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EFFICACY OF DIFFERENT BOTANICALS AGAINST *CARYEDON SERRATUS* (OLIVER) IN STORED GROUNDNUT

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ABSTRACT

The present investigation was carried out to evaluate the efficacy of some botanicals as grain protectant against *Caryedon serratus* (Oliver) in stored groundnut at Prayagraj during 2019 to 2020. Seven botanicals viz., Neem oil, castor oil, neem leaf powder, turmeric rhizome powder, lantana leaf powder, mint leaf powder, tulsi leaf powder were evaluated as compared to control on the basis of adult mortality (%), number of adult emergence and weight loss (%) in stored groundnut. The results showed that neem oil was more effective followed by castor oil, neem leaf powder.

Key words: *Caryedon serratus*, groundnut kernels, botanicals, grain protectant, neem oil, castor oil, neem leaf powder, turmeric rhizome powder, lantana leaf powder, mint leaf powder, tulsi leaf powder

Groundnut (*Arachis hypogaea* L.) is an important leguminacious crop and has several names like Peanut or Monkey nut. It is native to South America and widely grown in tropical and subtropical regions of the world. In India, it is majorly cultivated as oil seed crop as well as food legume crop. Groundnut kernels are a cheap source of proteins to man (Alabi et al., 2003). It contains 45-50% oil and 25% protein and 75 to 80% fatty acids (Sakhare et al., 2018).

Groundnut is stored as pods and kernels form in India and both forms are susceptible to insect pest attack in storage. Many storage pests damage the pods and reduce the quality. Among them groundnut bruchid*, C. serratus* is one of the major pests and widely spread in various groundnut growing areas of the world (Rekha, 2015, Sakhare et al., 2018) cause 20-50% loss in stored groundnut (Alabi et al., 2003). In 1914, *C. serratus* was first reported to be infesting groundnut in India (Fletcher, 1914).

The larvae of *C. serratus* bore into the seeds and feed on the embryo and endosperm. Final instar comes out for pupation through exit holes. Insect infestation causes considerable quantitative and qualitative losses to groundnut either in stored seeds (milling purpose) or pods (seed purpose).

C. serratus infestation causes loss in dry mass of the kernels, increased levels of free fatty acids in the oil (thereby lowering the quality) and reduction in germination potential (Howe, 1965 and Sakhare et al., 2018). Higher pod damage (%) was recorded in oil mills whereas lowest in cold storage units (Manjunath et al., 2018).

The protection of stored products by the use of plant materials is common practice among farmers. Repellent, antifeeding and insecticidal substances have been identified in a large variety of plant species (Green, 1959). Azadirachtin, a component of *Azadirachta indica* and *Melia azadirachta* L. (Meliaceae), is presently considered as a promising alternative to synthetic insecticides and is currently under investigation in several developing countries. Keeping in view, this experiment was aimed to evaluate the efficacy of botanicals on groundnut bruchid.

MATERIALS AND METHODS

The experiment was conducted in the Plant Protection Laboratory of Sam Higginbottom University of Agriculture, Technology and Sciences (SHUATS), Prayagraj, U.P. during 2019 to 2020. The treatments used for the study are castor seed oil (10%), neem seed oil (10%), lantana leaf powder (2.5%), mint leaf powder (5%), neem leaf powder (2.5%), tulsi leaf powder (5%) and turmeric powder (2.5%).

The botanical samples were prepared from fresh green leaves of neem (*Azadirachta indica*), lantana (*Lantana camera*), mint (*Mentha spicata*), and ocimum (*Ocimum sanctum*) were collected and shade dried. Leaves were made into powder with the help of electric

Table 1. Efficacy of botanicals on groundnut bruchid, *C. serratus*

Treatments	Adult Mortality (%)			Number of adult emergence			Weight loss (%)		
	3 DAT	7 DAT	10 DAT	30 DAT	60 DAT	90 DAT	30 DAT	60 DAT	90 DAT
Castor oil (T1)	60.00 (50.75)*	80.00 (63.41)	100.00 (90.00)	3.33 (10.49)	11.33 (19.66)	24.00 (29.32)	3.00 (9.87)	6.00 (14.17)	9.67 (18.09)
Neem oil (T2)	90.00 (71.54)	100.00 (90.00)	100.00 (90.00)	2.00 (8.13)	6.00 (14.14)	12.33 (20.53)	1.67 (7.33)	3.67 (11.01)	9.67 (18.09)
Lantana leaf powder (T3)	40.00 (39.21)	80.00 (63.41)	90.00 (71.54)	13.67 (21.68)	16.33 (23.82)	37.67 (37.84)	12.33 (20.54)	18.33 (25.34)	26.33 (30.86)
Mint leaf powder (T4)	10.00 (18.43)	20.00 (26.55)	36.67 (37.21)	14.33 (22.24)	16.00 (23.56)	39.67 (39.02)	14.00 (21.96)	21.33 (27.49)	30.33 (33.40)
Neem leaf powder (T5)	50.00 (44.98)	70.00 (56.76)	90.00 (71.53)	5.33 (13.33)	18.67 (25.58)	29.33 (32.77)	5.33 (13.33)	9.67 (18.08)	15.67 (23.29)
Tulsi leaf powder (T6)	13.33 (21.13)	20.00 (26.55)	20.00 (26.55)	15.67 (23.31)	30.00 (33.19)	33.67 (35.45)	15.67 (23.30)	24.33 (29.54)	34.33 (35.85)
Turmeric rhizome powder (T7)	50.00 (44.98)	63.33 (52.75)	86.67 (68.83)	9.33 (17.77)	22.33 (28.18)	42.33 (40.57)	9.33 (17.77)	16.33 (23.82)	19.67 (26.31)
Control (T8)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	18.33 (25.34)	35.67 (36.65)	46.33 (42.88)	17.33 (24.58)	26.67 (31.07)	37.67 (37.84)
SE(m)	1.18	1.18	1.67	0.31	0.60	0.92	0.50	0.43	0.60
C.D. (0.05)	3.53	3.53	4.99	0.93	1.80	2.76	1.49	1.27	1.80

Figures in parenthesis are arcsine transformed value

grinder and passed through mesh to obtain fine powder of uniform particle size and kept in an airtight container. Turmeric rhizome powder (*Curcuma longa*), neem oil (*Azadirachta indica*) and castor oil (*Ricinus communis*) were procured from the local market.

Mass culturing of *Caryedon serratus* was carried out by obtaining stock culture from the Regional Agricultural Research Station, Tirupati. Locally available groundnut variety was used for culturing the bruchids. The pods were disinfected by placing them in the deep freezer (- 51 ºC for two days). Ten pairs of one to two days old adult beetles were collected from stock culture and released into the plastic container (20 x 10 cm) containing 150 g of groundnut pods. The mouth of the container was closed with muslin cloth and tightened with rubber bands to provide aeration. Ten such containers were maintained for rearing the groundnut bruchids. Sub culturing was done at regular intervals for continuous supply of fresh adults for the experiment. The culture was maintained at 28± 2 ºC and 65± 5% relative humidity.

For mixing the plant powders and oils, 100 g of pods were placed in a plastic jar. Desired doses of powder were added to each jar and mixed well with pods. For mixing the oils, the solution was prepared in acetone for better effectiveness and mixed well. Simultaneously, untreated control was also placed and the treatments were replicated thrice. Five pairs of newly emerged adults were released into each jar for taking the observations on adult mortality, adult emergence and weight loss.

The adult mortality (%) was recorded at 3, 7 and 10 days after treatment. The data were subjected to standard protocol (Abbot, 1925). The adult emergence was worked out on the basis of number of eggs laid and number of adults emerged after completion of life cycle. The weight loss was recorded after the end of the experiment. Before weighing, all insect stages and frass were removed. The weight loss was calculated by subtracting the final weight from the initial weight and converted into percentage.

The experiment was conducted by following completely randomized block design with three replications. The data were transformed and analyzed by using ICAR WASP 2.0 software.

RESULTS AND DISCUSSION

Adult mortality

The adult mortality of *C. serratus* from pods treated with different plant powders and oils showed significant difference as compared to control. The mortality of released adults was recorded at the third, seventh and tenth day after treatment. The mortality of released adults was recorded highest in treatments which are treated with neem oil (90 & 100%) followed by castor

oil (60, 80 & 100%), whereas the lowest adult mortality was recorded with tulasi leaves powder (13, 20 & 20%).

Number of adult emergences

The adult emergence of *C. serratus* from pods treated with different plant powders and oils showed significant difference as compared to control. The number of adult emergences was recorded at 30, 60 and 90 days after treatment. The results showed that neem oil was most effective in which minimum adult emergence (2, 6 & 12) occurred and remained significantly superior to over rest of the treatments. The next effective treatment was castor oil (3, 11 & 24), followed by neem leaf powder (5.33, 18.67 & 29.33). The maximum adult emergence was recorded with the treatment of tulasi leaf powder (15.67, 30.00 & 33.67) as compared to control.

Weight loss

The weight loss of groundnut pods was recorded at 30, 60 and 90 days after treatment. Comparing the results obtained from various plant powders and oils, it was found that neem oil proved most effective in which minimum weight loss (3, 6 & 9.67%) remained significantly superior over rest of the treatments. Maximum weight loss with tulasi leaf powder (15.67, 24.33 and 34.33).

The present results revealed that adult mortality of *C. serratus* was observed on 3, 7 and 10 day after treatment maximum with neem oil (90 & 100%, respectively) followed by castor oil, neem leaf powder. The results are similar with the findings of Ejoka and Ogah, (2020) on neem oil. Rashmi et al. (2014) also reported that neem oil, castor oil and mentha oil were effective against pulse beetle. Egwurube et al. (2010) obtained 100% mortality with neem seed powder. Also, results are similar with the findings of Patta (2003), Harish et al., (2014), Pravasini et al., (2016) and Kumar et al., (2017), Sharma et al., (2017), Belay et al., (2017), Sreedhar et al., (2020).

The minimum adult emergence of bruchids from pods at 30, 60 and 90 days after treatment was observed in case of neem oil followed by castor oil. Similar results were found by Ejoka and Ogah (2020), Jilu et al., (2018). Neem leaf powder and lantana leaf powder observations were similar with Tripathy et al., (2004), Egwurube et al., (2010), Aguoru et al., (2015), Sagarka et al., (2017). The present results were also similar with Harish et al., (2014) and Pravasini et al., (2016).

The minimum weight loss of groundnut pods was recorded at 30, 60 and 90 days after treatment was recorded in case of neem oil followed by castor oil. The findings were similar with the observation of Ejoka and Ogah (2020) and maximum weight loss was observed with tulasi leaf powder. The findings were similar with the results of Harish et al., (2014), Okweche (2016), Sharma et al., (2017).

Neem oil was the most effective treatment in reducing the adult mortality, number of adult emergence, and weight loss in the pods followed by castor oil, neem leaf powder, lantana leaf powder. Tulsi leaf powder was found ineffective in the management of groundnut bruchid.

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