Indian Journal of Entomology, 81(4): 000-000 (2019) DoI No.:

PRE-HARVEST AND STORAGE TREATMENT OF BOTANICALS ON *CALLOSOBRUCHUS CHINENSIS* (L.) IN BLACK GRAM

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ABSTRACT

Field trials were conducted at the Agricultural College and Research Institute, Madurai, Tamil Nadu in black gram with pre-harvest treatment of botanicals on the carryover of pulse beetle *Callosobruchus chinensis* (L.). It was observed that the application of *Vitex* leaf Extract 10%, *Pongamia* oil 2% and *Madhuca* oil 2% had reduced the incidence. The same treatments in storage, revealed that maximum protection was obtained with neem oil 1%, NSK powder 1% and neem leaf powder 2% followed by *Madhuca longifolia* oil 1%, *Vitex negundo* leaf powder 2% and *Pongamia glabra* oil 1% as grain treatment as shown by reduced oviposition, adult emergence and damage.

Key words: Black gram, *Callosobruchus chinensis*, pre-harvest, storage, *Vitex*, *Pongamia*, *Madhuca*, neem oil, leaf powder, NSK powder, oviposition, emergence, damage

Storage of the grains and seeds is very important in agriculture mainly for food security. Among various biotic and abiotic factors which determine fate of grains during storage, insect pests are important as they cause significant loss. In India, storage losses to various food grain commodities have been estimated 2.5% due to insect pests alone. Pulses stored in godowns, warehouses and farmer's holdings are attacked mainly by pulse beetle, *Callosobruchus chinensis* (L.). Among the pulses, the highest damage (79.59%) caused by *C. chinensis* was reported in green gram followed by black gram (59.30%) (Muhamad, 2007). The damage generally starts on matured pods in the field from where it is carried over to storage godowns. Storage pest management is mostly dependent on synthetic insecticide (Azad et al., 2013). But due to problems of residues, pest resurgence, environmental and ecological hazards and resistance, botanicals can provide an ecologically safe alternative. (Singh, 2011; Kausar et al., 2017). Hence, the present study to evaluate some botanicals like neem oil, leaf extracts of *Vitex, Pongamia* and *Madhuca*

MATERIALS AND METHODS

Black gram variety MDU 1 (Madurai 1) was raised in the field with routine package of practices. Before the harvesting the pods, botanical treatments such as azadirachtin 3000, 5000 and 10000 ppm, 10% leaf extracts of *Calotropis* and *Vitex negundo* and 2% oil suspension of *Pongamia glabra* and *Madhuca longifolia*, cashew nut shell liquid 5% and malathion 5D @25 kg/ha (treated check) were imposed. The incidence of *C. chinensis* was observed from 10 pods picked 60 days after sowing in each treatment. Besides the harvested pods were shelled and observed for adult emergence until the cessation of emergence of first-generation. For the storage studies freshly harvested 100 g black gram grains were treated with the same set of treatments replicated thrice in completely randomized design. For the progeny development study, ten insects were released in each replication and on fifteenth day the adults were removed. After seven days, 20 seeds from each treatment were observed for oviposition. After 45 days adult emergence and damage were observed and % damage calculated.

RESULTS AND DISCUSSION

The results reveal that azadirachtin 10000 ppm, Vitex leaf extract 10%, Pongamia oil 2% and Madhuca oil 2% were found equally effective similar to malathion 5D @ 25 kg/ha. The plots sprayed with *Calotropis* 10 % leaf extract, cashew nut shell liquid 3%, azadirachtin 3000 and 5000 ppm registered 1.33, 0.67, 0.67 and 0.33% incidence, respectively at maturity/ before harvest. In storage, maximum emergence of bruchids was observed with Calotropis leaf extract 10% (3.33) followed by cashew nut shell liquid 5% (2.66), while it was less (1.33) in Vitex leaf extract 10% and Madhuca oil 2% (Table 1). These findings on the effectiveness of preharvest spray are in agreement with those of Patil

Table 1. Effect of pre-harvest on field infestation, and post harvest treatment in storage (*C. chinensis*, black gram)

Treatment	Adults emerged from 10 pods (60 DAS)	Adults emerged from 25 g of shelled grain	Treatment	Eggs laid/ 20 seeds*	No. adults/ 100g seed*	Damage (%)**
T1- Azadirachtin 3000 ppm	0.67 (0.99)	2.33 (1.52)	T1- Neem oil 1%	4.67 (2.16) [f]	8.33 (2.87) [d]	2.33 (8.75) [e]
T2- Azadirachtin 5000 ppm	0.33 (0.87)	2.0 (1.382)	T2- NSK powder 1%	5.67 (2.37) [ef]	14.33 (3.78) [d]	2.67 (9.36) [e]
T3- Azadirachtin 10000 ppm	0 (0.70)	1.66 (1.0)	T3- Neem leaf powder 2%	6.33 (2.51) [ef]	18.0 (4.23) [d]	3.67 (11.02) [de]
T4- *Calotropis* LE 10%	1.33 (1.26)	3.33 (1.794)	T4- *Calotropis* leaf powder 2%	14.33 (3.74) [bd]	86.67 (9.27) [b]	10.33 (18.72) [b]
T5- *Vitex negundo* LE 10%	0 (0.70)	1.33 (1.138)	T5- *Vitex negundo* leaf powder 2%	8.67 (2.90) [de]	60.33 (7.73) [bc]	6.33 (14.51) [c]
T6- *Pongamia glabra* oil 2%	0 (0.70)	1.66 (1.276)	T6- *Pongamia glabra* 1% oil	9.33 (3.04) [cd]	52.00 (7.19) [c]	5.33 (13.29) [cd]
T7- *Madhuca longifolia* oil 2%	0 (0.70)	1.33 (1.138)	T7- *Madhuca longifolia* oil 1%	7.33 (2.69) [cd]	45.00 [c] (6.69)	4.67 [cd] (12.42)
T8- Cashew nut shell liquid 5%	0.67 (0.99)	2.66 (1.609)	T8- Cashew nut shell liquid 3%	13.00 (3.59) [bc]	55.00 (7.38) [c]	7.00 (15.32) [c]
T9- Malathion 5D @ 25 kg/ha	0 (0.70)	0 (0.70)	T9- Malathion 5D	0.00 (0.00) [g]	0.00 (0.00) [e]	0.00 (0.00) [f]
T10- Control	2.0 (1.55)	4.0 (1.989)	T10- Control	32.33 (5.66) [a]	25.00 (15.71) [a]	22.33 (28.08) [a]
SEd	0.23	0.33	SEd	0.32	0.78	1.41
CD @ 5%	0.48	0.70	CD @ 5%	0.66	1.63	2.95

*Figures in parentheses square root transformed values; ** arcsine transformed values; Values in column followed by same alphabets do not differ significantly by LSD (p=0.05)

et al. (2009) and Biranda (2001). Neem oil 1% (4.67 eggs/20 seeds) gave maximum protection, followed by NSK powder 1% (5.67 eggs/ 20 seeds) and neem leaf powder (6.33 eggs/20 seeds). There was no adult emergence in malathion 5D. These results corroborate with those on the ovicidal effect of botanicals (Sreekanth et al., 2011, Shivanna et al., 1994). The adults emerged in the neem oil 1%, NSK powder 1% and neem leaf powder 2% were 8.33, 14.33, 18.0, respectively/ 100 g of seeds. Sandhya Rani et al. (2000) observed that botanical coatings would probably interfere with the respiratory mechanism and thus effective.

After a storage period of three months, neem oil 1% and NSK powder 1% were found to be effective with less damage (2.33 and 2.67%, respectively); these were on par with neem leaf powder 2% (3.67%) followed by Madhuca 1% oil (4.67%) and Pongamia 1% oil (5.33%). The effectiveness of neem 2% on oviposition and adult emergence of *C. maculatus* in black gram is known (Govindhan et al., 2009). The present findings were also supported by Tripathi et al. (2006) and Varma and Anandhi (2010), on the effect of neem leaf powder in red gram and green gram seeds. Hasan et al. (2012) also indicated that maximum adult mortality was recorded in neem leaf powder. Choudhary (2012) reported that neem and eucalyptus powders recorded more adult mortality in stored cowpea and soybean. Devi and Devi (2013) reported that neem leaf powder as the most effective. Suthar and Bharpoda (2016) reported that neem leaf, garlic bulb and eucalyptus leaf recorded more than 32 % adult mortality of *C. chinensis* in stored black gram.

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(Manuscript Received: June, 2019; Revised: November, 2019;
Accepted: November, 2019; Online Published: November, 2019)