Biological Forum – An International Journal **(SI-AAEBSSD-2021) 13(3b): 190-191(2021)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Efficacy of essential oils on groundnut bruchid *Caryedon serratus* (Oliver)

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(Received 01 July 2021, Accepted 01 October, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Groundnut bruchid *Caryedon serratus* (Oliver) is the major insect pest of concern as it attacks and damages the pods and kernals in stored conditions. To manage storage grain insect pest mostly inorganic pesticides are being used which causes deleterious effect on humans. Hence, an experiment was conducted to test the bio-efficacy of some safe and eco-friendly essential oils against groundnut bruchid under laboratory conditions. Highest adult bruchid mortality of 90% was recorded from neem seed oil 10% followed by neem seed oil 5% (83.33%). These were followed by pongamia seed oil 10% (80%), castor seed oil 10% (75%), pongamia seed seed oil 5% (73.33%) and castor seed oil 5% (65%). Therefore, an eco-friendly approach like use of essential oils like neem oil may be encouraged to manage the groundnut bruchid in storage conditions.

Keywords: Groundnut, *Caryedon serratus*, essential oils, per cent mortality.

INTRODUCTION

Groundnut is the major oilseed crop grown in Anantapur district of Andhra Pradesh state, India. In India of the total oilseeds, groundnut alone was cultivated in 78.65 % area during 2018-19. The area under this crop was 7.48 lakh hectares and the productivity was 617 kgs/ha in 2018-19 (Directorate of Economics and Statistics, 2018). In India, groundnut is stored as both pods and kernels that are infested by groundnut bruchid, *Caryedon serratus* Olivier (Bruchidae: Coleoptera). Groundnut bruchid consume both kernals and pods, which affects the quality of the produce. Oaya *et al*., (2012) reported groundnut bruchid causes 70 and 80% damage (weight loss) in shelled and unshelled groundnut. It was documented that damage ranges up to 70-80% in harvested stored groundnut (Harish *et al*., 2012). Besides bruchid direct damage to groundnut in storage, pods were contaminated with body prats, excreta that produces stinky smell (Manjunath *et al.*, 2018) and increases the aflatoxin content in the stored groundnut (Vijayasamundeswari *et al*., 2009).

Human being, poultry and livestock were effected considerably due to aflatoxins contamination in the stored groundnut (Chaytor *et al*., 2011). Aluminium phosphide is generally used a grain preservative for management of the bruchid in the storage (Harish *et al*., 2012). Abder-Rahman (1999) reported that exposure to the Aluminium phosphide could cause serious effects on the lungs, hearts and blood vessels. Hence, groundnut is often consumed directly usage of an inorganic insecticides must be regulated. Therefore, usage of biorationals should be encouraged in storage grain insect pest. A wide range of plants possess deterrent, antifeedant, repellant and insecticidal properties naturally and, for thatreasonplants and their products were exploited in storage pest control from decades across the worldwide (Tripathy *et al*, 2004; Mishra and Dash 2009). In this context an experiment was conducted to observe the bio-efficacy of essential oils against groundnut bruchid.

MATERIALS AND METHODS

A lab experiment was conducted at Agricultural Research Station, Kadiri, Acharya N G Ranga Agricultural University to know the relative efficacy of different essential oils against groundnut bruchid, *Caryedon serratus* on groundnut pods. Castor, Pongamia and Neem essential oils at 5 and 10 per cent concentrations were tested. Each concentration of essential oils was imposed on 100 pods to observe the efficacy. This experiment consists of nine treatments namely T1-Neem oil 5%, T2 - Pongamia seed oil 5%, T3 - Castor seed oil 5%, T4 -Neem seed oil 10%, T5 - Spinosad 0.3 ml/kg seed, T6 - Pongamia seed oil 10%, T7 - Castor seed oil 10%, T8 - Spinosad 0.6 ml/kg seed and T9 – water (negative control). Spinosad 45SC used as a positive control. The treatments were replicated thrice and entire experiment was conducted at room temperature. The fourth generation of laboratory reared bruchid population was used for experiment purpose. Tenbruchid adults were released into the container after imposing the treatments to the pods. The container was covered with muslin cloth and tied with the rubber band. Observations on adult bruchid mortality were recorded at 2^{nd}, 4^{th} and 6^{th}day after releasing adult bruchids. Data on per cent mortality was determined using the formula, per cent mortality (%) = Number of dead bruchids/total number of bruchids released X 100. This experiment was conducted in two episodes and presented pooled data in the results.

RESULTS AND DISCUSSION

Efficacy of different essential oils along with Spinosad 45 SC revealed that among nine treatments, Spinosad 45 SC (0.6 ml/kg seed) has provided numerically significant and highest mean bruchid mortality (91.67%),which was on par with other treatments

like neem oil 10% (90.00%), Spinosad 45 SC 0.3 ml/kg seed (86.67%) and neem oil 5% (83.33%) application. These were followed by pongamia seed oil 10% (80.00%), castor seed oil 10% (75.00%), pongamia seed oil 5% (73.33%) and castor seed oil 5% (65.00%). No adult bruchid mortality was noticed in case of (untreated pods) control (Table 1).

Table 1: Mean per cent adult mortality of *Caryedon serratus* (adults) on groundnut pods treated with different essential oils.

	Treatment	2 DAS	4 DAS	6 DAS	Mean
T1	**Neem seed oil 5%**	43.33 (41.15)	21.67 (27.73)	18.33 (25.34)	83.33 (31.41)
T2	**Pongamia seed oil 5%**	31.67 (34.23)	31.67 (34.23)	10.00 (18.43)	73.33 928.96)
T3	**Castor seed oil 5%**	35.00 (36.26)	18.33 (25.34)	11.67 (19.96)	65.00 (27.19)
T4	**Neem seed oil 10%**	70.00 (56.77)	13.33 (21.41)	6.67 (14.96)	90.00 (31.04)
T5	**Spinosad 0.3 ml / kg seed**	63.33 (52.71)	16.67 (24.09)	6.67 (14.96)	86.67 (30.58)
T6	**Pongamia seed oil 10%**	53.33 (46.89)	16.67 (24.09)	10.00 (18.43)	80.00 (29.80)
T7	**Castor seed oil 10%**	41.67 (40.19)	20.00 (26.55)	13.33 (21.41)	75.00 (29.35)
T8	**Spinosad 0.6 ml / kg seed**	48.33 (44.03)	25.00 (29.99)	18.33 (25.34)	91.67 (33.12)
T9	**Control (Untreated)**	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
SEm (±)		2.27	1.46	1.25	8.32
CD at p = 0.05		6.80	4.38	3.75	11.47
C.V %		10.08	10.72	12.34	6.71

Our experiment showed neem oil 10% treatment resulted in 90.00% adult bruchid mortality, these results were supported by Harish *et al*., (2012) findings, where neem oil 10% showed highest bruchid mortality and also resulted in lowest bruchid oviposition (2.3 eggs per 100 g of groundnut pods). Moreover, lowest groundnut pod damage was reported from neem oil treatment (Manjula, 2003; Char, 2008) and reduced emergence of bruchids was reported in groundnut treated with essential oils (Sundria, 2003; Tripathi, 2004; and Char, 2008). Ram and Gopal (2000) found 100% mortality of *Callasobruchus maculates* in lentil two days after neem oil treatment. The high lipophilic nature of essential oils allows them to penetrate into the insect cuticle (Abdullahi *et al*., 2011). However, essential oils cause mortality on all the insect stages, hence their usage is very often in storage insect pest management (Adedire, 2000).

CONCLUSION

Plants and their products possess vide variety of properties and bio-efficacy nature on insects and stored pests. The present experiment showed that neem seed oil 10% treatment resulted in 90% adult bruchid population in groundnut followed by neem seed oil 5% and pongamia seed oil 10% treatments.

FUTURE SCOPE

The present experiment results open a new avenue in the management of the storage grain pest in the groundnut. The present findings may encourage the usage of the essential oils by discontinuing the existed inorganic chemical practice in storage grain pest management.

Acknowledgement. Authors are thankful to the Acharya NG Ranga Agricultural University, Andhra Pradesh, India for providing facilities to conduct the experiment.

Conflict of Interest. None.

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