

RESEARCH PAPER

Seasonal Incidence and Damage Potentiality of the *Aulacophora* (Coleoptera: Chrysomelidae) Species in Cucurbits from the Southern part of Bangladesh

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ABSTRACT

Experiments on seasonal incidence and damage potentiality of the *Aulacophora* species in cucurbits from Southern part of Bangladesh were carried out in the field and in the Taxonomic Lab, Department of Entomology, Patuakhali Science and Technology University during the period from April, 2019 to March 2020. Three cucurbitaceous vegetables viz. sweet gourd, bitter gourd and bottle gourd were selected as test crops to know the incidence in the field; and snake gourd was used instead of bottle gourd along with other two to know the damage potentiality of red pumpkin beetle in the lab. They occurred throughout the year, but they were active from March to October, though the peak period of activity was between April to June and caused severe damage to the crops, especially at the seedling stage. The highest incidence of beetle per plant (76.0) was observed on sweet gourd followed by bottle gourd (36.0) and lowest on bitter gourd (4.0). Considering to leaf area consumptions, red pumpkin beetle was found mostly harmful to snake gourd (34.76%) followed by sweet gourd (27.04%) and no damage or infestation caused by *Aulacophora foveicollis* to bitter gourd was observed. On the other hand, percent leaf infestation per plant of sweet gourd, bottle gourd and bitter gourd was 52.3 ± 1.2 , 38.7 ± 1.1 and 3.5 ± 0.7 respectively caused by *Aulacophora* species. Snake gourd was more vulnerable to red pumpkin beetle than the other tested cucurbits.

Key words: Abundance, *Aulacophora*, damage severity, population dynamics, pumpkin beetle

Introduction

Cucurbits like pumpkin and gourds (Snake gourd, Pointed gourd, Ridge gourd, Sponge gourd, Bitter gourd, Wax gourd, Bottle gourd, Sweet gourd, Cucumber etc) have already taken a huge part in summer vegetables. The production of pumpkin and gourd in the Southern part of Bangladesh was 1,05,226 MT and 1,39,250 MT in about 26383 acres and 40384 acres in land respectively (BBS 2020). But high incidence of insect pests is considered as the major common constraint in the successful production of cucurbitaceous vegetables in Bangladesh (Rahman and Uddin 2016) because Bangladesh is a humid and subtropical country that provides a congenial environment compatible for the

bountiful growth of insect pest. Cucurbits are severely attacked by 12 insect pests (Ali et al. 2016), where different species of *Aulacophora* Chevrolat (Coleoptera: Chrysomelidae: Galerucinae) are able to feed on leaves, flower buds, flowers voraciously which causes 30-100% losses in the field (Rashid et al. 2014). Both larval and adult stage of those beetles is injurious to crop and cause severe damage to almost all cucurbits from the seedling stage (Rahman and Prodhan 2017). The adult beetles feed on the leaves making irregular holes and also attack the flowers and flower buds where larvae feed on root tissues (Guruswamy et al. 1995), stems and fruits touching to the ground.

Damage sometimes becomes very severe if it is not controlled timely. At the advent of spring the beetles defoliate the cucurbit seedlings to such an extent that the crop has to be re-sown for 3 to 4 times (Prasad and Kumar 2002; Mahmood et al. 2005). It makes the growers late marketing of the vegetables as well as lessen their income. The pest, however, occurs throughout the year and causes severe damage to the crops especially at seedling stage (Rajak 2001). To manage this pest properly, it is necessary to have an adequate knowledge on its seasonal incidence, proper identification and host plant preference for feeding and oviposition behavior. Some studies on the different factors relating to the abundance of red pumpkin beetles in different crops have already been done (Khan 2011; Mandal et al. 2012; Rathod and Borad 2010; Khan et al. 2012; Khursheed et al. 2013). But, unfortunately, information on seasonal incidence and damage potentiality of this pest is limited. Considering the above situation in present study an attempt was made to observe the seasonal incidence and damage potentiality of the beetles on different varieties of cucurbits in the field as well as in the laboratory condition.

Materials and Methods

Experiments on seasonal incidence and damage potentiality of the *Aulacophora* species in cucurbits from Southern part of Bangladesh were carried out in the field and in the Taxonomic Lab, Department of Entomology, Patuakhali Science and Technology University during the period from April, 2019 to March 2020.

Crop Selection-Different cucurbits (sweet gourd, bottle gourd, bitter gourd, Snake gourd etc.) were selected for the collection of insect sample and to observe the seasonal incidence and damage potentiality of *Aulacophora* both in field and lab.

Climate-The southern part of Bangladesh shows a tropical climate that is individualized by high temperature and humidity. April to September is characterized by heavy rainfall with occasional gusty winds. In winter, there is much less or little rainfall occurred than in summer. The average annual temperature is 25.9°C. The average annual rainfall is 2184 mm. The driest month is January, with 10 mm of rainfall. With an average of 444 mm, the most precipitation falls in July.

Seasonal incidence and damage potentiality-Experiments was conducted in field laboratory of the Department of Entomology, Patuakhali Science and Technology University, Dumki, Patuakhali during April 2019 to March 2020. In the field experiment the land was ploughed with a power tiller and the soil was kept open to sunlight for few days. The land was gradually ploughed and cross ploughed for several time with power tiller and spade to obtain the desirable tilth. All ploughing operation was done followed by laddering for breaking up the clods and leveling the surface of the soil. All weeds and stubbles were removed from the field and finally the unit plot was prepared as 10 cm raised beds along with the addition of the manure and basal dose of fertilizer. The whole experimental fields were

divided into 12 equal plots (2m x2m) and one pit was prepared in the middle of each plot. Three cucurbitaceous vegetables such as sweet gourd, bottle gourd and bitter gourd were used in the experiment with three replications of each. Before sowing, seeds were soaked overnight for proper germination. Three seeds were shown in each pit and one healthy seedling per pit was maintained through thinning at 7 days after germination. Each plot was supported by bamboo platform by easy creeping and preventing from lodging. All the seedlings were maintained by following all recommended horticultural practices. Percent leaf infestation and leaf area consumption by cucurbit beetles were used as a parameter for incidence and damage potentiality. Data was recorded at 10 day's interval started from one month age of the plants. Food consumption of beetle and grubs was studied in laboratory. Five adult beetles and five grub were released in separate petridishes containing three leaves of each of the selected vegetables. Snake gourd was used instead of bottle gourd as test crops. The set was replicated three times, The cut end of leaf petiole was covered by the water soaked cotton pad for the prevention of withering data on consumer leaf area by beetles and grubs was taken at daily basis and fresh leaves were replaced. Percent leaf area consumption and percent leaf infestation were calculated by using the following formula-

$$\% \text{ leaf area consumption} = \frac{\text{Consumed leaf area}}{\text{Total leaf area}} \times 100$$

$$\% \text{ leaf infestation} = \frac{\text{Number of infested leaves/plant}}{\text{Total number of leaves/plant}} \times 100$$

Meteorological data -Data on weather parameters viz., temperatures, relative humidity and rain fall were collected from weather station, Patuakhali. The collected data on population of *Aulacophora* species were either statistically correlated with the weather parameters or not to understand the influence of individual weather factors on the development and seasonal occurrence of cucurbit beetle in cucurbits were compared.

Statistical analysis-Three cucurbitaceous vegetables such as sweet gourd, bottle gourd and bitter gourd were used in the experiments in the field with three replications of each following the layout of Randomized Blok Design. Data were expressed in three individual replicates, and mean values $\pm$ standard error were plotted using Sigma plot 8.0 (Systat software, Inc., Point Richmond, CA,USA). Analysis of variance (ANOVA) were carried out in order to analyze the means by using PROC General Linear Model (GLM) with the Statistical Analysis System (SAS, 2002-2003 SAS Institute Inc., Cary, NC, USA) version 9.1 program.

Results and Discussion

Incidence of *Aulacophora*

Aulacophora is a major pest of cucurbits. In Bangladesh cucurbits are occupied a larger portion of vegetables specially in summer but production of cucurbits is hampered due to the attack of *Aulacophora*. In case of severe attack this pest may cause damage up to 100%. Seasonal incidence indicates the time of outbreak of

insects. So if we know about the seasonal incidence of *Aulacophora*, we can able to reduce the damage of cucurbits by escaping the time of higher incidence in cucurbit cultivation with keeping the insect ecology quite and reducing the cost of production. The red pumpkin beetle occurs throughout the year, but they are active from March to October, though the peak period of activity is between April to June and causes severe damage to the crops, especially at the seedling stage.

In this experiment, three cucurbitaceous vegetables viz. sweet gourd, bitter gourd and bottle gourd were selected to know the incidence of red pumpkin beetle. The highest incidence of beetle per plant (76.0) was observed on sweet gourd followed by bottle gourd (36.0) and lowest on bitter gourd (4.0) in the month of May. The higher number of beetle occurrence observed from the month of April – June in all three types of plants which tends to decline from August (Fig. 1).

The red pumpkin beetle was abundantly found in the month of April and May that was recorded at 9 AM (Khan 2018). The same result was found in the present investigation. Borkataki et al. (2016) revealed that correlation studies on population density of *Aulacophora foveicollis* showed significant negative correlation with maximum temperature and significant positive correlation with evening humidity. In that study *Aulacophora foveicollis* was found feeding on the leaves of *C. indica* plants predominantly from March to June with maximum number of population of 2 beetles/plant which also supported by the present research.

The highest infestation of RPB was recorded mostly from March, April and May but peak incidence was noted during 3rd week of April which was justified by the current research work (Ghule et al. 2014; Saljoqi and Khan 2007). Rathod and Borad (2010) conducted a field experiment on the population dynamics of red pumpkin beetle (*Aulacophora foveicollis*) in relation to weather parameter. During the period of kharif, the month August-September and in summer, the month March – April was noted as highest incidence of pest but the present research showed the highest incidence of beetle in the month of May. Incidence of adult pumpkin beetle (*Aulacophora foveicollis*) observed during February-April with 1-4 adults per vain but this present research find the maximum present of beetle in April-June which does not justify the statement (Prashad and Kumar, 2002). It might be happened due to the different weather parameters in different locations.

Damage severity of pumpkin beetle

The Red Pumpkin Beetle, *Aulacophora foveicollis* Lucas is the most serious pest of the cucurbits. It occurs throughout the year and causes severe damage to the crops, especially at the seedling stage. It is polyphagous and attacks more than 81 plant species including pumpkin, quash, cucumber, bottle gourd, sweet gourd, bitter gourd, snake gourd, wax gourd, watermelon, etc and a wide range of fruit crops. It may cause up to 70 % damage on leaves and 60% damage on flowers of cucumber. *Aulacophora* is a serious pest in some areas, where it may destroy the whole plantations. The adults

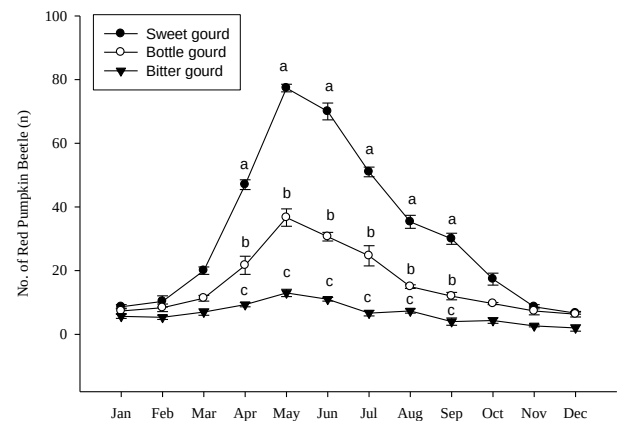


Fig.1. Seasonal incidence of pumpkin beetle against sweet gourd, bottle gourd and bitter gourd

feed on the leaves of young plant causing death or retardation of growth. The larvae attack roots and stems below the ground when the plants are mature and fruiting as a result of which the root and stem rot by fungi invaded, the plants become wither and half ripe fruits dry in sun.

In the experiment, at all the three stages the highest damage potentiality was found on snake gourd and the lowest on bitter gourd in the field. Considering the leaf area consumptions, red pumpkin beetle was found mostly harmful to snake gourd (34.76%) followed by sweet gourd (27.04%) and no damage or infestation was caused by *Aulacophora foveicollis* to bitter gourd (Fig. 2). Snake gourd was found as more vulnerable to red pumpkin beetle than the other tested cucurbits in the lab. On the other hand, percent leaf infestation per plant of sweet gourd, bottle gourd and bitter gourd was 52.3 ± 1.2 , 38.7 ± 1.1 and 3.5 ± 0.7 respectively caused by *Aulacophora* species (Table. 1).

Rahman and Uddin (2016) studied on host preference and damage potentiality of Red pumpkin beetle and Epilachna beetle both in laboratory and in field condition and illustrated that in field experiment the harm caused by the red pumpkin beetle was severe in snake gourd (22.62% and 8.84% respectively) and low in bitter gourd (3.00% and 1.23% respectively) considering the percent of leaf infestation and leaf area consumption. Similarly to the field experiment red pumpkin beetle consumed more leaf area in snake gourd (43.36%) where bitter gourd and ridge gourd were least preferable host about 1.42% and 0.78% to 41.27% respectively. In the present research work the most leaf infestation and most damaged area were found in Snake gourd with 52.62% and 34.76% respectively and less in bitter gourd which appreciate this statement. Al-Ali et al. (1982) cited that *Aulacophora foveicollis* feed on seedlings and mature plants of melon, snake gourd, cucumber and bottle gourds from flower to leaves. On the basis of the number of adults on 10 plants of each crop snake gourd was the most preferred host plant which also showed by the current research work.

Table. 1. Percent leaf infestation per plant by *Aulacophora* species in the field

Crop	Replication	No. of leaves	No. of infested leaves	%leaf infestation	% Mean infestation
Sweet gourd	1	70	38	54.29	52.3±1.2 a
	2	66	33	50.00	
	3	76	40	52.63	
Bottle gourd	1	57	23	40.35	38.7±1.1 b
	2	64	25	39.06	
	3	71	26	36.62	
Bitter gourd	1	115	4	3.48	3.5±0.7 c
	2	105	5	4.76	
	3	127	3	2.36	

Saljoqui and Khan (2007) revealed a findings of their research on susceptibility of *Aulacophora foveicollis* to different species of cucurbits where they highlighted cucumber and squash as more susceptible to attack where sponge gourd and bottle gourd was moderately tolerate and bitter gourd was found resistant to *Aulacophora foveicollis*. In the present research work bitter gourd was also found as the resistant host of *Aulacophora* with 0% leaf infestations and damage. Sweet gourd was noted as most preferred host and tends to damage by *Aulacophora* than bitter gourd (Sarker et al. 2015; Kamal et al. 2014 and Hassan et al. 2012). In the present research work sweet gourd was also found as more preferable host than bitter gourd with 47.26% leaf infestation and 27.04% damage in sweet gourd and 0% damage and leaf infestations in bitter gourd. This present research also supports this statement (Fig. 2).

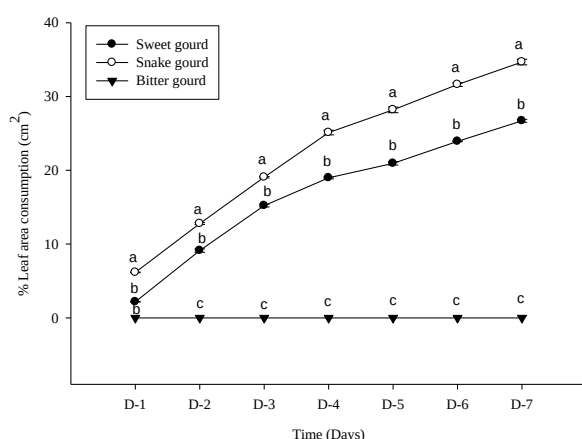


Fig. 2. Percent leaf area consumption (cm²) of *Aulacophora foveicollis* for a week in the lab condition.

Conclusion

In conclusion, the incidence of red pumpkin beetle was found in cucurbitaceous vegetables viz. sweet gourd, bitter gourd, snake gourd and bottle gourd throughout the year, but they were active from March to October, though the peak period of activity was between April to June and caused severe damage to the crops, especially

at the seedling stage. So, early variety of cucurbits should be selected or should be aware of time period of infestation to take necessary management action against beetle. The highest incidence of beetle per plant (76.0) was observed on sweet gourd and lowest on bitter gourd (4.0). Considering to leaf area consumptions, red pumpkin beetle was found mostly harmful to snake gourd (34.76%) then in sweet gourd (27.04%) and no damage or infestation caused by *Aulacophora foveicollis* to bitter gourd. On the other hand, percent leaf infestation per plant of sweet gourd, bottle gourd and bitter gourd was 52.3±1.2, 38.7±1.1 and 3.5±0.7 respectively caused by *Aulacophora* species. Snake gourd was more vulnerable to red pumpkin beetle than the other tested cucurbits.

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