2.64	
	4.50	8.00	2.82	7.12	2.67	6.03	2.44	6.39	2.52	6.89	2.61	
	5.50	7.97	2.82	6.93	2.63	5.95	2.44	6.33	2.51	6.80	2.60	
Karanj oil	2.50	6.98	2.64	6.15	2.48	7.13	2.66	6.99	2.63	6.81	2.60	
	3.50	5.79	2.39	6.06	2.46	7.00	2.64	6.85	2.61	6.43	2.53	
	4.50	5.72	2.39	6.01	2.45	6.89	2.62	6.76	2.60	6.35	2.52	
	5.50	5.57	2.36	5.86	2.42	6.69	2.59	6.67	2.58	6.20	2.49	
Neem oil	2.50	8.51	2.92	6.76	2.60	6.79	2.61	7.28	2.70	7.34	2.71	
	3.50	7.27	2.69	6.62	2.57	6.61	2.57	7.21	2.68	6.93	2.63	
	4.50	7.13	2.67	6.38	2.53	6.49	2.55	7.06	2.65	6.77	2.60	
	5.50	6.99	2.64	6.21	2.48	6.41	2.53	6.93	2.63	6.64	2.57	
Linseed oil	2.50	6.89	2.62	6.87	2.62	6.98	2.64	7.06	2.66	6.95	2.64	
	3.50	6.78	2.59	6.71	2.59	6.81	2.61	6.95	2.64	6.81	2.61	
	4.50	6.73	2.58	6.65	2.58	6.76	2.60	6.85	2.62	6.75	2.59	
	5.50	6.64	2.57	6.51	2.55	6.66	2.58	6.77	2.59	6.65	2.57	
C.D. (P=0.05)			0.084		0.069		0.059		0.074			
S.E.+			0.043		0.035		0.030		0.038			

* Square root transformed value

Table 2 : Ovipositional (Number of egg laid) preference of pulse beetle on different oil treatments

Treatments	Dose (ml/kg)	Number of eggs laid								Mean	
		Seed exposed days after treatment (DAT)									
		60 DAT		90 DAT		120 DAT		150 DAT			
1	2	3	4	5	6	7	8	9	10	11	12
Control	0.00	103.88	2.02*	76.43	1.89*	68.36	1.84*	92.49	1.93*	85.29	1.92*
Sesame oil	2.50	68.79	1.84	10.74	1.06	28.67	1.47	37.42	1.49	36.41	1.47
	3.50	67.26	1.83	10.50	1.05	28.03	1.46	36.57	1.58	35.59	1.48
	4.50	66.40	1.83	10.37	1.05	27.67	1.45	36.13	1.48	35.14	1.45
	5.50	65.57	1.82	10.24	1.04	27.33	1.45	35.67	1.59	34.70	1.47
Mahua oil	2.50	40.82	1.62	7.34	0.92	12.49	1.13	20.20	1.23	20.21	1.22
	3.50	39.90	1.61	7.18	0.91	12.21	1.12	19.74	1.29	19.76	1.23
	4.50	39.63	1.60	7.08	0.91	12.06	1.11	19.50	1.21	19.57	1.21
	5.50	38.91	1.60	7.00	0.90	11.91	1.11	19.25	1.24	19.27	1.21
Coconut oil	2.50	43.61	1.65	8.64	0.98	34.27	1.54	32.51	1.56	29.76	1.43
	3.50	42.64	1.64	8.45	0.97	33.51	1.53	31.79	1.51	29.10	1.41
	4.50	41.84	1.60	8.34	0.97	33.08	1.53	31.36	1.50	28.66	1.40
	5.50	41.24	1.62	8.24	0.96	32.67	1.52	30.99	1.49	28.28	1.40
Mustard oil	2.50	93.67	1.98	45.11	1.66	31.37	1.51	52.97	1.65	55.78	1.70
	3.50	92.55	1.97	44.10	1.65	30.70	1.50	51.79	1.65	54.79	1.69
	4.50	91.36	1.96	43.55	1.65	30.68	1.50	51.14	1.65	54.18	1.69
	5.50	90.23	1.96	43.00	1.64	29.91	1.49	50.49	1.64	53.41	1.68
Groundnut oil	2.50	68.17	1.84	3.49	0.65	17.49	1.27	28.49	1.40	29.41	1.29
	3.50	66.91	1.83	3.42	0.64	17.10	1.26	27.56	1.40	28.75	1.28
	4.50	66.51	1.83	3.37	0.64	16.88	1.25	27.50	1.37	28.57	1.27
	5.50	65.57	1.82	3.33	0.63	16.67	1.25	27.16	1.39	28.18	1.27
Soybean oil	2.50	41.17	1.62	10.04	1.04	22.99	1.38	27.79	1.47	25.50	1.38
	3.50	40.25	1.61	9.82	1.03	22.47	1.37	27.17	1.37	24.93	1.34
	4.50	39.74	1.60	9.69	1.02	22.19	1.36	26.83	1.45	24.61	1.36
	5.50	39.24	1.60	9.57	1.02	21.91	1.36	26.49	1.36	24.30	1.33
Castor oil	2.50	50.95	1.71	2.11	0.49	23.17	1.38	25.08	1.41	25.33	1.25
	3.50	49.19	1.70	2.09	0.49	22.47	1.37	24.52	1.41	24.57	1.24
	4.50	49.15	1.70	2.07	0.49	22.19	1.36	24.22	1.36	24.41	1.23
	5.50	48.57	1.69	2.00	0.48	20.91	1.34	23.91	1.39	23.85	1.22
Karanj oil	2.50	26.13	1.43	2.47	0.54	25.18	1.42	21.33	1.37	18.78	1.19
	3.50	25.55	1.42	2.44	0.53	24.62	1.41	20.85	1.36	18.37	1.18
	4.50	25.22	1.42	2.42	0.53	24.31	1.40	20.59	1.35	18.13	1.18
	5.50	24.91	1.41	2.33	0.52	24.00	1.45	20.33	1.36	17.89	1.19
Neem oil	2.50	15.29	1.21	2.17	0.50	3.22	0.63	5.06	0.74	6.44	0.77
	3.50	14.94	1.20	2.12	0.49	1.62	0.42	4.94	0.64	5.91	0.69
	4.50	14.76	1.20	2.07	0.49	1.02	0.31	4.88	0.63	5.68	0.66
	5.50	14.57	1.19	2.00	0.48	0.00	0.00	4.82	0.50	5.35	0.54
Linseed oil	2.50	42.30	1.63	8.47	0.97	33.22	1.53	31.13	1.54	28.78	1.42
	3.50	41.37	1.62	8.39	0.97	32.48	1.52	30.43	1.48	28.17	1.40
	4.50	40.84	1.62	8.30	0.96	32.40	1.52	30.05	1.52	27.90	1.40
	5.50	40.33	1.61	8.00	0.95	31.67	1.51	29.67	1.51	27.42	1.40
C.D. (P=0.05)			0.024		0.025		0.024		0.043		
S.E.±			0.012		0.013		0.012		0.022		

* Transformed value Log (X+1)

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Effect on orientation:

All the different oil treatments recorded on number of adult oriented were significantly higher (effective) in repelling the adults of the pulse beetle over control (17.75 adults) at 60, 90, 120 and 150 days after treatment (Table 1). The minimum orientation (6.19 adults) was recorded in mahua oil with the treatment (5.5 ml/kg seed) followed by karanj oil (5.5 ml/kg seed) which was significantly less than oriented on mustard oil but was at par to rest of the tested oils. Significantly higher orientation (8.09 adults) was recorded in treatments of mustard oil (2.5 ml/kg seed) than rest of the treatments against pulse beetle. Similar findings were reported by Yadav (2001) and Yadav *et al.* (2004) and Kachare (1994).

Influence on oviposition:

Among the different observations recorded on number of egg laid on treated seed were significantly effective in reducing the egg deposition (5.35 to 55.78 eggs) over control (85.29 eggs) under neem oil. Among oil treatments significantly less number of egg (5.35) were deposited on seed treated with neem oil with treatment 5.5 ml/kg seed than rest of the treatments. Where as mustard oil was found least effective in reducing the egg deposition that was 55.78 with the treatment 2.5 ml/kg seed than rest of the treatments (Table 2).

Significantly less number of egg (2.00 to 45.11) were deposited on 90 days old treated seeds and higher egg (14.57 to 93.67) on 60 days old treated seeds. No egg deposition was found at 120 DAT of neem oil with treatment 5.5 ml/kg seed. Minimum and similar number of egg (2.00) deposited on 90 DAT seed of castor and neem oil with treatment 5.5 ml/kg seed. Whereas maximum eggs (93.67) were deposited on 60 DAT in mustard oil with the treatment of 2.5ml/kg seed. These findings are in the conformation with the findings of Yadav (2001), Singhal *et al.* (1998) and Tripathi *et al.* (2007).

Summary:

Seed treated by neem oil with the treatment 5.5 ml/kg

seed was found most effective against egg deposition and mahua oil with the treatment 5.5 ml/kg seed was found most effective against pulse beetle orientation under free choice conditions. Mustard oil was found least effective in reducing the egg deposition and orientation of pulse beetle under free choice condition with the treatment 2.5 ml/kg seed.

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