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Host plant preference of army worm (*Spodoptera litura*) on crops and weeds

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ABSTRACT

A study was conducted to determine the preference and host range of a polyphagous lepidopteron, *Spodoptera litura*, collected during a search for biocontrol agent of *Trianthema portulacastrum* L. Culture of *S. litura* was maintained on *T. portulacastrum* leaves at 26 ±2 ^{0}C and 70 ±5% RH. The experiment was done using 10 days old larvae of *S. litura* obtained from the laboratory reared nuclears culture. Forty five plant species of crops and weeds belonging to 21 families were used for host preference study. In each replication, 10 larvae were placed on bouquet of various crop and weed plants in well aerated large size containers (2x3x2 ft). Out of the 45 crop and weed plants tested, larvae of *S. litura* showed high, moderate, low and nil preference for 15, 12, 7 and 9 plant species, respectively. Among the crop plants, maximum preference was observed on *Lycopersicon esculentum* Mill., *Spinacea oleracea* L., *Brassica oleracea* L. var. *capitata* and *Trifolium alexandrium* L. Among the 25 weed plants tested, high feeding preference was observed on *Alternanthera philoxeroides* Mart., *Euphorbia hirta* L., *Eichhornia crassipes* Mart., *Trianthema portulacastrum* L., *Parthenium hysterophorus* L., *Cichorium intybus* L., *Rumex obtusifolius* L. *Chenopodium album* L., and *Ipomoea fistulosa* Mart.

Army worm (*Spodoptera litura* Fabricius Lepidoptera: Noctuidae) is a notorious leaf feeding insect of more than one hundred plants around the Asia-Pacific region. It is considered as one of the most destructive insect pests in the region because of its high reproductive rate and heavy losses to crops. Larvae feed gregariously on plant leaves and later eat almost every plant part. The behavior of moving like army from one field to another gave its local name as armyworm in Indo-Pak region (Ahmad *et al.* 2007). Large host range has been considered significant for better chance to survive (Lee *et al.* 2003). Host selection may be associated with primary as well as secondary metabolites present in the plants, which help them to choose preferred hosts due to nutritional variation. Difference in quality or quantity of a satisfactory diet can have a intense effect on insect development (Awmack and Leather 2002). The acceptance of plant species by any insect depends on the specific interaction between host and insect, which includes feeding, digestion and efficiency of conversion of plant biomass into insect biomass. Such quantitative aspect of insect nutrition has been studied by several authors to understand host preference of several insects. Reese (1979) stated that those insects species feeding on less quality food face nutritional hurdles in obtaining sufficient energy. Several authors have studied growth, development and host range of *S. litura* on crop plants (Sharma 1994). However, there are many weed species which act as alternate host to number of insect pests. *Trianthema portulacastrum* is one such a weed on which *S. litura* has been found to feed vigorously. Not much work has been done on weed hosts of this insect. Therefore, a study was undertaken to determine host preference of *S. litura* on weeds along with its crop hosts.

The present study was undertaken during the rainy season of 2008-2009 at ICAR-Directorate of Weed Research, Jabalpur, Madhya Pradesh. A culture of *S. litura* was maintained on *T. portulacastrum* leaves at 26 ±2 ^{0}C temperature and 70 ± 5% relative humidity. The adults were reared in well aerated plastic jars and were provided with *T. portulacastrum* twigs in form of bouquet for egg laying. Cotton swabs soaked in 10% sucrose solution was kept for adult feeding in each jars. The experiment was done using larvae of *S. litura* obtained after the egg laying

from the adults in the rearing jars. Forty five plant species of crop and weed species belonging to 21 families were used for host preference study. Ten larvae were placed on each host plants in well aerated containers. All the experiments were replicated thrice. Fresh food material was provided daily until pupation of larvae. The uneaten food along with the fecal matter was removed regularly. The feeding preference was visually monitored and scores were assigned as no feeding (-), low feeding (+), moderate feeding (++) and high feeding (+++).

Weed preference

Among 45 plant species of crops and weeds studied, *S. litura* fed on all the plants except *Oryza sativa* L., *Centrella asiatica* L., *Caesulia axillaris* L., *Sonchus arvensis* L., *Convolvulus arvensis* L., *Cyperus iria* L., *Cynodon dactylon* L., *Sida acuta* Burm. F. and *Lantana camara* L. (**Table 1**). Among the crop plants, maximum feeding was observed on *Lycopersicon esculentum* Mill., *Spinacea oleracea* L., *Chenopodium album* L., *Brassica oleracea* L. var. *capitata* and *Trifolium alexandrium* L. Among the 25

Table 1. Feeding preference of *S. litura* on crop and weed hosts

Common name	Vernacular name in Hindi	Botanical name in English	Family	Plant status	Feeding preference*
Alligator weed	Pani-khutura	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae	Weed	+++
Sessile joyweed	Kantewali santhi	*Alternanthera sessilis* L.	Amaranthaceae	Weed	++
Amaranth	Chaulai	*Amaranthus viridis* L.	Amaranthaceae	Cultivated	++
Cauliflower	Phool gobhi	*B. oleracea* L. *var. botrytis*	Brassicaceae	Cultivated	+++
Cabbage	Bandha gobhi	*B. oleracea* L. *var. capitata*	Brassicaceae	Cultivated	+++
False oxtongue	Kukurbanda	*Blumea lacera* DC	Asteraceae	Weed	++
Para grass	-	*Brachiaria mutica* (Forsk.) Stapf.	Gramineae	Weed	++
Rai	Sarson	*Brassica campestris* L. *var sarson*	Brassicaceae	Cultivated	+
Ghrilla	Balonda	*Caesulia axillaris* Robx.	Asteraceae	Weed	-
Pigeon Pea	Arhar	*Cajanus cajan* L.	Fabaceae	Cultivated	+++
Asian pennywort	Brahmi	*Centella asiatica* L.	Apiaceae	Medicinal	-
Goosefoot	Bathua	*Chenopodium album* L.	Chenopodiaceae	Cultivated	+++
Gram	Chana	*Cicer arietinum* L.	Fabaceae	Cultivated	++
Chickory	Kasani	*Cichorium intybus* L.	Asteraceae	Weed	+++
Tropical Spiderwort	Kanteri	*Commelina benghalensis* L.	Commelinaceae	Weed	++
Bindweed	Hiran chara	*Convolvulus arvensis* L.	Convolvulaceae	Weed	-
Podrush	Bagnatho	*Corchorus aestuans* L.	Tiliaceae	Weed	+
Bermuda grass	Dubh	*Cynodon dactylon* L.	Gramineae	Weed	-
Rice foot sedge	Galmotha	*Cyperus iria* L.	Cyperaceae	Weed	-
Waterhyacinth	Jal kumbhi	*Eichhornia crassipes* (Mart.) Solms	Pontederiaceae	Weed	+++
Asthma weed	Dudhi	*Euphorbia hirta* L.	Euphorbiaceae	Weed	+++
Soybean	Soyabean	*Glycine max* L.	Fabaceae	Cultivated	++
Pignut	Wilayati tulsi	*Hyptis suaveolens* L. Point.	Lamiaceae	Weed	+
Morning Glory	Beshram	*Ipomoea fistulosa* Mart.	Convolvulaceae	Weed	+++
Lantana	Makoiya	*Lantana camara* L.	Verbenaceae	Weed	-
Lentil	Masoor	*Lens esculenta* Moench	Fabaceae	Cultivated	++
Linseed	Alsi	*Linum usitatissimum* L.	Linaceae	Cultivated	+
Tomato	Tamaatar	*Lycopersicon esculentum* Mill.	Solanaceae	Cultivated	+++
Medick	-	*Medicago polymorpha* L.	Fabaceae	Weed	+
Paddy	Dhan	*Oryza sativa* L.	Gramineae	Cultivated	-
Carrot grass	Gajar ghas	*Parthenium hysterophorus* L.	Asteraceae	Weed	+++
Wild gooseberry	Pachkotta	*Physalis minima* L.	Solanaceae	Weed	++
Water lettuce	-	*Pistia stratiotes* L.	Araceae	Weed	++
Pea	Matar	*Pisum sativum* L.	Fabaceae	Cultivated	+
Broad-leaved dock	Jungli palak	*Rumex obtusifolius* L.	Polygonaceae	Weed	+++
Common wire weed	Kareta	*Sida acuta* Burm. f.	Malvaceae	Weed	-
Perennial sowthistle	Bhatkataiya	*Sonchus arvensis* L.	Asteraceae	Weed	-
Spinach	Palak	*Spinacia oleracea* L.	Chenopodiaceae	Cultivated	+++
Marigold	Genda	*Tagetes erecta* L.	Asteraceae	Ornamental	+
Horse-purslane	Patharchata	*Trianthema portulacastrum* L.	Aizoaceae	Weed	+++
Coat buttons	Phulani	*Tridax procumbens* L.	Asteraceae	Weed	++
Egyptian clove	Barseem	*Trifolium alexandrium* L.	Fabaceae	fodder	+++
Wheat	Gehoon	*Triticum aestivum* L.	Gramineae	Cultivated	++
Mung bean	Moong	*Vigna radiata* L.	Fabaceae	Cultivated	+
Maize, Corn	Bhutta	*Zea mays* L.	Gramineae	Cultivated	++

*Feeding preference: no feeding (-), low feeding (+), moderate feeding (++), high feeding (+++).

weed plants tested, high feeding was observed on *Alternanthera philoxeroides* Mart., *Euphorbia hirta* L., *Eichhornia crassipes* Mart., *Trianthema portulacastrum* L., *Parthenium hysterophorus* L., *Cichorium intybus* L., *Rumex obtusifolius* L. and *Ipomoea fistulosa* Mart (**Table 1**).

S. litura showed preference towards wide range of hosts plants from no feeding to high voracious feeding. Mandal and Mandal (2000) also reported feeding preference and life cycle of *S. litura* on different crop and weed plant species. They reported good feeding of *S. litura* on *Ricinus communis*, *Solanum nigrum*, *Ipomoea aquatica*, *Amaranthus viridis*, tomato, tobacco, mulberry, brinjal and cabbage. In our experiment, *S. litura* did not feed on *Cynadon dactylon* while Jamjanya and Quinsenberry (1988) reported feeding of *S. litura* on some genotypes of *C. dactylon*. Sushilkumar and Ray (2007) reported high consumption of leaves of eight weed species out of 24 weed plants, among which *Triaanthema portulasactrum, Rumex obtusifolius* and *Cichorium intybus* emerged the best food plant for fast development of *S. litura*. Though the insect is a major crop pest, yet it plays an important role in natural biological control of several noxious weeds. Ahmad *et al.* (2013) during their survey in the cotton belt in Pakistan revealed 27 plant species as host plants of *S. litura* belonging to 25 genera of 14 families including cultivated crops, vegetables, weeds, fruits and ornamental plants. Major host plants on which it thrived for maximum period were *Gossypium hirsutum Ricinus communis*, *Brassica oleracea* var. *botrytis*, *Colocasia esculenta*, *Trianthema portulacastrum* and *Sesbania sesban.*

Survival and feeding of *S. litura* on major weed and crop species necessitates its regular monitoring for its population build-up and for early warning for its management on commercial crops. Preference of this insect pest towards different weed species reflects that though weeds act as alternate hosts for the insects and give chances of their enhanced survival, yet they play important role in suppression of weeds naturally in the field.

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