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ANTI-FEEDING ACTIVITY OF *NEEM SEED* KERNEL EXTRACT AND OIL ON *SPODOPTERA LITURA* (FABRICIUS) INFESTING SOYBEAN

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ABSTRACT

A laboratory experiment was carried out to evaluate the anti-feeding activity of NSKE (5%) and *Azadirachta indica* oil (0.3%) on tobacco caterpillar, *Spodoptera litura* infesting different soybean varieties viz., MAUS-81, JS-335, RKS-24, JS-95-60, RKS-45, MAUS-47, RKS-113 and MAUS-61. NSKE (5%) showed relatively more pronounced anti-feeding activity ranging from 68.64 to 97.51 per cent as compared to that for *Azadirachta indica* oil (0.3%) ranging from 22.61 to 85.95 per cent. No adult moths emerged from the treatments conducted on varieties RKS-45 and MAUS-61, which may be due to anti-feeding activity coupled with the varietal influence.

Key words: Soybean, anti-feeding, *Azadirachta indica*, *Spodoptera litura*

INTRODUCTION

Soybean is a major oilseed crop of Rajasthan cultivated in 1.175 lac hectares with an annual production of 974.6 thousand tones and productivity of 829 kg/ha. India ranks fourth in the world with respect to area under soybean and fifth in production (Annual Report, 2012). During the year 2014-15, soybean occupied an area of 10.83 million hectares with a production of 10.43 million tons and 959 kg ha^{-1} productivity. The cultivated area in Rajasthan was 0.68 million hectares and the production was 0.56 million tons during *kharif* 2014 (SOPA, 2014). Jayappa *et al* (2002) reported nine caterpillars of Lepidoptera as pests on soybean at different stages of growth: *Thysanoplusia orichalcea* (Fabricius), *Spodoptera litura* (Fabricius), *Helicoverpa armigera* (Hubner), *Amsacta lactinea* (Hampson), *Spilosoma obliqua* (Walker), *Chrysodeixis* sp., *Achaea janata* (Linnaeus), *Aproaerema modicella* (Deventer) and *Lamprosema indicata* Fabricius [*Omiodes indicata* (Fabricius)].

With a view to minimize the negative effects of synthetic pesticides, integrated pest management has been advocated with an emphasis on cultural methods of pest management. Improving plant resistance is one of the more important IPM techniques as it has good prospects to decrease the dependence on pesticide applications in agro-ecosystems (Robinson *et al*., 1991; Webster *et al*., 1991; Li *et al*., 2004). Soybean varieties also vary in morphological characteristics and secondary metabolites that can influence the survival, development and fecundity of herbivorous insects including foliage feeding Lepidoptera. It has been possible to identify soybean genotypes with resistance/ tolerance to a location-specific pest complex and good yield potential. Keeping in view the above facts and with a view to evaluate the anti-feeding activity of NSKE (5%) and *A. indica* oil (0.3%) on the major foliage-feeding Lepidoptera" the present study was carried out.

MATERIAL AND METHODS

A laboratory experiment was conducted in the Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur to evaluate the anti-feeding activity NSKE (5%) and *Azadirachta indica* oil (0.3%) against tobacco caterpillar, *Spodoptera litura* (Fabricius) infesting different soybean varieties *viz.*, MAUS-81, JS-335, RKS-24, JS-95-60, RKS-45, MAUS-47, RKS-113 and MAUS-61. The experiment was laid out in a CRD. The leaf disc no-choice bioassay method was followed wherein leaf discs of soybean (varieties recommended for the zone) given above was treated with *A. indica* oil and seed kernel extract separately. Known area of fresh soybean leaf discs was dipped in the aqueous solutions. After evaporation of water at room temperature, the leaf disc was kept in individual petri plate (10 cm diameter). In each petri plate a single pre-starved second instar larva of the tobacco caterpillar was introduced; likewise, the larva was allowed to feed on treated discs for twenty four hours. The leaf discs dipped in RO water served as the control. At the end of the experiment, unconsumed area of leaf disc was measured

with the aid of a cm-graph paper and per cent anti-feeding activity was calculated based on the method suggested by Singh and Pant (1980). The data were subjected to ANOVA. Larval mortality as well as adult wing span of the emerged adults was also recorded.

$$\text{Anti-feeding activity}(\%) = \frac{\text{Leaf discconsumed in control-Leaf discconsum edintreated}}{\text{Leaf discconsumed in control+Leaf consumed in treated}} \times 100$$

RESULT AND DISCUSSION

A perusal of the Table 1 showing the impact of feeding *A. indica* seed kernel extract (5%) and oil (0.3%) treated soybean leaves of different varieties indicates that the mean consumption of neem oil treated leaves was more (369 mm) than that for neem seed kernel extract (139 mm) indicating stronger anti-feeding activity of neem seed kernel extract. The corresponding mean per cent anti-feeding activity was more for neem seed kernel extract ranging from 68.64 to 97.51 per cent; while that for neem oil ranged from 22.61 to 85.95 per cent. The wing span of adult moths that emerged after the treatments was also measured that varied on account of the soybean variety as well as the neem anti-feeding treatments, ranging from 13.00 to 17.00 mm for neem seed kernel treatment on different varieties and from 13.30 to 16.00 mm for neem oil treatment on different varieties of soybean; however, it may also be noted that no adult moths emerged from the treatments conducted on varieties RKS-45 and MAUS-61. The anti-feeding activity coupled with the variety could possibly have resulted into no adult moth emergence after the treatments on these two varieties; however, precise investigation is required to draw conclusions, as to whether it was a result of the *A. indica* treatments, a varietal influence or both.

Previous workers have reported that feeding with the *neem* treated foliage even for a day caused significant pupal mortality. Continuous feeding of leaves treated with NSKE and *neem* oil caused complete mortality of *A. albistriga* in five days. The continuous feeding of *S. litura* with NSKE treated foliage gave complete mortality in seven days, while the *neem* oil formulations took nine days. Larval, pupal mortality and larval-pupal intermediates were formed due to feeding on *neem* formulation treated leaves (Ayyasami, 2009). Chaudhary and Srivastava (2007) observed that among the *neem*-based products, application of *neem* seed kernel extract (NSKE) at 5 per cent + *neem* leaf extract (NLE) at 10 per cent reduced the maximum larval population (51.59%). However, the ICBR showed that the application of NSKE at 5 per cent (2.44) proved economically most viable amongst the *neem*-based treatments, followed by NLE at 5 per cent (2.20). Murugan *et al.* (1999) reported that upon combining NPV with *neem* products, the percentage mortality was enhanced three-fold even at reduced concentrations. NSKE and NO significantly inhibited the growth and development of *S. litura*, and extended the duration of the larval and pupal stages. The oviposition period, adult longevity and fecundity were significantly reduced following treatment with *neem* products and with a *neem* + NPV treatment. The efficiencies of conversion of ingested food (ECI) and digested food (ECD) were also significantly decreased by treatment with NSKE, NO and NPV, either alone or in combination.

Table 1. Anti-feeding activity of *neem* on tobacco caterpillar infesting some soybean varieties

Soybean Varieties	Mean leaf area (mm) consumed in treatments		Anti-feeding Activity (%)		Wing span (mm)	
	NSKE	NO	NSKE	NO	NSKE	NO
	(5%)	(0.3%)	(5%)	(0.3%)	(5%)	(0.3%)
MAUS-81	26	288	96.22	64.83	14.00	15.50
JS-335	251	150	68.64	80.00	15.30	15.30
RKS-24	160	852	78.80	22.61	13.00	16.00
JS-95-60	175	102	77.04	85.95	14.00	13.90
RKS-45	98	146	86.46	18.48	--	--
MAUS-47	237	698	70.13	31.83	15.00	13.30
RKS-113	151	410	79.88	53.40	17.00	15.00
MAUS-61	17	307	97.51	62.94	--	--
Mean for varieties	139	369				
S. D. (+)	87.31	273.23				

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