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Effect of botanicals (oils) on green gram (*Vigna radiata* L. Wilczek) against *Callasobruchus maculatus* (Fab.)

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ABSTRACT

Efficacy of eight botanical oils viz; Castor (Ricinus communis L.), coconut (Cocos nucifera L.), groundnut (Arachis hypogea L.), Karanj (Pongamia glabra V.), linseed (Linum usitatissimum L.), mustard, (Brassica juncea L.), neem (Azadirachta indica A. Juss) and sesamum (Sesamum indicum L.) at two doses 1 ml and 0.5 ml per 100 g seeds (v/w) against Callosobruchus maculatus (f.) and their effect on seed viability and cooking quality of green gram Vigna radiata L. (Wilczek) seeds were studied. The results indicated that the effectiveness towards grain damage by C. maculatus, number of eggs per seed, holes per seed, loss in grain weight and total development period was in the order of neem oil > karanj oil > linseed oil > groundnut oil > mustard oil > sesamum oil > coconut oil > castor oil. All the oils were found to be more effective at higher does in comparison to 0.5 ml oil. The oil smearing did not influence the seed viability however it increased the percent of uncooked grains and also required more time for cooking.

Key words: Botanical oils, Green Gram seed, *Callasobruchus maculatus*

INTRODUCTION

Use of plant bioproducts became substitute of synthetic pesticides, protecting environment from pesticidal pollution [1 and2]. The efforts have been made by many workers, and the efficacies of botanicals have been found against most of the stored grain pests [3].Recently, an attempted has been made for developing and evaluating botanical insecticides in view of their relative safety to the environment [4]. Since, Pulses are the major source of protein and their storage is more difficult. Therefore, the present work has been undertaken to observe the efficacy of selected botanicals oils on green gram (*Vigna radiata* L. Wilczek) against *Callasobruchus maculatus* (Fab.) in order to protect the environment from hazardous effect of synthetic pesticides.

MATERIALS AND METHODS

Insect culture

The culture of *C. maculatus* was raised on the green gram in the laboratory and the removal and transfer of the culture were carried out by aspirator. Beetles emerged from these cultures were used in the experiment with in 24 hours. Saxes were distinguished on the basis of antennae and abdomen [5]. The following oils were taken for treatment

1. Groundnut oil
2. Mustard oil
3. Linseed, Karanj oil, Neem oil, Castar oil, Sesamum & Coconut oil.

The doses ranged from 0.01% w/v and 0.005% w/v ml/100 gm seed. The experiments were carried for different days such as 10 days, 60 days, 120 days, 180 days and 1 year.

RESULTS AND DISCUSSION

Smearing of green gram seeds with different oils *viz*; Groundnut, Mustard, Linseed, Karanj, Neem, Castar, Sesamum and Coconut in different doses were found to be superior to control, in reducing the survival and oviposition of *C. maculatus* (Linn.), seed damage and seed weight loss by the pest. Studies on extent of ovipositon were carried out by counting the total number of eggs laid on the seeds after 10 day, 60 days, 120 days, 180 days and 1 year on release of the insects. Higher doses (0.01% w/v) of almost all the treatments were fount to be more effective to prevent the oviposition than the lower doses (0.005% w/v) but higher doses of karanj and neem oil were found to be most effective, as both of them adversely influenced the ovipositional behaviour of *C. maculatus* since no oviposition was observed on the seeds.The data on the extent of oviposition by *C. maculatus* up to 10 days, 60 days, 120 days, 180 days and 1 year are summarized in Table–1. All the treatment was found to be superior over control.

No egg were observed on stored seeds smeared with higher doses of karanj oil and neem oil followed by lower doses of karanj oil, neem oil, higher doses of groundnut oil, linseed oil, sesamum oil, lower doses of groundnut oil, sesamum oil, higher doses of coconut oil, mustard oil, caster oil, lower doses of coconut oil, mustard oil and caster oil. No damage was observed in seeds smeared with eight different oils in two concentrations from 10 days to 1 year of storage. The insects did not survive in any of the treatment. Therefore, survival percentage could not be observed. Reduction in seed weight was also not observed in all the treatment.

Table -1: Influence of Botanical oils on bruchid *C. maculatus* oviposition on green gram seed

Botanical Oils	Dose	Extent of Oviposition				
		10 Days	60 Days	120 Days	180 Days	1 Year
Castor Oil	0.01 %	4.95	5.83	8.41	9.36	9.36
Castor Oil	0.005 %	11.52	12.25	21.54	23.62	23.62
Sesamum Oil	0.01 %	2.55	2.84	3.44	4.04	4.04
Sesamum Oil	0.005 %	3.15	3.56	4.65	6.58	6.58
Linseed Oil	0.01 %	0.81	1.82	2.45	2.54	2.54
Linseed Oil	0.005 %	1.46	2.31	2.72	3.43	3.43
Mustard Oil	0.01 %	4.60	5.62	7.23	8.74	8.74
Mustard Oil	0.005 %	6.51	9.78	13.41	14.44	14.44
Karanj Oil	0.01 %	0.0	0.0	0.0	0.0	0.0
Karanj Oil	0.005 %	0.03	0.32	0.32	0.61	0.61
Neem Oil	0.01 %	0.0	0.10	0.0	0.30	0.30
Neem Oil	0.005 %	0.37	0.64	0.71	0.86	0.86
Coconut Oil	0.01 %	4.20	5.32	6.38	8.11	8.11
Coconut Oil	0.005 %	5.17	6.06	9.16	9.70	9.70
Groundnut Oil	0.01 %	0.48	2.21	2.40	2.26	2.26
Groundnut Oil	0.005 %	2.60	3.46	4.51	6.31	6.31
Control		36.5	60.63	71.25	100	100

The result of the present study reveals that the selected botanical oils (*viz*; Groundnut, Mustard, Linseed, Karanj, Neem, Castar, Sesamum and Coconut in different doses) were found to be more effective than control in oviposition of *C. maculatus* (Linn), seed damage and seed weight loss by the pest. Whereas, it was found that the dose concentration of 10% was most effective and causes lowest damage to the grains of *Vigna radiata* and the damaged percentage of grains of *Vigna radiata* affected with *Callosobruchus chinensis* are directly related with concentration [6]. However, Jain *et al*. [7] have observed a significant decrease in egg laying by pulse beetle *Callosobruchus chinensis* (Coleoptera: Bruchidae) on *Tephrosia purpurea* (Fabaceae) by taking use of certain formulations in different experimental sets. Kardinan *et al*. [8] have reported that custard apple seed powder 1% (w/w) adversely affects the oviposition behaviour of C. analis on stored food.

However, Gupta *et al*. [9] observed the efficacy of six plant materials namely bhilawa (*Semecarpus anacardium* L.), black gram flour (*Vigna mungo* L.), custard apple seed powder (*Anona squamosa* L.), neem leaf powder (*Azadirachta indica* A. Juss.), neem seed kernel powder and tobacco leaf powder (*Nicotiana tobaccum*) at two doses 0.5 mg and 0.25 mg per 100 g seeds (w/w) against stored grain pest, *Callosobruchus maculatus* (Fab.) and noticed the effectiveness of grain damage by *C. maculatus* was in the order of custard apple > neem seed kernel > tobacco leaf > neem leaf > black gram flour > bhilawa. The different formulations viz., aqueous suspension, aqueous extract and ether extracts of 10, 5, 2.5 and 1% concentrations of various parts (root, stem, leaf, fruit) of *Solanum surratensa* were applied on egg laying activities of the pulse beetle *C. chinensis* (Linn.) and found the significant reduction in the oviposition (eggs laid per pair) of insects [10]. A complete prevention of egg laying by

C. analis have been noticed upon treatment with seed powder of custard apple, black pepper, leaves of mint until 60 days [11]. Begum and quiniones [12] found that coconut, soyabean, mustard or peanut oils applied to moong bean seeds infested with *Callasobruchus chinensis*, reduced their population number. Kumari *et al*. [13] evaluated the efficacy of mustard, Linseed, Til, Groundnut, Neem and Mahua oil as grain protectant against *Callosobruchus chinensis.* The results of the present investigation are also are in agreement with the findings of previous authors.

This study is helpful to store and protect the green gram from insecticidal activities of studied/related pest and thus become important from agricultural point of view to make the environment free from pesticide pollution and for betterment of human health.

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