International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Suitability of Parts of Gram Plant for the Development and Growth of *Heliothis armigera* (Hübner) (Lepidoptera: Noctuidae)

V. K. Dwivedi

Department of Zoology, Sri J N PG College Lucknow U.P., India-226001
Email: *vinod.dwivedi[at]hotmail.com*

Abstract: ***The effects of the stem, leaf, flower and pod of gram plant on the growth and post-embryonic development of Heliothis armigera were investigated. During the investigation, the temperature ranged from 11 to 25°C and R.H. from 47 to 91%. The investigation revealed that the tested parts of gram plant behaved like different food. Plants; these parts differed in their capacity to support survival, development and growth. The stems failed completely to support these aspects; the flower prolonged larval period and also caused the poorest survival.***

Keywords: Polyphagous pest, larval period ,Emergance, Larval weight

1. Introduction

Heliothis armigera, a notorious polyphagous pest, does extensive damage to the gram (Cicer arietinum) crop. The damage caused by this insect in the north-eastern Uttar Pradesh has been recorded even up to 57. 85% (TRIPATHI & SHAR MA, 1984). In the early stages of the crop, caterpillars feed on leaves, flowers and buds and at a later one, when pods appear, they bore into them and eat away seeds therein, resulting in a markedly reduced yield. But, there is hardly so far, any information on the comparative suitability of these parts of gram plant for the growth and development of this insect. Therefore, the present experiment was designed.

2. Materials and Methods

Young *Heliothis armigera* larvae were originally obtained from gram fields in the month of January and reared on a mixed diet of stems, leaves, flowers and pods. The feeding of larvae exclusively on any particular part was avoided, as this could develop liking or preference for a particular part in the trials of this investigation. The larvae obtained from the rearing of the field collected ones, on mixed diet, were employed for the assessment of the suitability of plant parts in experiments as described below.

During the investigation, the temperature ranged from 11 to 25 °C and RH. from 47 to 91%; all biological materials were subjected to the same conditions of temperature and R.H. The host plants selected for feeding were predominantly in flowering and pod formation stages.

Support for development - This was determined by one experiment designed separately for each part of the plant. The experiment consisted of 3 repetitions, 20 larvae each. Freshly emerged larvae were kept in Petri dishes (15 cm in diameter) containing a particular part of gram plant to serve as a food. The Petri dishes were covered with muslin cloth tightened by rubber band. Larvae were supplied with fresh food twice a day until they pupated. On pupation, larval survival and period, and when moths emerged from pupae, pupal period and the percentage of emergence, were recorded. Growth indices were calculated following DUBE et al. (1981).

Support for growth - The experiment was identical with the one above-described and consisted of 3 repetitions, 20 larvae each. Larvae were reared separately on each plant part untill pupation. Fresh food supply was maintained twice a day. The weight acquired by larvae on the 6th, 12th and 18th day of larval period in consequence of rearing on each plant part was recorded.

3. Results and Discussion

Support for development - The stem could not support even larval survival. Larvae nibbled it without feeding and died on the second day (larval period). The stem has a hard woody texture and it is quite possible that young larvae failed to bite at its harder part with their tender mouth parts, hence died for their failure the feed. In behaviour, this insect is similar to *Utethesia pulchella* (PANDEY, 1976) and *Leptinotarsa decemlineata* (Soo Hoo & FRAENKEL, 1966), which refuse some acceptable foods because of toughness.

The other parts of the food plant viz., leaves, flowers and pods, succeeded in supporting the development of *H. armigera*. The results (table 1) show part specific differences in the development of the insect. The values of Chi-square calculated for the association of larvae and plant parts were found significant and therefore, larval survival differs among food plant parts. Pods and leaves supported larva survival to the extent of 85.00 and 78.33% respectively, but flowers brought the same to 55% causing 45% larval mortality. This suggests that the flower possesses very strong antibiosis for this insect. Larval period varied from 19.8 to 25.0 days among tested parts and the analysis of variance showed a significant difference in larval period among the different food plant pants ($P<0.05$). The pod induced the most rapid larval development (larval period=19.8 days) and flowers the slowest (larval period-25.0 days). However, leaves (larval period- 20.4 days) were

not much inferior to pods in this respect. Thus it appears that the antibiosis of flowers which causes very high larval mortality, also retards larval development. This is confirmed by the significant linear correlation coefficient (y=-0.977, P<0.01) between larval survival and larval period. PANDEY (1975) has reported that the poor nutritive value of food results in poor growth, and consequently prolongs larval development. Thus, it appears that flowers are poor in nutritive value and, therefore, prolong the larval development in this insect. This is also confirmed by the growth index values (table 1). As suggested by SRIVASTAVA et al. (1980), the florigin present in flowers (CHAILAKHIYAN 1936a, b) may be one of the reasons for gram flower antibiosis.

The value of the variance ratio between pupal period and the type of food is significant (P<0.05). It indicates that pupal period differs among host plant parts. It is shorest on pods (14.2 days) and longest on flowers (20.6 days), but leaves approach pods in pupal period, prolonging it a little. Like pupal period, emergence is also affected differently by the different parts of the food plant. But surprisingly, the pod, which appears to be more suitable for the survival and development of larvae, affords the minimum emergence (44.11%) while the flower, the least suitable for these two aspects, induces far more emergence (84%) than pods. These facts suggest that the antibiosis of flowers does not operate in the emergence of this insect, and that pods possess a factor which reduces emergence. However, leaves are the most suitable for emergence

Support for growth -The results have been summarized in table -2. The weight of larvae acquired on different plant parts is different. The variance ratio between weight and the different parts of the host plant is highly significant (P <0.05) This suggests that growth is differently affected by the different parts which, on the basis of larval weight, can be arranged as pod > leaf flower.

Table 1

Reared on	died	No. of Larvae papated	Pupation%	Larval period (days)	Growth index	Pupal period	Emergance %
Stem	60	Nil	-	-	-	-	-
Leaf	13	47	78.33	20.4±1.33	3.49	15.8±0.92	89.36
Flower	27	33	55	25.1±1.17	2.20	20.6±1.75	84
Pod	9	51	85	19.8±1.11	4.29	14.2±1.32	44.11

Table 2

Reared on	Larval weight in mg (Mean ±SD) during larval period on the		
	6th day	12th day	18th day
Stem	-	-	-
Leaf	32.54±4.83	170.00±10.83	362.45±17
Flower	17.38±3.86	92.76±19.42	127.35±18.37
Pod	54.47±7.66	202.45±29.18	452.00±37.23

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