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RESEARCH ARTICLE

Influence of physical traits of certain green gram varieties on the life parameters of leaf folder (*Nacoleia vulgalis* Guen.)

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ABSTRACT

Physical traits of crop varieties influence the level of susceptibility of the varieties to the pest species. Investigations were carried out to find the possible influence of physical traits of certain green gram varieties on the life parameters of *Nacoleia vulgalis*. It was evident from the data that the varieties had significant affects on larval period and fecundity of *Nacoleia vulgalis* while other life parameters of *Nacoleia vulgalis viz*., pupal period, reproductive rate, larval survival, adult emergence and growth index were not significantly affected. Correlation studies revealed that the pilosity of lower surface of young leaves, leaf area of older leaves, leaf thickness, veinlet density and days to 1st flowering had exhibited significant correlations with the larval period of *N. vulgalis*. while the intensity of green colour of leaves, leaf area of medium aged leaves and number of trifoliate leaves showed significant correlations with fecundity. Pilosities of older leaves and medium aged leaves, red and blue colour intensities and leaf area of young leaves did not have any significant effect on larval period and fecundity of *N. vulgalis*.

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INTRODUCTION

Green gram [*Vigna radiata* (L.)Wilczek] is an important pulse crop of Assam. It is grown both in summer (February / March sown) as well as in *Kharif* (August /September sown) of the state. Insect pest attack is a prime factor for low productivity of this crop. Among various insects attacking green gram, the leaf folder (*Nacoleia vulgalis* Guen.) is considered to be an important one. The grain yield loss due to this pest in green gram is 365.65kg to 374.40 kg /ha (Dutta, 1994). Available information regarding the association of physical traits of green gram varieties with life parameters of this pest is rather limited. Physical traits of crop varieties influence the biological parameters of phytophagus insects. Such information is indicative of the level of susceptibility of the varieties to the pest species. Persual of literature reveals that there is a paucity of information available on this aspect of *N. vulgalis* in Assam. In the present investigation, an attempt has been made to determine the possible association of physical factors of certain green gram varieties and life parameters *of N. vulgalis.*

MATERIALS AND METHODS

A field collected egg mass of *N. vulgalis* was kept for hatching along with leaf substrate in a Petridish (15 cm diameter) under laboratory conditions. On hatching, the first instar larvae were transferred to separate Petridishes (10 cm diameter), each of which contained fresh leaves of different green gram varieties *viz*., ML-131, ML-729, K-851, AAU-34, PMB-5, ML-5, PM-2, IIPRM-4, SG-1, PMB14 and Kopergaon. 11 numbers of larvae were reared separately by providing leaves of respective varieties till they became full grown. The larval period was then recorded. Three replications were kept for each variety. The full fed last instar larvae were transfered along with leaves into glass chimneys (22 cm x 10 cm) for pupation. The glass chimneys were covered with muslin cloth around their mouth so that the emerged adults could not

escape. Pupal period was recorded. Growth index was computed following the method suggested by Srivastava (1959). For studying the larval survival and adult emergence, a field collected egg mass was kept in a Petridish (15 cm of diameter) for hatching. Upon hatching, ten first instar larvae were transferred to leaves of 11varieties kept in separate Petridishes. Two replications were kept for each variety. Leaves were renewed every alternate day. The larvae were reared till pupation. Larval survival till pupation was recorded and growth index was computed. The pupae obtained from this rearing were kept separately (variety wise) in glass chimneys (22 cm x 10 cm) till adult emergence. Adult emergence percentage was recorded. Honey (10 %) soaked in cotton swab was provided as food for the emerged adult. The adults were allowed to pair inside the chimneys. Fresh leaves of respective varieties were introduced in to the chimneys for oviposition. Oviposition period, fecundity, oviposition rate and adult longevity were recorded from three replications. To determine the leaf pilosity of green gram varieties six leaves (2 young leaves from top 1/3, 2 medium aged leaves from middle 1/3 and 2 old leaves from bottom 1/3 rd of the canopy) from each variety were collected from the experimental plots in the late vegetative stage. In the laboratory, the leaves were thoroughly cleaned and examined under a binocular microscope to record the number of hairs present on unit area of both the leaf surfaces. For this purpose, a square shaped hole (1cm x 1 cm) was made on a paper which was then placed over the leaf under microscope. The hairs present on that area of 1sq. cm of leaves of each variety were counted. The mean of six observations (*i.e.*, 2 young 2 mediumm and 2 old aged leaves) gave the pilosity for the variety. For estimating the colour intensity of different green gram varieties, one fresh leaf of each variety was collected from the middle of the canopy during late vegetative stage. The leaf was placed under a lovibon Tintometer model E, AF900 for recording the intensity of the red, yellow and blue colours. The colour intensities of both the leaf surfaces were recorded and the average was expressed in lovibond scale. Leaf area was confirmed by placing nine leaves (3 each from top, middle, bottom 1/3 of canopy) of each variety collected at late vegetative stage over a graph paper (1square= 1 sq.mm) and their peripheries were drawn on the graph paper with a pencil. The number of squares present within the periphery was counted which gave the area in square millimeter. In order to determine the leaf thickness, three leaves collected at late vegetative stage from top, middle and bottom (one from each strata) of the canopy of each variety were cut into small bits. Fine sections of the leaf bits were made with razor blade. Five sections of each variety were then placed under a compound microscope and their thickness was measured with stage and ocular microscope. To find out the veinlet density of green gram varieties, three leaves (one each from top, middle, bottom of canopy) of each variety were collected at late vegetative stage from the experimental plots. After washing, the leaves were cut into bits of 4 sq.cm (2 cm x 2cm) size. The bits of each variety were then placed under a binocular microscope and the veins and veinlets observed were counted. Three observations were taken for each variety. For determining the number of trifoliate leaves, samples of one meter row length were marked out in the plots of each variety in the field. The total no. of plants and total no. of trifoliate leaves in each sample were counted to calculate the mean no. of leaves / plant. This observation was taken during flowering stage of the crop. The day of blooming of the first flower in each variety was recorded in order to determine the no. of days to first flowering since germination.

RESULTS AND DISCUSSION

The green gram varieties had significant affect on larval period and fecundity of *N.vulgalis* (Table 1). Other life parameters of *N. vulgalis viz*., pupal period, reproductive rate, larval survival, adult emergence and growth index were not significantly affected by the varieties. Variety PMB-14 registered the longest larval period (16.33 days) while the shortest period (11.33 days) for larval development was recorded on PM-2. Larval periods were comperatively shorter (12.00-13.00 days) on varieties PMB-5, IIPRM-4 and ML-131, which were statistically at par with AAU-34, K-851 and ML-5. The larval periods were comparatively longer on Kopergaon (15.67 days) and SG-1(15.00 days). Varieties AAU-34 and PMB-5 registered the shortest pupal period (6.00 days) while Kopergaon registered the longest pupal period (7.33days). The maximum percentage (90.00%) of larvae survived and entered pupation when they were allowed to feed on ML-131 and PM-2, while the minimum larval survival (55.00% was observed in case of the larvae reared on Kopergaon. Variety IIPRM-4 registered the maximum adult emergence (95.00%) while the variety PMB-14 recorded minimum emergence of adults (66.67%) followed by Kopergaon (71.67 %). The lowest growth index of 3.51 was noticed on Kopergaon followed by 3.75 on PMB- 14 and the highest growth index of 7.96 was noticed on IIPRM-4 followed by 7. 94 on PM-2. Varieties PM-2, IIPRM-4 and ML-131 were found to be comperatively suitable varieties in respect of growth and development of *N. vulgalis*. Pilosity of young leaves varied significantly among the varieties. Variety Kopergaon possesed the highest number of hairs (208.00 hairs/ cm^2) on the upper surface of leaf while on the lower surface the highest number of 117.50 hairs// cm^2 was registered in SG-1., ML-131 registered only (35.00 hairs/ cm^2) on the upper surface of leaf while on the lower surface, the least number (18.00 hairs/ cm^2) was recorded on PMB-5. As for the medium aged leaf, the highest no. of hairs on upper surface (103.00 hairs/ cm^2) was recorded on IIPRM-4 and the

lowest number (31.00 hairs/ $cm^{2)}$ was recorded on AAU-34. On older leaves, the pilosity was maximum (172.00 hairs/ cm^2) in ML-729 on the upper surface of leaf. Variety PMB-5 registered the lowest pilosity 51.50 hairs/ cm^2 on upper leaf surface. The pilosity of lower surface of older leaf was highest (112.00 hairs/ cm^2) on Kopergaon while it was lowest (21.00 hairs/ cm^2) in AAU-34.

Correlation studies (Table 2) revealed that pilosity of lower surface of young leaf (r=0.6069) was positively associated with larval period of *N. vulgalis* .Intensity of green colour of leaf (r=0.4706, p=0.20), leaf area of medium aged leaf (r=0.6357; p=0.10) and number of trifoliate leaf (r=0.5801; p=0.10) showed significant correlations with fecundity (r=0.4706; p=0.20.). Leaf area of older leaf (r=0.4523, p=0.20), leaf thickness (r=-0.5100, p=0.10), veinlet density (0.5109, p=0.10) and days to 1st flowering (r=0.5218, p=0.10) and exhibited significant correlations with larval period. Pilosities of older leaf and medium aged leaf, red and blue colour

Table 1: Life parameters of *N. vulgalis*

Variety	Larval period (days)	Pupal period (days)	Fecundity (No. of eggs/female)	Oviposition period (days)	Rate of oviposition (No. of eggs /Female/day)	Larval survival (%)	Adult emergence (%)	Growth index (%)
ML-131	13.00	6.33	95.67	2.67	36.67	90.00	88.75	6.92
ML-729	14.33	7.00	91.00	2.33	54.11	75.00	73.22	5.23
K-851	13.67	6.67	65.33	2.00	52.00	75.00	80.36	5.49
AAU-34	14.00	6.00	104.00	2.00	52.00	80.00	81.25	5.71
PMB-5	12.00	6.00	86.00	3.00	29.19	80.00	87.30	6.67
ML-5	14.00	7.00	93.00	3.33	28.72	80.00	74.61	5.71
PM-2	11.33	6.33	108.67	2.67	43.78	90.00	88.75	5.71
IIPRM-4	12.33	6.67	90.67	2.67	39.17	85.00	95.00	7.96
SG-1	15.00	7.00	90.67	2.33	44.44	65.00	84.52	4.33
PMB14	16.33	7.00	86.67	3.38	39.00	60.00	66.67	3.75
Kopergaon	15.67	7.33	63.67	3.00	20.61	55.00	71.67	3.51
S.E.±	0.40	NS	15.77	NS	NS	NS	NS	NS
C.D. (0.05)	0.73	NS	32.90	NS	NS	NS	NS	NS
C.D. (0.01)	1.08	NS	NS	NS	NS	NS	NS	NS

NS=Non-significant

Table 2: Correlation of certain physical traits of green gram varieties with larval period and fecundity of *N. vulgalis*

Leaf pilosity	Larval period		Fecundity	
	Upper	Lower	Upper	Lower
Older	0.0125	0.0658	0.0577	-0.3297
Medium	0.0156	-0.2343	0.1706	0.3683
Young leaf	0.3230	0.6069 **	-0.2499	-0.3295
Red colour	0.1078		-0.16692	
Blue	0.3836		-0.0777	
Green	-0.0599		* (20%)	
Leaf area				
Young	0.2302		0.3146	
Medium	0.2149		0.6357 ** (10%)	
Old	0.4523 * (20%)		0.1995	
Leaf thickness	-0.5150 ** (10 %)		0.1121	
Veinlet density	0.5109 ** (10%)		-0.1433	
No. of trifoliate leaf	0.3591		- 0.5801** (10%)	
Days to 1st flowering	0.5213 ** (10%)		- 0.1025	

* and ** Indicate significance of value at P=0.05 and 0.01, respectively

intensities and leaf area of young leaf did not have any significant effect (p=0.20) on larval period and fecundity of *N..Vulgalis*. The present findings are in agreement with those of Saikia (1973) and Dutta and Saharia (1984) who observed lower population of mustard aphid on hairy varieties of mustard. Other workers like Lukefahr *et al.* (1975) also found that trichomes immobilized lepidopteran larvae feeding on host plants and they also reduced egg deposition and larval population. Devi (1991) also found shorter larval duration of *Pieris canidia* on glabrous host plants. The resistant variety PMB-14 possessed darker green leaves as compared to the susceptible variety PM-2. Similar observations were also made by Gotz (1935).

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