Short communication

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CHARACTERISTICS OF COTTON PLANTS ASSOCIATED WITH SUCKING INSECTS AND NATURAL ENEMIES

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ABSTRACT

The abundance and relationship of the arthropod predators with prevailing sucking insect pests, aphid and jassid, were observed on five cotton varieties namely, CB12, CB13, CB14, CB15, and HC1. The studied cotton varieties showed differences in their superficial characteristics but all the varieties harbored the predators namely lady bird beetle, lace wing, syrphid fly and spider. The prevailed predators showed positive correlation with the sucking insects and abundance was significantly the highest on HC1 variety, where the lowest on CB14.

Keywords: Abundance, aphid, jassid, superficial characteristics

Cotton *Gossypium hirsutum* L., one of the most highly valued cash crops, is prone to severe damage by a variety of insect pests. Among the insects found on cotton field, sucking insects are mostly destructive of which aphid, *Aphis gossypii* Glover (Homoptera: Aphididae) and jassid, *Amrasca devastans* Distant (Homoptea: Cicadellidae) cause damage throughout the season (Tithi *et al*. 2010). Natural enemies of the pests in the cotton field of Bangladesh are dominated by ladybird beetles, lacewings, syrphids, and spiders (Tithi *et al.* 2010).

The cotton varieties were sown in 3.0 m × 3.0 m plots, replicated five times, and arranged in a randomized complete block design with the spacing of 1.5 m and 1.0 m between blocks and plots, respectively. Fertilizing and intercultural operations were done on necessity basis. During the fruiting stage of plants, their plant growth habit, stem color, leaf, flower, pollen, fuzz and lint, stem and leaf hairs, leaf and boll shape, leaf bract, nectar gland, petal spot, seed fuzz, and hair type were observed with naked eye. At advent to insect incidence, data on the abundance of the predators were collected at weekly intervals at the cotton plants' boll formation stage. A one-way analysis of variance (ANOVA) was applied for determining the abundance of predators. The mean values were separated according to Tukey HSD posthoc test. Pearson correlation between the abundance of the insect pests and predators was done. All the analyses were performed using IBM SPSS 21.0 (IBM SPSS Statistics, Armonk, NY, USA).

The superficial characteristics such as, branching, stem and leaf hairiness, leaf and boll shape, flower and lint color differed among the cotton varieties (Table 1). All the varieties had erect growth habit with nectar glands and possessed green leaves and leaf bracts, but petal spot was absent. All the plants possessed cream colored pollen and gray color fuzzy seed and a glabrous hair. The CB12, CB13, and CB15 varieties produced conical/oval-shaped bolls, whereas CB14 produced oval-shaped bolls and HC1 produced conical-shaped bolls. CB13, CB14, CB15, and HC1 had hairy leaves, whereas CB12 had slightly hairy leaves. CB12, CB13, and CB15 had hairy stems, but CB14 and HC1 had slightly hairy stems. CB12, CB13, CB14, and CB15 had entire-shaped leaves, but HC1 had okra-shaped leaves. CB14 had light yellow flowers, but other varieties had creamy yellow flowers. HC1 produced bright white lint, but CB12, CB13, CB14, and CB15 produced whitish lint. Amin *et al.* (2015) reported that the cotton varieties CB1, CB3, CB5, CB8, and CB12 showed differences in their branching, stem and leaf hairiness, leaf shape, flower color, boll shape, and lint color. They also reported that all varieties had nectar glands and possessed green leaves and leaf bracts.

Table 1. Superficial characteristics of the cotton varieties

Characteristics	Cotton variety				
	CB12	CB13	CB14	CB15	HC1
Growth habit	Erect	Erect	Erect	Erect	Erect
Branching	Medium	Medium	Short	Medium	Long
Stem color	Green	Green	Green	Green	Green
Stem hair	Hairy	Hairy	Slight hairy	Hairy	Slight hairy
Leaf color	Green	Green	Green	Green	Green
Leaf hair	Slightly hairy	Hairy	Hairy	Hairy	Hairy
Leaf shape	Entire	Entire	Entire	Entire	Okra
Leaf bract	Normal	Normal	Normal	Normal	Normal
Nectar gland	Present	Present	Present	Present	Present
Flower color	Creamy yellow	Creamy yellow	Light yellow	Creamy yellow	Creamy yellow
Boll shape	Conical/oval	Conical/oval	Oval	Conical/oval	Conical
Petal spot	Absent	Absent	Absent	Absent	Absent
Pollen color	Cream	Cream	Cream	Cream	Cream
Seed fuzz	Fuzzy	Fuzzy	Fuzzy	Fuzzy	Fuzzy
Fuzz color	Gray	Gray	Gray	Gray	Gray
Lint color	White	White	White	White	Bright white
Hairs	Glabrous	Glabrous	Glabrous	Glabrous	Glabrous
Leaf bronzing	Medium high	Medium	Minute	Extreme	Medium
Leaf curl	Moderate	Moderate	Low	Severe	Low
Leaf dropping	Medium high	Medium high	Few	High	Medium
Boll browning	Medium high	Moderate	Little	Heavy	Little
Hopper burn	Moderately high	Moderate	Low	Excessive	Moderate
Plant dwarfism	Medium high	Medium high	Little	Extreme	Moderate

Table 2. Abundance of predators (number/plant) on the cotton varieties

Cotton variety	Predators			
	Lady bird beetle	Lacewing	Syrphid fly	Spider
CB12	3.7±0.7 ab	3.5±0.5 bc	3.1±0.5 b	3.8±0.5 ab
CB13	4.1±0.4 ab	4.5±0.5 abc	4.2±0.4 ab	4.9±0.5 ab
CB14	3.3±0.7 b	3.1±0.6 c	2.9±0.4 b	3.4±0.6 b
CB15	5.7±0.4 ab	5.3±0.5 ab	4.7±0.5 ab	5.1±0.6 ab
HC1	6.1±0.7 a	5.9±0.6 a	5.2±0.6 a	5.7±0.5 a

Data expressed as mean ± standard error (SE) days from sowing. Means within a row followed by the same letter(s) are not significantly different according to Tukey honestly significant difference test at $p < 0.05$.

Table 3. Correlation matrix of the harbored arthropod predators and the abundance of sucking insects on the cotton varieties

CB12					
	LBB	LW	SF	SP	AA
LW	0.26 NS				
SF	0.69*	0.06 NS			
SP	−0.43 NS	−0.05 NS	0.09 NS		
AA	0.33 NS	0.53 NS	0.35 NS	0.01 NS	
JA	0.35 NS	0.31 NS	0.72*	0.09 NS	0.74*
CB13					
LW	0.42 NS				
SF	0.39 NS	0.39			
SP	−0.20 NS	0.00 NS	0.56*		
AA	0.29NS	0.19 NS	0.35 NS	0.11 NS	
JA	0.23 NS	0.04 NS	0.21 NS	0.43 NS	0.29 NS
CB14					
LW	−0.27 NS				
SF	0.87**	−0.40 NS			
SP	−0.21 NS	0.64*	−0.35 NS		
AA	0.20 NS	0.17 NS	0.01 NS	0.57*	
JA	0.12 NS	0.38 NS	0.62*	0.09 NS	0.58*
CB15					
LW	0.60 NS				
SF	0.45 NS	−0.09 NS			
SP	0.51 NS	0.54 NS	0.37 NS		
AA	0.39 NS	0.14 NS	0.67*	0.80*	
JA	0.78*	0.41 NS	0.41 NS	0.68*	0.72*
HC1					
LW	0.43 NS				
SF	−0.47 NS	−0.31 NS			
SP	0.56*	0.59*	−0.47 NS		
AA	0.29 NS	0.21 NS	0.21 NS	0.13 NS	
JA	0.18 NS	0.10 NS	0.09 NS	0.50 NS	0.03 NS

*Significant ($p \leq 0.05$), **Highly significant ($p \leq 0.001$), NSNon-significant ($p \geq 0.05$). LBB= Lady Bird Beetle, LW= Lacewing, SF= Syrphid Fly, SP= Spider, AA= Aphid Abundance, JA= Jassid Abundance.

The mean abundance of ladybird beetle (LBB), lacewing (LW), syrphid fly (SF), and spiders (SP) differed significantly on the cotton varieties and ranged from 3.3 ± 0.7 to 6.1 ± 0.7 plant^{-1}, 3.1 ± 0.6 to 5.9 ± 1.8 plant^{-1}, 2.9 ± 0.4 to 5.2 0.6 plant^{-1}, and 3.4 ± 0.6 to 5.7 ± 0.5 plant$^{-1,}$ respectively (Table 2). Among the tested varieties, CB14 and HC1 revealed significantly the lowest and highest number of predator population, respectively. Hossain *et al.* (2012) reported that the mean abundance of ladybird beetle, lacewing, syrphid fly, and spider in the control conditions were 6.5 plant^{-1}, 5.9 plant^{-1}, 5.2 plant^{-1}, and 5.6 plant^{-1}, respectively, and the results supported the present findings. The studied results were in agreement with Sahito *et al*. (2016), who observed that in starting, the predator population was found less, but when it went to peak levels, aphid population got reduced, which indicated a positive correlation between pests and predators.

Jassid abundance had a significant positive correlation with ladybird beetle on CB15 variety. Syrphid fly had a significant positive correlation with jassid population on CB12 and CB14 varieties, and with aphid population on CB15 variety (Table 3). Spider had a significant positive correlation with aphid and jassid population on the CB15 variety, and with aphid population on the CB14 variety. Aphid and jassid populations had a significant positive correlation on CB12, CB14, and CB15 varieties.

The harbored predator populations interrupted the abundance of the insect pests. So, predators can be an important component for Integrated Pest Management Program in cotton fields.

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References

Amin MR, Roy MC, Rahman MM, Miah MG, KwonYJ and Suh SJ. 2015. Foraging and growth responses of the cotton armyworm *Spodoptera litura* to the biophysical characteristics of five cotton varieties. Entomological Research, *45*: 286-293.

Hossain SMA, Baque MA, Amin MR and Chun IJ. 2012. Field Evaluation of imidacloprid as an insecticidal seed treatment of cotton cultivar with particular references to sucking pest, predator and yield. Our Nature, *10*: 44-52.

Sahito HA, Solangi R, Kousar T, Shah ZH and Mangrio WM. 2016. Population fluctuation of aphids, *Lipaphis erysimi* (Kalt) with response of biological control under mustard field conditions. Journal of Entomology and Zoology Studies, *4*: 326-33.

Tithi DA, Amin MR, Hossain SMA and Azad HMS. 2010. Consequence of *Spodoptera litura* Fabricius (Lepidoptera: Noctuidae) morphometrics reared on different cotton varieties. Our Nature, *8*: 118-121.

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Journals

Amin MR, Bussiere L and Goulson D. 2012. Effects of male age and size on mating success in the bumblebee *Bombus terrestris.* Journal of Insect Behavior, *25*: 362-374.

Books

Written SD and Fry GIA. 1996. Field and Laboratory Exercises in Ecology. Edward Arnold, London, UK. Pp. 98-103.

Chapter in a book

Amin MR. 2018. Sampling procedures of different arthropods emphasize on biological control agents. In: Integrated Pest Management (Eds. Alam SN, Sarkar MA, Pandy PR and Bokhtiar SM) SAARC Agriculture Centre, Dhaka, Bangladesh, Pp.13-20.

Proceedings

Cunningham JP, Moore CJ, Zalucki MP and Cribb BW. 2004. Insect odour perception: recognition of odour components by flower foraging moths. Proceedings of the Royal Society of London B Biological Sciences, *273*: 2035-2040.

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