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Environment friendly application of medicinal herb Nirgundi, *Vitex negundo* Linn. (Verbenaceae) as protectant of mung bean, *Vigna radiata* Linnaeus Wilczek management of pulse beetle, *Callosobruchus maculatus* Fabricius

Indrani Dubey and BS Chandel

Abstract
An laboratory experiment was conducted to test the insecticidal biopotency of verbanaceous leaves powder of *Vitex negundo* (Linn.) against pulse beetle, *Callosobruchus maculatus* Fabr. Infestation on Mungbean, *Vigna radiata* Linnaeus (Wilczek). Leaves powder of *Vitex negundo* (Linn.) as protectant of applied in different treatments after 30 days, 60 days and 90 days respectively. The data depicted from result obtained that the leaves powder of *Vitex negundo* when mixed with mungbean seeds at rate of 0.5 part, 1.0 part and 2.0 parts per 100 parts of *Vigna radiata* seeds(w/w), significantly protected them for at least 90 days by preventing the damage of mungbean seeds and checking build up of *Callosobruchus maculatus* Fabr. Population.

Keywords: *Vitex negundo*, *Callosobruchus maculatus* and mungbean¸ *Vigna radiata*

Introduction
Mungbean, *Vigna radiata* Linnaeus Wilczek belongs to the family of crops Fabaceae, genus *Vigna*. It is known as southern peas or moong or green gram and constitutes one of the most important food legumes in the tropics and sub-tropical countries [1]. It is a cheap source of protein and thus serves as sources of plant protein to low income farmers that cannot afford animal protein such as meat and fish [2].

Mungbean, *Vigna radiata* Linnaeus Wilczek is one of the most important pulse crops widely grown in Indian subcontinent. Mungbean contains significant role in human diet and famous for protein supplement in subtropical zones of the world. Mungbean is a short duration cash crop between two principle crops i.e. *Rabi* and kharif. *Vigna radiata* seeds contains 51.5% carbohydrate, 26.0% protein, 4.0% mineral, and 3.0% vitamins [3]. Besides providing protein in the diet, mungbean has the remarkable quality of helping the symbiotic root rhizobia to fix atmospheric nitrogen and hence to enrich soil fertility [21].

In spite of the best efforts for improving the mungbean varieties, the yield of this crop remains low. Several studies have been made to understand their performances which mainly include the contribution of various yield components towards yield [5-7].

Normally synthetic insecticides are used to control the infestation of this noxious insect pest under storage condition but they are hazardous to human being in manufacturing, handling and causing environmental pollution and residual toxicity [8, 9]. So that, there is need to search for alternative of synthetic chemical insecticide using plant materials as biopesticide to control *Callosobruchus maculatus* (F.) (Coleoptera: Bruchidae) [10-12]. Objective of this Research work is to look in to the successes of the use of naturally occurring indigenous ecofriendly *Vitex negundo* (Linn.) leaves powder being cheap and safe for its protective characteristics of *Mungbean* against pulse beetles to control the infestation of *Callosobruchus maculatus* (F.) specially in the Indian sub continent where cowpea is cultivated and consumed [13, 14].

Materials and Methods
Leaves of nirgundo, *Vitex negundo* (Linn.) were collected, dried in shade and powder made in an ordinary domestic grinder and passed through a 30-mesh-sieve. The obtained powder was used as undiluted dust for mixing with mungbean, *Vigna radiata* Linnaeus Wilczek seeds at

the rate of 0.5, 1.0 and 2.0 parts per 100 parts of seeds (w/w). After adding the powder, the seeds were well mixed to ensure through mixing. Fifty grams of treated mung bean seeds were kept in glass jars and 3 replications of the treatments were maintained. Control of untreated mung bean seeds was also kept simultaneously. Initially 20 adults pulse beetles of were introduced in each jar and mouth was covered with muslin cloth. The jars were kept in a temperature controlled room at 27 ± 2 ºC. Observation on damaged *Moong* seeds and population of adult beetles in each jar was taken periodically. After each observation, a fresh batch of 20 adult beetles was introduced in each jar. After the final observation the data were statistically analyzed.

Table 1: Mean mung bean, *Vigna radiata* damage per cent due to *C. maculatus* infestation different concentrations, periods irrespective *Vitex negundo* treatment

Treatment	Extractive	Conc.	30days	60 days	90 days	Mean damage%
T^4	*V. negundo*	0.5	1.25	4.80	4.80	19.37
T^3	*V. negundo*	1.0	0.00	0.44	0.44	4.80
T^2	*V. negundo*	2.0	0.04	0.04	0.04	0.04
T^1	Control	Untreated	3.80	54.24	54.24	89.35
* SE= 4.801, CD at 5%= 1.748						

TBV=Transform Back Values

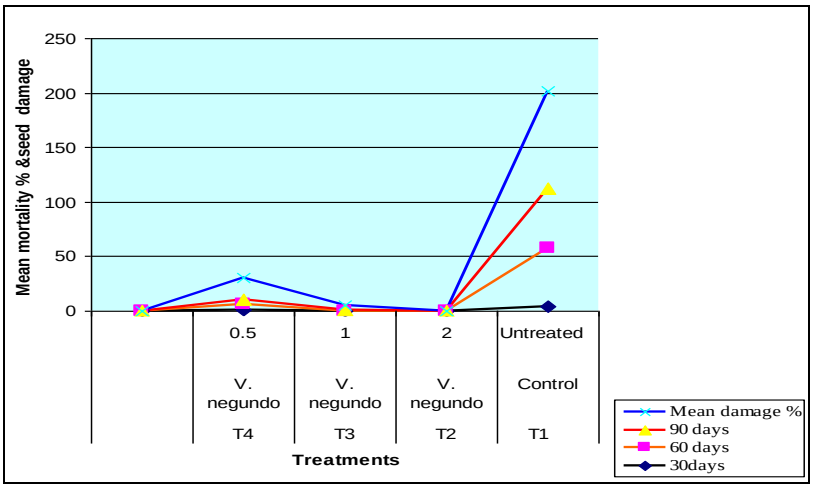

Fig 1: Meaan moong, *Vigna radiata* damage per cent due to *C. maculatus* infestation different concentrations, periods irrespective *Vitex negundo* treatment

Table 2: Mean percentage of mung bean damage by per cent during different concentrations, periods irrespective *Vitex negundo* treatment

Treatment	Conc.	Mean damage after 90 days	Angular values	Mean% of TBV
V. negundo- T^4	0.5	19.37	19..37	11.00
V. negundo- T^3	1.0	4.80	7.87	1.90
V. negundo- T^2	2.0	0.04	1.07	0.04
Control- T^1	Untreated	89.35	71.13	69.50
* SE= 4.801, CD at 5%= 1.748				

TBV=Transform Back Values

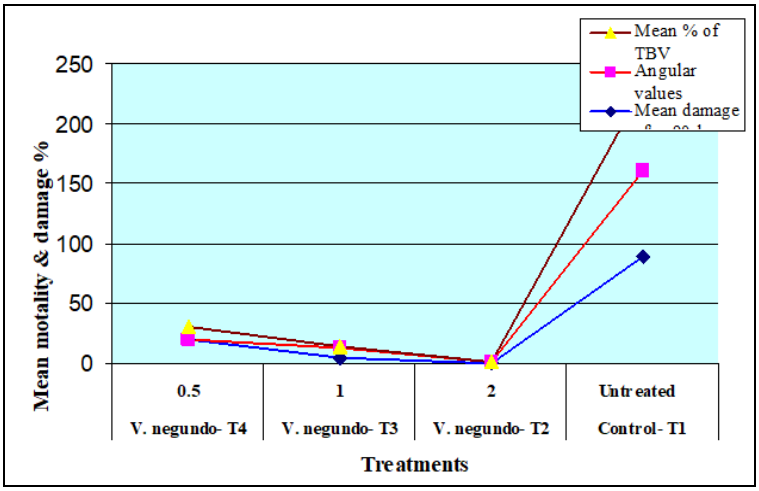

Fig 2: Mean moong, *Vigna radiata*, damage per cent due to bruchid infestation different concentrations, after 90 days irrespective *Vitex negundo* treatment with control

Results and Discussions

1. Mean percentage of damaged mungbean, *Vigna radiata* Linnaeus Wilczek

The percentage of damaged seed in each replication of the different treatments was calculated by finding out the number of mung bean seeds damaged in 50 gm. (mean number of seeds in 50 gm. was 1527). The damage observed at different intervals after treatments (0.5 part, 1.0 part and 2.0 parts per 100 parts of *Vigna radiata* seeds (w/w), is given in Table Table 1, 2 and Figure 1&2, respectively.

2. Mean adult Population of *Callosobruchus maculatus* Fabricius:

The mean adult population in each treatment was calculated by finding out the number of adult beetles, *Callosobruchus maculatus* in each replication. The mean adult population observed and recorded at different intervals (30, 60 and 90 days). The data in Table 3 and 4 and Figure 3and 4 shows that *C. maculatus* adult population increased in all the treatments with the advancement of time. The data on the mean adult population during the final observation were stastically analyzed after subjecting the values to log-transformation and the results are presented in Table 3 and 4.

Table 3: Mean mortality per cent of *C. maculatus* different concentrations of *Vitex negundo* treatment after 90 days

Extractive	Conc.	30days	60 days	90 days	Mean damage%
V. negundo- T^4	0.5	19.67	73.33	187.67	2.151
V. negundo- T^3	1.0	00.00	7.00	34.67	0.492
V. negundo- T^2	2.0	0.67	0.67	1.33	3.135
Control- T^1	UT	58.00	8.61	1366.00	71.13
* SE= 4.801, CD at 5%= 0.884					

TBV=Transform Back Values

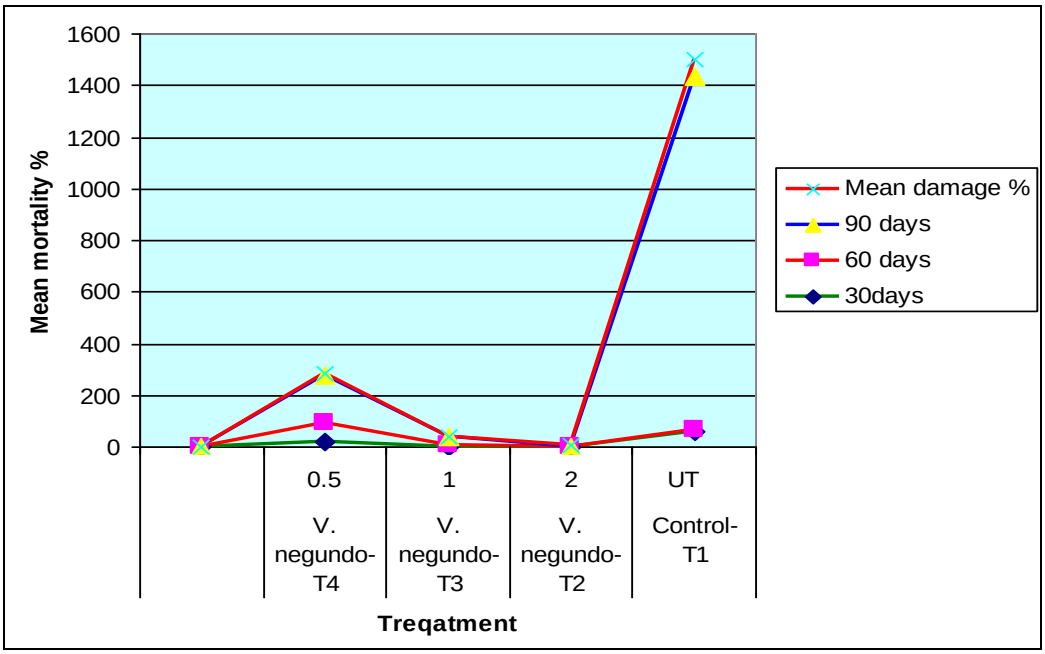

Fig 3: Mean mortality per cent of *C. maculatus* different concentrations of *Vitex negundo* treatment after 90 days

Table 4: Mean mortality per cent of *C. maculatus* different concentrations of *Vitex negundo* treatment after 90 days

Treatment	Conc.	Mean damage after 90 days	Angular values	T.B. Value%
V. negundo- T^4	0.5	2.151	141.60	2.151
V. negundo- T^3	1.0	1.362	23.01	1.362
V. negundo- T^2	2.0	0.492	3.135	0.492
Control- T^1	Untreated	3.135	1368.00	3.135
* SE= 4.801, CD at 5%= 0.884				

TBV=Transform Back Values

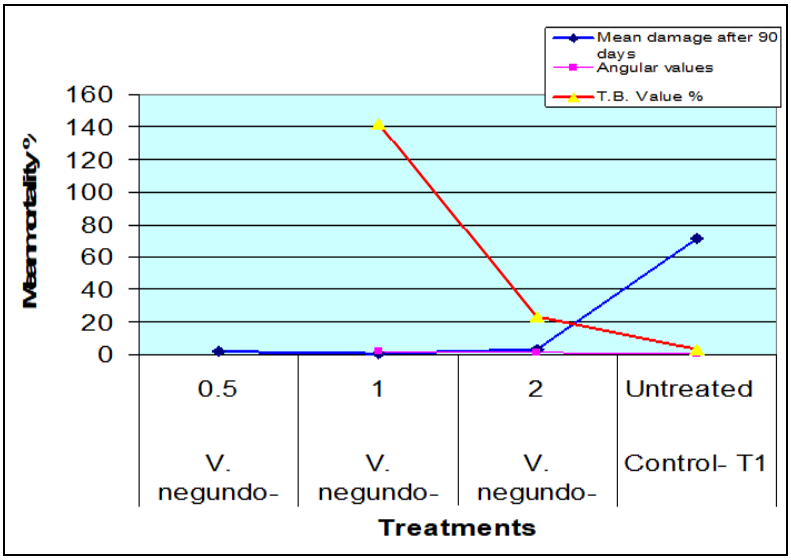

Table 4: Mean mortality per cent of C. maculatus different concentrations of *Vitex negundo* treatment after 90 days

It is clear from the above table that the average percentage of damaged Mungbean seeds increased progressively with the advancement in time which indicates loss in the insecticidal properties of *Vitex negundo* leaves powder due to ageing. The maximum damage, while the damage in treated seeds was found to be significantly related to the amount of *Vitex negundo* leaves powder mixed with them. The data depicted from results that it is clear from the above table that treatment T_2 was significantly superior to T_4 and T_1 resulting in least damage to the *Mungbean* seeds but the difference was non-significant between T_2 and T_3 treatments.

It is observed from the above analysis that the treatment T_2 differs significantly from treatment T_4 and T_1 but non-significant difference is recorded in-between T_2 and T_3 regarding adult population. Maximum number of adults was produced in treatment T_1, followed by T_4, T_3 and T_2 in that order. Thus the results obtained it can be concluded that both on the basis of insect damage and adult population, the *Vitex negundo* leaves powder when mixed with mung bean seeds at the rate of 0.5-2.0 parts per 100 parts of seed, protects them against *C. maculatus* at least for 100 days. It has been reported that the seeds of mungbean, Bengal gram, cowpea and pigeonpea could be effectively protected from the damage of *Callosobruchus maculatus* Fabr. For 237, 336, 288 and 282 days, respectively, by mixing the seeds with crushed neem seed at the rate 1-2 parts per 100 parts of seed (w/w)[2].

The result obtained in the present investigation to be conformity with those reported on insecticidal properties of certain plant materials against their targeted insect-pest. (Kannathasan *et al.* 2008, En-shun *et al.* 2009, Rahuman *et al.* 2009, Sahayaraj *et al.* 2011) By the present study, one can find that *Vitex negundo* leaves powder and extract and other naturally occurring plant extractives has also found qualifying for use against storage pests [15-18].

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