ISSN 0258-7122
Bangladesh J. Agril. Res. 37(2): 361-367, June 2012 **Short Communication**

INFLUENCE OF WEATHER FACTORS ON THE INCIDENCE AND DISTRIBUTION OF PUMPKIN BEETLE INFESTING CUCURBITS

M. M. H. KHAN[1], M. Z. ALAM[2], M. M. RAHMAN[2]
M. I. H. MIAH[3] AND M. M. HOSSAIN[4]

Keywords: Weather, incidence, population, pumpkin beetle, cucurbits

Cucurbits are the most widely grown and important crops in the tropical and subtropical countries of the world. In Bangladesh, major vegetables grown in summer are cucurbits. Pumpkin beetle is the major pest and causes considerable damage to almost all cucurbits (Butani and Jotwani, 1984; Yawalkar, 1985). Among different species of pumpkin beetles, incidence of adult stage of red pumpkin beetle (RPB), *Aulacophora foveicollis* (Lucas) on different cucurbits have been reported by various workers (Nath, 1964; Nath and Thakur, 1965; Bogawat and Pandey, 1967). The pest, however, occurs throughout the year and causes severe damage to the crops, especially at the seedling stage (Alam, 1969; Butani and Jotwani, 1984). The adult beetles feed voraciously on the cucurbit leaf making irregular holes. They also attack cotyledons and flowers (Butani and Jotwani, 1984). The beetles may kill seedlings and sometimes the crops have to be resown 3-4 times (Azim, 1966). The grubs feed on roots and underground portions of host plants as well as fruits touching the soil and thus making such fruits unsuitable for human consumption (Butani and Jotwani, 1984). The pest, however, occurs throughout the year but they are active from March to October, though the peak period of activity is between April to June (Butani and Jotwani, 1984) and causes severe damage to the crops, especially at the seedling stage (Alam, 1969). It may cause up to 70 % damage on leaves and 60 % damage on flowers of cucumber (Alam, 1969). According to Nath and Thakur (1965), among the gourds, sponge gourd, was the least preferred by RPB, while the bottle gourd was most preferred and ridge gourd was intermediate in preference. Khan and Hajela (1987) found that RPB preferred sweet gourd followed by cucumber, squash melon, sponge gourd and bottle gourd. The environmental conditions though can not entirely change the genetic make up of a plant carrying resistance to insect pests, but they influence the biology of the pest considerably which in turn influences the population of the pest. According to Nath and Thakur (1965), relative humidity and temperature variations did not have significant influence on the susceptibility or resistance to RPB. Therefore, the present study was undertaken to find out the influence of weather factors on the incidence and population pattern of pumpkin beetle infesting cucurbits.

[1]Department of Entomology, Patuakhali Science and Technology University (PSTU), Dumki, Patuakhali, [2]Department of Entomology, Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur, [3]Department of Plant Pathology, BSMRAU, Gazipur, [4]Department of Horticulture, BSMRAU, Gazipur, Bangladesh.

The study was conducted in the experimental field of Bangabandhu Shiekh Mujibur Rahman Agricultural University (BSMRAU), Gazipur during February-June 2007. Cucurbit crops viz., sweet gourd *(Cucurbita mosehata L.)*, bottle gourd *(Lagenaria siceraria L.)*, bitter gourd *(Momordica charantia L.)*, sponge gourd *(Luffa cylindrica L.)*, ribbed gourd *(Luffa acutangula L.)*, cucumber *(Cucumis sativus L.)*, and muskmelon *(Cucurbita melo* L.) were grown in the experimental fields following randomized complete block design with 4 replications. Cow dung and fertilizer were applied as recommended (Rashid, 1993) for cucurbits at the rate of 10,000, 69, 60, and 60 kg of cow dung, N, P, and K per hectare, respectively. The seeds were sown on 3rd February 2007 in polythene bag (15 cm x 10 cm) containing 50 % well decomposed cow dung and 50 % sandy loam soil. Two seedlings of 15 days old were planted in each of the two pits on 4 March 2007. Irrigation and other recommended agronomic practices were followed as suggested by Rashid (1993). The crop was kept under constant observation from 2 leaf stage to reproductive stage for recording data on the incidence of pumpkin beetles. The experimental field was visited at an hourly interval from sun rise to sunset for one week during 7-13 April 2007. Number of pumpkin beetles appeared on leaves of four selected cucurbitaceous crops were recorded. The selected crops were muskmelon (highly preferred host), cucumber (medium preferred host), and bottle gourd (less preferred host). The incidence of beetle was accumulated hourly basis per week to observe the diurnal incidence. Monthly population pattern of pumpkin beetle infesting cucurbit hosts during March through June 2007 was recorded. Incidence of pumpkin beetle was recorded from 8:00 to 10:00 am and from 4:30 to 6:00 pm regularly in those months. The mean number of beetles appeared in four separate months was calculated to observe the seasonal population pattern. Data collected from highly preferred hosts of red pumpkin beetle and blue pumpkin beetle among 7 cucurbits were subjected to represent the diurnal incidence and monthly population pattern graphically. Simple correlation of beetle incidence with temperature and relative humidity was done.

Figure 1 revealed that the red pumpkin beetle appeared on the host leaf from 7:00 am to 6:00 pm. In the early part of the day, insect first appeared at 7:00 am. Its population increased gradually with the progress of the day showing maximum population at around 9:00 am. After 9:00 am, its incidence started to decrease having the lowest population at 2:00 pm. In the later part of the day, population of RPB started to increase after 2:00 pm and continued up to 6:00 pm, when maximum incidence was recorded. Such trend of diurnal incidence of RPB was observed on three hosts having different levels of susceptibility. Findings of the observation clearly showed that populations of the RPB were low during middle of the day when temperature is maximum. The temperature may be the principal factor for influencing diurnal distribution of RPB on cucurbits. In general, the phytophagous insects always avoid scorching sun to protect themselves from

desiccation (Atkins, 1978; Chapman, 1979). In this situation, they tried to conceal themselves under soil, leaves, and debris. Bright sunlight with high prevailing temperature is always unfavourable for phytophagous insects (Hill, 1983). Another reason of lower infestntion of RPB in the mid day may be due to absence of polarized light at middle part of the day compared to others. Wellington (1974) indicated the importance of polarized light in a study and showed that insects often become inactive or restricted their range of movement during mid day when polarized light was absent from the overhead sky. The polarized light orientation at morning and afternoon hours of the day enables insects to maintain a steady course across open, unfamiliar teritory when sun navigation or orientation by landmarks is not possible (Atkins, 1978). Therefore, the incidence of RPB on different cucurbits was higher during morning and afternoon hours. The findings of the present study are similar to that reported by Begum (2002).

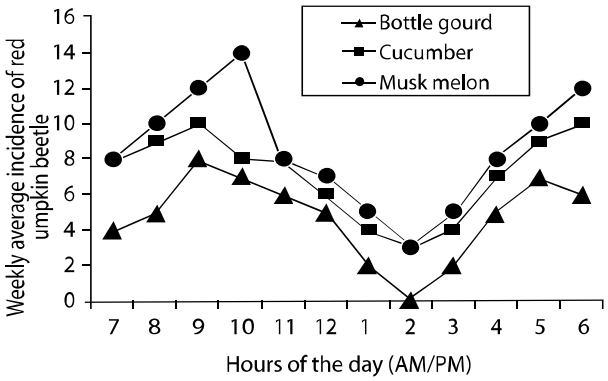


Figure 1. Diurnal incidence of red pumpkin beetle infesting three cucurbit vegetables grown at BSMRAU experimental farm during 7 - 13 April 2007.

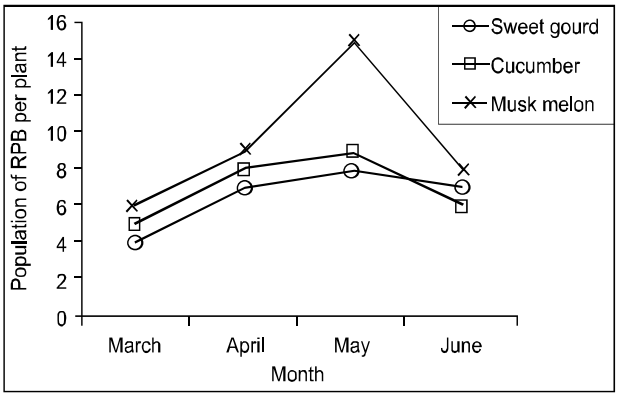


Figure 2. Population of red pumpkin beetle on three preferable cucurbit hosts during March to June 2007.

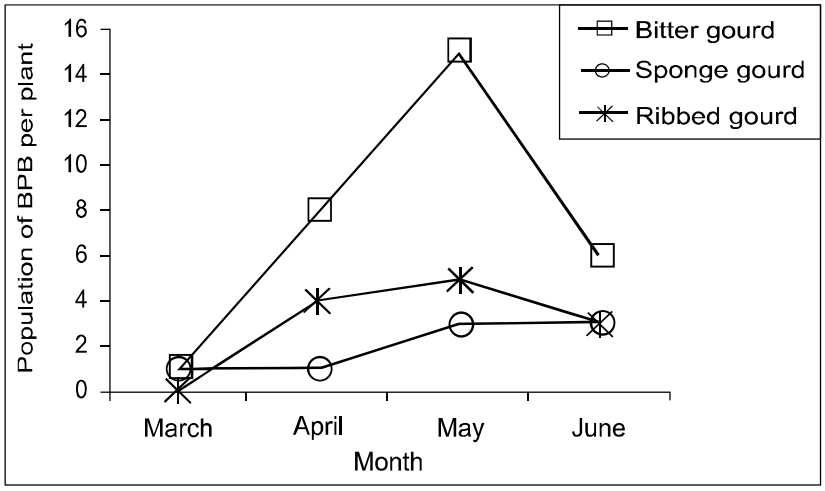
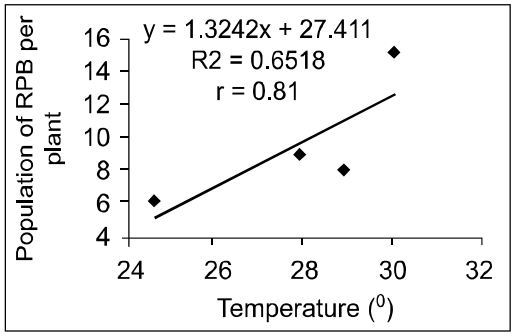


Figure 3. Population of blue pumpkin beetle on three preferable cucurbit hosts during March to June 2007.

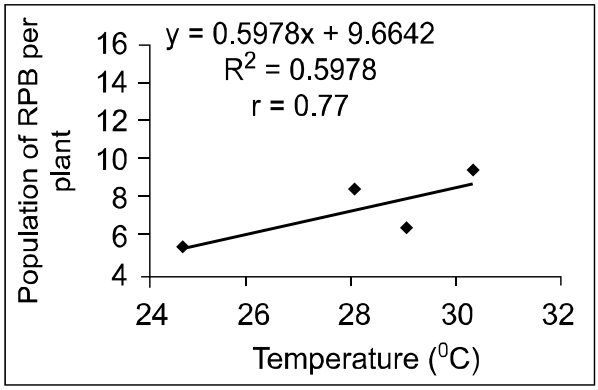
The population of red pumpkin beetle (RPB) on three preferable hosts, namely muskmelon, cucumber, and sweet gourd was minimal in the month of March. Its population increased gradually with the progress of time up to May and decreased thereafter (Fig. 2). The highest population of RPB was recorded in the month of May. The population of blue pumpkin beetle (BPB) on three preferable hosts, namely bitter gourd, ribbed gourd, and sponge gourd followed the similar trend (Fig. 3). Such increasing and decreasing trends in pumpkin beetle population might be due to changes in food availability. In March, food availability was the lowest because plants were young. In May, plant growth was maximal covering largest canopy. In June, plants were at their senescent stage causing food scarcity.

Population of RPB on muskmelon, cucumber, and sweet gourd was linear and positively correlated with air temperature. The correlation co-efficient of muskmelon ($r = 0.81$) cucumber ($r = 0.77$), and sweet gourd ($r = 0.98$), was significant. The R^2 values of muskmelon ($R^2=0.65$), cucumber ($R^2= 0.59$), and sweet gourd ($R^2= 0.96$) indicate that their relationships could be explained by 65.18, 59.78 and 96.45%, respectively, on musk melon, cucumber, and sweet gourd (Fig. 4 A, B & C. Its population was also linearly and positively correlated with relative humidity. However, the relationship was not significant (Fig. 5 A, B & C). The monthly variations in populations of RPB and BPB on their preferred cucurbit hosts (Fig. 2 & 3) might be due to temperature fluctuation in the months of March, April, May, and June. Azim (1966) and Alam (1969) reported that the maximum population of the beetle was observed during April and May. According to Butani and Jotwani (1984), red pumpkin beetles are active from March to October, though the peak period of activity is in April to June. SaIjoqi

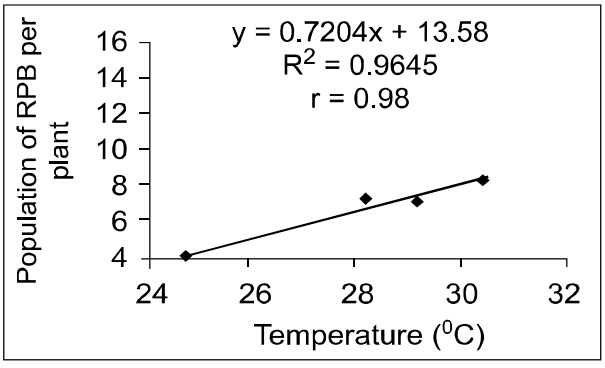
and Khan (2007) reported that the infestation of red pumpkin beetle was high from 7 May to 18 June 1998, while from 25 June to 13 August 1998. the population gradually declined.



A

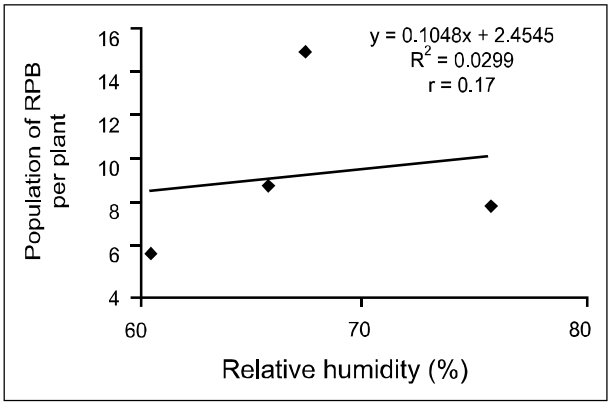


B

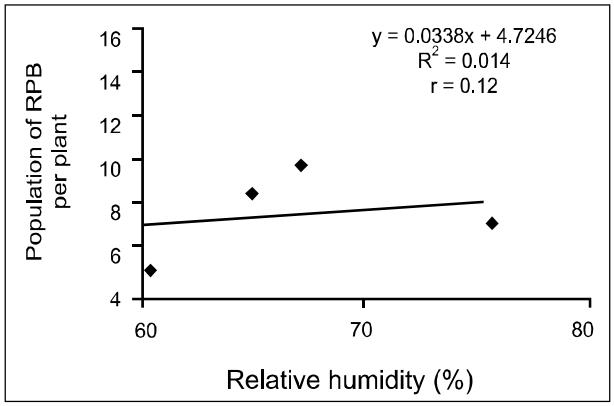


C

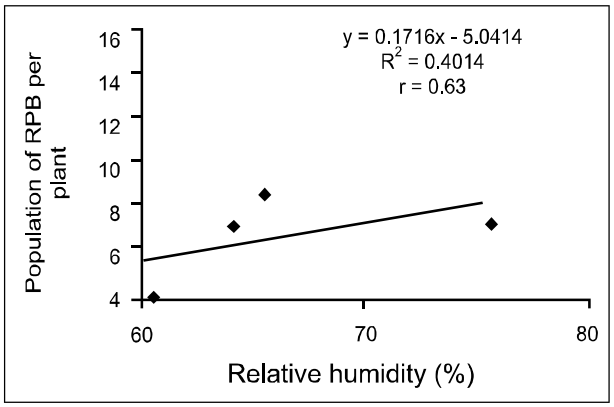
Figure 4. Relationship between populations of RPB on muskmelon (A), cucumber (B) and sweet gourd (C) hosts with air temperature.



A



B



C

Figure 5. Relationship between populations of RPB on muskmelon (A), cucumber (B) and sweet gourd (C) hosts with relative humidity.

From the present study, it may be concluded that the highest incidence of pumpkin beetles was observed at around 9:00 am and 6:00 pm, while the lowest incidence was at 2:00 pm. The highest population of red pumpkin beetle on muskmelon, cucumber, and sweet gourd and blue pumpkin beetle on bitter gourd, ribbed gourd and sponge gourd was recorded in the month of May. The linear and positive relationship was found in the population of RPB with the temperature and relative humidity, but the relationship was not significant.

References

Alain, M.Z. 1969. Pest of cucurbit vegetables. *In:* Insect-pests of vegetables and their vegetables in East Pakistan. Agri. Infor. Serv., Dept. Agri., Dacca. pp. 87-110.

Atkins, M.D. 1978. Insects In Perspective. Macmillan Publishing Co. Inc. New York Collier Macmillan Publishers London. 513p.

Azim, M.I.I. 1966. Studies on the biology of red pumpkin beetle, *Aulacophora foveicollis* (Lucas) (Chrysomelidae: Coleoptera) in East Pakistan. M. Sc. Thesis. Department of Entomology, Bangladesh Agricultural University, Mymensingh. pp. 1-95.

Begum, L.A.A. 2002. Host preference of fruit fly and red pumpkin beetle to different cucurbit vegetables grown in summer. M.S. Thesis. Department of Entomology. BSMRAU, Gazipur, Bangladesh. 65p.

Bogawat, J. K. and S. N. Pandey. 1967. Food preference in *Aulacophora sp. Indian J. Ent.* **29** (4): 349-352.

Butani, D.K. and M.G. Jotwani. 1984. Insects in Vegetables, Periodical Expert Book Agency, Vivek-Vihar, Delhi , India. pp. 356.

Chapman, R.F. 1979. The insects structure and function (Second edition) Published by Elsevier-Narth Holland, Inc. 52 Vanderbilt Avenue, New York N. Y. 100 17. 819p.

Hill, D.S. 1983. Agricultural Insect Pest of the Tropics and Their Control. 2nd edition. Cambridge University Press, London. 40-41p.

Khan, M. Z. and K. P. Hajela. 1987. Studies on *Aulacophora foveicollis* Lucas (Coleoptera: Chrysomelidae)-Food preference and extent of damage. *Indian J. Ent.* ***49 (4):*** 457459.

Nath, P. and M. R. Thakur. 1965. Evaluation for red pumpkin beetle resistance in gourds. *Indian J. Hort.* **22** (3 -4): 330-339.

Nath, P. 1964. Resistance of cucurbits to red pumpkin beetle. *Indian J. Hort.* **21** (1) :77-78.

Rashid, M.M. 1993. Kumra Paribarer Shabji. *In:* Shabji Bijnan (in Bengali), Bangla Academy, Dhaka, Bangladesh. pp. 254-356.

Saljoki, A.U.R. and S. Khan. 2007. Relative abundance of the red pumpkin beetle, *Aulacophora foveicollis* Lucas, on different cucurbitaceous vegetables. *Sarhad J. Agric.* **23** (1): 135-140.

Wellington, W.G. 1974. A special light to steer by Nat. Hist. December 47-52.

Yawalkar, K.S. 1985. Vegetable Crops of India. Agri-Horticultural Publishing House: Nagpur, India. 374pp.