

Feeding Preference of *Spodoptera exigua* (Lepidoptera: Noctuidae) on Various Host Plants

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ABSTRACT *Spodoptera exigua* larvae show feeding preference among the tested host plants. Host plant was the main factor for feeding preference, while larval age and time of exposure were not. However, a combination of both host plant and larval age factors also showed a significant difference in feeding preference. The hierarchy of feeding preference shown in the choice test of three host plants was reflected in the choice test of five host plants. The same sequence of cabbage, shallot and chilly was found in both choice tests. This study has shown that the *S. exigua* larvae prefer to feed on cabbage leaf compared to shallot, chilly, long beans and lady's finger.

ABSTRAK Larva *Spodoptera exigua* menunjukkan kecenderungan memilih makanan di antara tanaman hos yang diuji. Tanaman hos didapati sebagai faktor utama untuk kecenderungan memilih makanan, manakala umur larva dan masa pendedahan tidak. Bagaimanapun, kombinasi faktor tanaman hos dan umur larva juga memberi kesan yang signifikan terhadap kecenderungan memilih makanan. Hierarki kecenderungan memilih makanan dalam ujian tiga hos pilihan juga ditunjukkan dalam ujian lima hos pilihan. Turutan yang sama antara kobis, bawang dan cili diperolehi dalam kedua-dua ujian tersebut. Kajian ini menunjukkan larva *S. exigua* lebih cenderung makan daun kobis berbanding dengan daun bawang, cili, kacang panjang dan bendi.

(*Spodoptera exigua*, feeding, host plant)

INTRODUCTION

Spodoptera exigua (Hübner) is known to feed on more than 50 plant species from over 10 families worldwide [1, 2]. Being a phytophagous and polyphagous insect, it may eat any part of a plant and occur on a much greater variety of plants which are not necessarily taxonomically or chemically related. There is not much local information available in the literature on the feeding preference of the *S. exigua* larvae on the host plant except by Idris and Emelia [3]. Hence, this study was conducted to determine whether there is host plant preference for feeding.

MATERIALS AND METHODS

Choice test of three host plants

Feeding tests were done under laboratory conditions with mean temperature of 25.7°C and

relative humidity of 70.4%, measured using a thermohygrograph (Dickson THDx-CE). Fresh young leaves collected from the Institute of Biological Sciences' garden and cleaned before they were used in the experiment, as food to twenty larvae each of second to third instars and fourth to fifth instars.

Three choices of host plant, cabbage (*Brassica oleracea* var *capitata*, KK cross), shallot (*Allium cepa* var Indian Rose) and chilly (*Capsicum frutescens*) leaves were placed at different corners of a plastic container [30 cm (L) x 24 cm (W) x 10 cm (H)] and at the same distance from the releasing point of the larvae. Twenty larvae were placed at the centre of the container, closed with a lid with mesh wire [18 cm (L) x 11.5 cm (W)] for aeration and were given 30 minutes for dispersal. The number of larvae on each leaves were recorded after that 30 minutes and the

experiment was continued for another 30 minutes. After the second 30 minutes, the number of larvae that feed on each leaves were recorded. This experiment was divided into two groups i.e. second to third instars and fourth to fifth instars. Each experiment was repeated 10 times.

Choice test of five host plants

This experiment was repeated using five choices of host plant i.e. cabbage (*Brassica oleracea* var *capitata*, KK cross), shallot (*Allium cepa* var Indian Rose), chilly (*Capsicum frutescens*), long beans (*Vigna unguiculata*) and lady's finger (*Abelmoschus esculenta*). All of the experiment procedures are as explained in the choice test of three host plants.

Data Analysis

A factorial ANOVA (STATISTICA 6.0; StatSoft Inc., 1984 - 2001) was performed to detect effects of host plant on feeding preference of *S. exigua* larvae. When significant F values were obtained, means were separated using Duncan's multiple range test. Data for number of larvae on three and five host plants were square-root transformed before being analyzed further. These transformations were made in order to homogenize the variance.

RESULTS

In the choice test of three host plants, there was a significant difference ($F = 63.25$; $df = 3,144$; $P < 0.05$) in the number of larvae feeding among treatments (Table 1). Host plant was found to be the main factor for feeding preference, while larval age and time of exposure were not. However, a combination of both host plant and larval age factors also gave a significant difference in feeding preference. In this interaction, the result is the same as in the host plant. It was found that the number of larva feeding on cabbage leaf was higher ($F = 7.82$; $df = 3,144$; $P < 0.05$) compared to the other leaves. This indicates that both groups of the larvae (i.e. 2nd - 3rd and 4th - 5th instars) preferred to feed on cabbage leaf compared to the other leaves (Table 1). While a number of both 2nd - 3rd and 4th - 5th instars larvae, and 4th - 5th instars larvae were found to feed on shallot and chilly leaves respectively after cabbage (Table 1). Concomitantly, a small number of 2nd - 3rd instars larvae were found to feed on chilly (Table 1). Nevertheless, there were also some larvae who

were not feeding on any leaves (i.e. wandering around in the plastic container).

In the choice test of five host plants, there was a significant difference ($F = 17.872$; $df = 5,216$; $P < 0.05$) between treatments (Table 2). Similar to the three choice test, host plant was still the main factor and a combination of both host plant and larval age factors also resulted in a significant difference in feeding preference (Table 3). The number of 2nd - 3rd instars larvae feeding on cabbage leaf is higher ($P < 0.05$) than chilly, shallot, long beans and lady's finger leaves (Table 3). While for the 4th - 5th instars larvae, the number of larva fed on the cabbage leaf is higher ($P < 0.05$) than the shallot, long beans and lady's finger leaves but not significantly different from chilly (Table 3). There was significant difference in the number of larvae wandering around in the plastic container between 2nd - 3rd and 4th - 5th instars larvae (Table 3). It was found that the younger larva seems to be confused in choosing their host preference for feeding (Table 3). This indicates that many choices of food may affect their olfactory. However, the older larva shows that they know to choose their food plant since not many larvae left wandering around.

DISCUSSION

Generally, the hierarchy of feeding preference shown in the three choice test was reflected in the five choice test. The same sequence between cabbage, shallot and chilly was found in both choice tests (Tables 1 and 3). Thus, we can conclude that larvae of *S. exigua* prefer to feed on cabbage leaves compared to shallot, chilly, long beans and lady's finger. However, in the five choice test, the number of *S. exigua* larvae that fed on cabbage was less compared to the three choice test. This is due to the addition of 2 new host plant choices, i.e. long beans and lady's finger. The number of larvae aged 2nd - 3rd instars was relatively higher on shallot and long beans compared to lady's finger and chilly. Whilst the 4th - 5th instars larvae, the number was higher on chilly compared to both long beans and shallot. This shows that that the older larvae also favor feeding on chilly leaf (Tables 1 and 3).

A comparison of both choice tests have shown that when more host plant leaves were offered, the least preference was observed (Table 2). This indicates that the presence of many host plants could reduce larval olfactory ability to allocate

their preferred host plants or due to being a generalist herbivore.

Idris and Emelia [3] reported that the *S. exigua* 3rd instars larvae were found to choose okra, onion and chilly but never tomato or brinjal and the time taken to reach, staying on, feeding and leaving the okra, onion and chilly was not significantly different. This study also demonstrated the same occurrence, where there was no difference in host plant preference between chilly, lady's finger and shallot. However, they stated that the larvae relatively preferred okra compared to onion or chilly. This is contradictory with our finding where the larvae relatively preferred shallot than lady's finger and chilly (Table 3).

Showler [4] stated that first instar beet armyworms showed no preference for excised cotton or pigweed leaves. Once the first instars found either of the hosts, they stayed on them. However, the third instars displayed a preference for pigweed over cotton. The same phenomenon was shown in this study where the 2nd - 3rd and 4th - 5th instars larvae were found to choose cabbage over other tested plants leaves.

Unlike the adults, the larvae showed no feeding preference for stressed over the non-stressed leaves, suggesting that beet armyworm larvae do not necessarily move from plant to plant in response to differences in nutritional quality [4]. This shows that the parental feeding history does not significantly influence the feeding preference of the progeny [5].

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Table 1. Number of larvae feeding on three host plants for the first and second 30 minutes

HOST PLANT LEAVES	NUMBER OF LARVAE AGE 2 ND - 3 RD INSTARS (MEAN ± SE)		NUMBER OF LARVAE AGE 4 TH - 5 TH INSTARS (MEAN ± SE)	
	1 st 30 mins	2 nd 30 mins	1 st 30 mins	2 nd 30 mins
	Cabbage	11.0 ± 1.49 c	11.9 ± 1.30 c	10.2 ± 1.28 c
Chilly	1.5 ± 1.18 a	1.3 ± 0.88 a	4.4 ± 1.18 b	4.7 ± 1.22 b
Shallot	5.8 ± 1.16 b	5.9 ± 1.11 b	3.8 ± 0.49 b	3.8 ± 0.59 b
Not on any leaves	1.7 ± 0.75 a	0.9 ± 0.41 a	1.6 ± 0.67 a	1.4 ± 0.4 a

* Mean accompanied by the same letter is not significantly different

Table 2. Number of larvae feeding on five host plants for the first and second 30 minutes

HOST PLANT LEAVES	NUMBER OF LARVAE AGE 2 ND - 3 RD INSTARS (MEAN ± SE)		NUMBER OF LARVAE AGE 4 TH - 5 TH INSTARS (MEAN ± SE)	
	1 st 30 mins	2 nd 30 mins	1 st 30 mins	2 nd 30 mins
	Cabbage	7.7 ± 0.93 hi	8.5 ± 1.08 i	6.6 ± 1.36 fghi
Chilly	1.4 ± 0.34 abc	1.5 ± 0.40 abcd	5.2 ± 1.34 efgh	4.5 ± 1.24 defg
Shallot	2.8 ± 0.67 cdef	3.2 ± 0.66 cdefg	1.8 ± 0.59 abcd	1.8 ± 0.55 abcd
Long beans	2.5 ± 0.62 bcde	2.8 ± 0.68 bcde	2.6 ± 1.02 bcde	2.7 ± 1.03 bcde
Lady's finger	2.2 ± 0.53 bcde	2.1 ± 0.54 bcde	3.0 ± 0.95 cdef	3.0 ± 0.95 cdef
Not on any leaves	3.4 ± 0.54 cdefg	1.9 ± 0.46 bcde	0.8 ± 0.38 ab	0.5 ± 0.40 a

* Mean accompanied by the same letter is not significantly different

Table 3. Number of larvae feeding on five host plants without time factor

HOST PLANT LEAVES	NUMBER OF LARVAE (MEAN ± SE)	
	2 nd - 3 rd INSTARS	4 th - 5 th INSTARS
Cabbage	16.2 ± 1.99 e	14.1 ± 2.62 de
Chilly	2.9 ± 0.72 b	9.7 ± 2.45 cd
Shallot	6.0 ± 1.32 bc	3.6 ± 1.11 b
Long beans	5.3 ± 1.29 bc	5.3 ± 2.05 b
Lady's finger	4.3 ± 1.08 b	6.0 ± 1.91 bc
Not on any leaves	5.3 ± 0.96 bc	1.3 ± 0.78 a

* Mean accompanied by the same letter is not significantly different