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EFFECT OF NEEM AND PUNGAM OIL AGAISNT THE BIOLOGY OF *SPODOPTERA LITURA*

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Abstract

Among the neem and pungam oil tested against biology of *Spodoptera litura* larvae, highest mortality of *Spodoptera litura* larvae were recorded in pungam oil 2% (55.55%) followed by neem oil 3% (44.44%) and pungam oil 2% (44.44%). Highest pupation was recorded in pungam oil 1% (88.89%) followed by neem oil 2% (66.66%). Highest pupicidal activity was recorded in neem oil 3% (80.00%). Lowest adult emergence percentage was recorded in neem oil 3%. From the above results it was clear that pungam oil was found in causing mortality of *Spodoptera litura* at 2% and lowest adult emergence percentage also recorded in pungam oil.

Key words: Pungam oil, neem oil, *Spodoptera litura,* biology.

Introduction

Tobacco cutworm, *Spodoptera litura* (Noctuidae: Lepidoptera), is an important lepidopterous, noctuid, polyphagous and multivoltine pest. It has worldwide distribution and cosmopolitan in food habits, feeding on the plants of economic importance. The larva of *S. litura* has been reported to feed on 112 cultivated crops all over the world affecting all stages of the crop. The pest had developed resistance against all groups of insecticides (Kranthi *et al*., 2002). Botanical pesticides are one of the important components in Integrated Pest Management (IPM) in managing the insect population. Among the botanicals, neem and pungam products are promising in the management of insect population. The malformation and mortality is referred as the dose-dependent in the insect feeding on the neem treated hosts due to various developmental, post-embryonic, reproductive and growth inhibitory effects (Ascher, 1993). Essential oils (EO) from plants may be an alternative source of *S. litura* third in star larvae control. It is because they are the rich source of bioactive compounds that are safe for human health and the environment. Neem oil is known to be active over 400 insect pests. It varies in colour from golden yellow, reddish brown, dark brown, greenish brown or bright red. The compounds present in the neem oil are reported as strong antifeedants and growth inhibitors against lepidopteran larvae (Koul *et al*., 2004). Kumar and Kalidhar, 2003 reported that pungam oil consists of higher proportions of mono-unsaturated fatty acids (46%) and polyunsaturated fatty acids (33%) and was found effective against insect pests of stored grains, field and plantation crops. Juices from the plant, as well as oil are antiseptic and resistant to pests. The oil has high content of triglycerides and bitter flavanoids including karangin, pongamol, tannin and karanjochromene. Krishnaveni *et al.*, 2013 reported that pungam oil at larval mortality from 49.79% to 79.79%. Based on the above literatures, study was conducted in the Department of Entomology, Annamalai University to know the effect of pungam and neem oil against the biology of *Spodoptera litura.*

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Materials and Methods

Egg masses of *Spodoptera litura* were collected from groundnut field at Sivapuri near Cuddalore District of Tamil Nadu. The eggs were surface sterilized with 0.02% sodium hypochlorite solution, dried and allowed to hatch. After hatching, the neonate larvae were reared on leaves of castor *Ricinus communis*, till pre-pupal stage and sterilized soil was provided for pupation. After pupation, the pupae were collected from soil and placed inside the oviposition champers (40 × 25 × 25 cm). After adult emergence, cotton soaked with 10% (w/v) sugar solution with few drops of multivitamins was provided

for adult feeding to increase the fecundity. Potted groundnut plant was kept inside adult emergence cage for egg laying. After hatching the larvae were provided tender castor leaf for feeding. These laboratory reared larvae were used for bioassay, at room temperature (27 ± 2°C) with 14-10 light: dark photoperiod and 75 ± 5% relative humidity (Baskar *et al*., 2011).

The experimental materials Neem oil and Pongam oil were brought from an oil dealer in Chidambaram. Three different concentrations (1, 2 and 3%) were prepared for both neem and pungam oil by using distilled water mixed with an emulsifier (tween 20) stirred at 120 rpm for 10 minutes to remove the dust and allowed to evaporate. The experiment was replicated at three times. A leaf disc assay method was followed to evaluate the biology of *S. litura* using oils of neem and pungam. The control was maintained with the leaves dipped in distilled water. The observations such as larval mortality, pupation, pupicidal and adult emergence from the treatments were made at 24, 48, 72 hours after treatment (Musabyimana *et al*., 2001).

Results and Discussion

Among the different concentrations of neem oil tested against biology of *Spodoptera litura*, highest mortality of larvae was recorded in 3% (44.44%) followed by 2% (33.33%) and 1% (33.33%) where as highest pupation (66.66%) and pupicidal (80.00%) were observed in 3%. Highest adult emergence was observed in 1% (66.67%) followed by 2% (50%) and 3% (25%). Among the different concentrations of pungam oil tested against biology of *Spodoptera litura*. Highest mortality of larvae was recorded in 2% (55.55%) followed by 3% (44.44%) and 1% (11.11%) where as highest pupation was observed in 1% (88.89%) followed 3% (55.55%) and 2% (44.44%). Highest pupicidal activity was observed in 3% (60.00%) followed by 1% (37.5%) and 2% (25%). Highest adult emergence was observed in 1% (62.5%) followed by 2% (50%) and 3% (40.00%).

Table 1: Effect of neem and pungam oil against the biology of *Spodoptera litura.*

S. No.	Treatments	Larval mortality (%)	Pupation (%)	Pupicidal (%)	Adult emergence (%)
1.	Neem oil 1%	33.33 (35.26)^{c}	66.66 (54.73)^{c}	33.33 (35.06)^{e}	66.67 (54.74)^{b}
2.	Neem oil 2%	33.33 (35.26)^{c}	66.66 (54.73)^{c}	50.00 (45.00)^{c}	50.00 (45.00)^{d}
3.	Neem oil 3%	44.44 (41.81)^{b}	55.55 (48.20)^{d}	80.00 (68.54)^{a}	25.00 (30.00)^{f}
4.	Pungam oil 1%	11.11 (19.47)^{d}	88.89 (70.72)^{b}	37.50 (37.76)^{d}	62.50 (52.25)^{c}
5.	Pungam oil 2%	55.55 (48.20)^{a}	44.44 (41.80)^{e}	25.00 (30.00)^{f}	50.00 (45.00)^{d}
6.	Pungam oil 3%	44.44 (41.81)^{b}	55.55 (48.20)^{d}	60.00 (50.77)^{b}	40.00 (39.23)^{e}
7.	Control	0 (1.65)^{e}	100.00 (88.35)^{a}	0 (1.66)^{g}	100.00 (89.72)^{a}
	SEd	0.627	1.41	1.22	0.774
CD (0.05)		1.345	3.02	2.61	1.66

Values in parenthesis are arc sine transformed
Values with different alphabets differ significantly according to LSD

Among the neem and pungam oil, highest mortality of *Spodoptera litura* larvae were recorded in pungam oil 2% (55.55%) followed by neem oil 3% (44.44%) and pungam oil 2% (44.44%). Highest pupation was recorded in pungam oil 1% (88.89%) followed by neem oil 2% (66.66%). Highest pupicidal activity was recorded in neem oil 3% (80.00%). Lowest adult emergence percentage was recorded in neem oil 3%. From the above results it was clear that pungam oil was found in causing mortality of *Spodoptera litura* at 2% and lowest adult emergence percentage also recorded in pungam oil. Based on the above findings, it was concluded that pungam oil was found better in suppressing the larva when compared to neem oil.

Similar results were found when Shannag *et al*., 2015 evaluated pure neem oil and Azatrol and at high concentrations observed 20 and 13.3% larval mortality of *Spodoptera eredania* and Bushra *et al*., 2014 proved that mortality of *Sitobion avenae* and *Rhopalosiphum padi* was (77.56%) and (77.88%) at 3% concentration of neem oil whereas turmeric oil exhibited mortality of *S. avenae* was maximum (90.58%) and *R. padi* (90.38%) at 3% concentration.

Adriana Yatie Mikami and Maurício Ursi Ventura, 2008 proved that higher mortality of 100% was observed in higher dosage (1%) and 93% in the lower concentration (0.25%) of neem oil against *Microtheca punctigera*. Kumari *et al*., 2017 evaluated neem oil with 2g of other botanicals showed mortality of 80% at 250 and 300 ppm and the least mortality of 20% at 50 ppm against Khapra beetle. Khattak *et al*., 2006 showed neem oil at 2% reduced 33.7% thrips, 42.31% against whitefly and 37.89% against jassid population when observed at 24 hours after spray.

Radhika and Sahayaraj, 2016 reported that pungam oil at 0.3% caused less mortality of 64.2% when compared to 80% mortality caused by monocrotophos against *Dysdercus cingulatus*. Pavela, 2009 proved that pongam oil alone at 1.5% caused 71% mortality against the larva of *Plutella xylostella* when observed at 12 days in contrast to the combined form of other botanicals.

Baskera and Srivastava, 2011 found that karanj oil and Jatropha oil at 1% caused the mortality of only 15% when compared to other insecticide formulations of Cypermethrin, Lamdacyhalothrin and Alphamethrin when evaluated against *Spodoptera litura*.

Our results also coincided with Krishnaveni *et al*., 2013 who also reported that pongam oil was more effective with the mortality of 49.79% to 79.79% with median lethal concentrations (LC50) ranging from 38.74% to 31.83% followed by neem gold (44.59% to 69.79%) with the (LC50) value of 40.65% to 35.92%. Packiam *et al*., 2013 studied that neem oil and pungam oil caused toxic effect of 22.93 and 25.40% at 5µ/L against fourth instar larvae of *Helicoverpa armigera*.

Results of our experiment clearly indicated that the active principles such as karanjin and azadirachtin presented in pungam and neem inhibiting larval feeding and may have effect on larval mortality, pupation percentage, pupal mortality and adult emergence percentage.

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