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FIELD EVALUATION OF MUNGBEAN VARIETIES AGAINST THE INCIDENCE AND DAMAGE OF FLEA BEETLE

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Abstract

A field evaluation of ten mungbean varieties for flea beetle tolerance was conducted in Sonakhali, Barguna sadar, Barguna, Bangladesh from January to April 2016. No variety was found completely free from the attack. BARI Mung-5 and BARI Mung- 6 exhibited the lowest mean flea beetle populations (1.93/m^2 and 2.00/m^2, respectively) indicating least susceptibility. The local variety had the lowest percentage of leaf infestation per plant (13.95%), followed by BARI Mung-5 (14.84%). Flea beetle appeared in 16 days after germination (16th February) and peaked in the third week (February 23rd). No variety was found to be free the leaf area damage by flea beetle. BARI Mung-6, GK Mung-27, Binamoog-2 and IPSA Mung-5 had the highest leaf damage, indicating greater susceptibility to flea beetle infestation. Beetle populations increased with rising temperature and relative humidity. A negative correlation existed between beetle numbers and yield, showing yield decreased progressively with infestation increase. BARI Mung- 5 and BARI Mung-6 demonstrated comparatively better tolerance.

Keywords: Tolerance, susceptible, temperature, humidity.

Introduction

Mungbean [*Vigna radiata* (L.) R. Wilczek] belongs to the family Fabaceae (Lambridge and Godwin, 2006). It is an important pulse crop and is extensively grown in tropical and subtropical countries of the world (Asante *et al*., 2002). After chickpea, mungbean is called as poor man diet due to its protein content and is fulfilling the major protein demand of the people (Shafique *et al*., 2009). It is a short duration crop and its seeds bear high price. Due to its high protein level and easy digestibility, it consumed as food and has an edge over other pulses (Ghafoor *et al*., 2003). It has the capability to fix atmospheric nitrogen to the soil because of its root nodules (Hoorman *et al*., 2009). Two hundred insect pest that belongs to 48 families from the Orders, Coleoptera, Diptera, Hemiptera, Hymenoptera, Isoptera, Lepidoptera, Orthoptera, Thysanoptera and 07 mites of the Order Acarina are known to infest green gram and blackgram (Swaminathan *et al*, 2012). More than 12 species of insect pests were found to attack mungbean in Bangladesh

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(Hossain *et al*., 2004; Kabir *et al*., 2014). The percentage of leaf area damaged by flea beetle on BARI Mung-6 is 11.33% (Islam et al., 2021). Among major insect pests, flea beetle is the most damaging at seedling to vegetative stage on mungbean as early as the end of February and pest pressure is high by mid-March. Mungbean is attacked severely which first appear at the seedling stage of the crop and maintain their population up to pod formation. The larvae live in the soil and fed on root hairs and roots of the host plants, and depending on soil temperature, they develop into the pupae within 8-10 weeks. A new generation of adults then emerges from the pupae. The newly emerged flea beetles have a strong propensity to feed (John Colvin, 2010). Flea beetles feed on the cotyledons, making the severe innumerable round holes on leaves of young plants and ultimately dried the older damaged leaves. The damaged leaves dried up and the plant growth is rendered with few pods (Hossain, 2015).

Management of insect pests at farmers' level has largely been relied on synthetic chemical insecticides. However, the demand for safe food and ecologically sound control strategies, careful planning for rationalizing the insecticides interventions. In this regard, varieties can play an important role in producing high yield of mungbean because different varieties perform differently due to their genetic variations. Development of resistant varieties is an ideal component against buildup of insect population without any extra cost, compatible with other pest control method and free from environmental pollution. The exploitation of host plant resistance, an economically viable varieties measure against insect pests has become necessary to find out resistant variety with higher yield (Tamang et al., 2017). Different research institutes of Bangladesh have released different varieties of mungbean against insect pests. There is no definite and conclusive work against flea beetle of mungbean. Considering the above fact, the present study was undertaken to find out the resistance of variety against flea beetle through recording the incidence and damage of the flea beetle during cultivation period.

Materials and Methods

The experiment was conducted at the farmers' field at Sonakhali village, sadar upazila of Barguna district, Bangladesh to screen mungbean varieties against flea beetle during January to April 2016. Ten mungbean varieties *viz.*, BARI Mung-2, BARI Mung-5, BARI Mung-6, BU Mung-1, BU Mung-2, IPSA Mung-5, IPSA Mung-12, GK Mung-27, Binamoog-2 and local mung were used as treatments for this study. The seeds of these mungbean varieties were collected from Bangladesh Agricultural Research Institute (BARI), Gazipur, Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh, Bangabandhu Sheikh Mujibur Rahman Agricultural University (BSMRAU), Gazipur, and local mung variety from farmers' of Barguna. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. The whole field was divided into 3 equal blocks representing 3 replications. Each block was divided into 10 sub plots resulting 30 plots in total. The size of each unit plot was 3.0m × 2.0m. The distance maintained between two blocks and two-unit plots were 1.0 m and 0.75m, respectively. The treatments were randomly assigned to the plots within a block. The mungbean seeds were sown on 30th January 2016 @ 30 kg ha^{-1} (BARI, 2011). The fertilizers were applied as per fertilizers recommendation guide (BARI, 2011). The plants were exposed to natural insect pests' infestation and insecticide was not applied during the experimental.

Number of flea beetle

Population of flea beetle per square meter was recorded at an interval of 7 days commencing from first incidence. Data on the number of flea beetle was collected 4 times (16, 23, 30 37 DAS) at early in the morning (7.00 am to 9.00 am) at seedling and vegetative stages, respectively. All plants of one square meter were observed individually.

Percentage of leaf area damaged by flea beetle

Data on the percentage of leaf area damaged by flea beetle from 5 randomly selected plants of each unit plot were measured separately by eye estimation and recorded at vegetative stage.

Statistical analysis

The collected data were statistically analysed through the analysis of variance using Web Agri Stat Package (WASP 1.0). Means were separated by using Least Significant Difference (LSD) test at 5% level of significance.

Results and Discussion

Incidence of flea beetle on different varieties of mungbean at different DAS

Mean number of flea beetle per square meter was recorded at different days after sowing (DAS) on different mungbean varieties and is presented in Table 1 and Plate 1 A. At 16 DAS, the highest number of flea beetle/m^2 was observed in the variety IPSA Mung-5 (5.33). The second highest number was recorded in BARI Mung-6 (5.00) which was similar to Binamoog-2 (5.00) followed by IPSA Mung-12 (4.67) and BU Mung-2 (4.67). IPSA Mung-12 was identical with BU Mung-2. However, the lowest number of flea beetle was observed in the variety BARI Mung-2 (3.0) followed by BARI Mung-5 (4.0), BU Mung-2 (4.0), local Mung (4.0) and GK Mung-27 (4.33). BARI Mung-5, BU Mung-2 was identical with local mung.

At 23 DAS, significantly the highest population of flea beetle (9.00) was recorded in the variety of local Mung followed by IPSA Mung-5 (7.67), BU Mung-1 (7.67), BU Mung-2 (7.0), IPSA Mung-12 (7.0), GK Mung-27 (6.33) and Binamoog-2 (6.33). BU Mung-2 was statistically identical with IPSA Mung-12, similar to GK Mung-27 and BINA Mung-2. The lowest number of flea beetle was found in the variety of BARI Mung-5 (5.00) followed by BARI Mung-6 (5.33), BARI Mung-2 (6.0).

At 30 DAS, significantly the highest number of flea beetle/ m^2 was observed in the variety of BU Mung-2 (7.67) which was statistically similar to BARI Mung-2 (7.67). The second highest number was recorded in local mung (7.33) followed by IPSA Mung-5 (7.0), BARI Mung-2 (6.67), GK Mung-27 (6.67). BARI Mung-2 was statistically identical with GK Mung-27. However, the lowest number of flea beetle was observed in the variety of BARI Mung-5 (4.67) followed by BARI Mung-6 (6.0), BU Mung-1 (6.0) and IPSA Mung-12 (6.0). BARI Mung-6, BU Mung-1 was statistically also identical with IPSA Mung-12.

At 37 DAS, significantly the highest population of flea beetle (2.41) was recorded in the variety of local Mung followed by BARI Mung-5 (1.74), BARI Mung-2 (1.68), IPSA Mung-12 (1.68), IPSA Mung-5 (1.64), BU Mung-1 (1.60) and BU Mung-2 (1.60). BARI Mung-2 was statistically identical with IPSA Mung-12. Likewise, variety of BU Mung-1 (1.60) was statistically similar with the variety of BU Mung-2 (1.60) in respect of flea beetle population (Table 2). The lowest number of flea beetle was found in the variety of BARI Mung-6 (0.99) followed by GK Mung- 27(1.27), BARI Mung-2 (1.39).

Table 1. Flea beetle population of mungbean on selected varieties at different DAS

Varieties name	Number of flea beetle /m^2 at				Mean/m^2
	16 DAS	23 DAS	30 DAS	37 DAS	
BARI Mung - 2	3.00	6.00 b-d	6.67ab	1.68 b	4.34 b-d
GK Mung - 27	4.33	6.33 b-d	6.67ab	1.27 bc	4.46 b-d
Binamoog - 2	5.00	6.33 b-d	7.67a	1.38 bc	5.10 a-c
IPSA Mung - 5	5.33	7.67 ab	7.00ab	1.64 bc	5.41 ab
IPSA Mung - 12	4.67	7.00 a-d	6.00bc	1.68 b	4.88 a-d
BU Mung - 1	4.00	7.33 a-c	6.00bc	1.56 bc	4.72 b-d
BU Mung - 2	4.67	7.00 a-d	7.67a	1.56 bc	5.22 a-c
BARI Mung - 5	4.00	5.00 d	4.67c	1.74 ab	3.85 d
Local mung	4.00	9.00 a	7.33ab	2.41 a	5.69 a
BARI Mung - 6	5.00	5.33 cd	6.00bc	0.99 c	4.33 cd
Level of significance	NS	*	*	*	*
CV (%)	20.10	19.19	11.86	24.84	7.56

* Significant at 5 % level

Means within column followed by the same letter are not significantly different from one another by LSD test. Values are average of three replications.

From the mean of all varieties regarding flea beetle population, it was evident that local Mung, BU Mung-2, IPSA Mung-5 and Binamoog-2 had highest population of flea beetle which indicated that these varieties were highly susceptible to flea beetle. On the other hand, IPSA Mung-12, GK Mung-27, BARI Mung-2 and BU Mung-2 had lowest population of flea beetle, which indicated that these varieties were least susceptible to flea beetle. Among all tested varieties, none showed complete resistance against flea beetles. However, BARI Mung- 5 and BARI Mung- 6 had the lowest mean population of flea beetle and showed comparatively better resistance against flea beetle.

The abundance of flea beetle on mungbean at different growth period

Abundance of flea beetle varied throughout the growing period (Figure 1). Flea beetle appeared in 16 days after seed germination (February 16th) and reached its peak in the third week (February 23rd) because of soft and succulent leaves of mungbean at active vegetative stage. After that its population decreased gradually with the increasing of plant age.

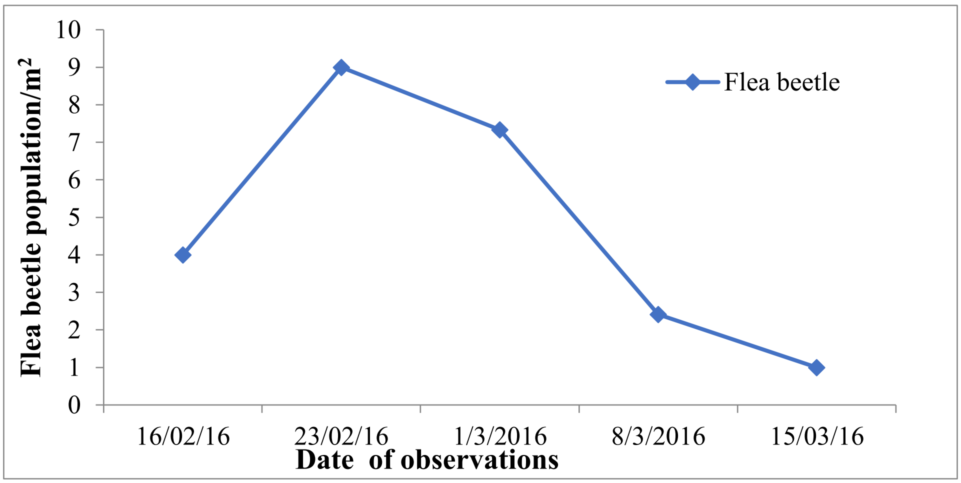

Fig. 1. The abundance of flea beetle on mungbean at various dates of observation during the year of 2016.

Percent leaf area damaged by flea beetle

Mean leaf area damaged by flea beetle on different mungbean varieties at different days after sowing is presented in Table 2 and Plate 1 B. At 16 DAS, among the varieties, significantly the highest percent leaf area damage (8.00%) was recorded from the variety Binamoog-2 followed by BARI Mung-6 (6.33%), BARI Mung-5 (6.0%), BU Mung-1 (5.33%), BU Mung-2 (5.33%), IPSA Mung-5 (5.00%) and BARI Mung-2 (5.00%). BU Mung-1 (5.33%) was statistically identical with BU

Mung-2 (5.33%), IPSA Mung-5 (5.00%) and BARI Mung-2 (5.00%). However, the lowest percent leaf area damage (3.00%) was found in the variety of IPSA Mung-12 followed by local Mung (3.67%) and GK Mung-27 (4.67%).

At 23 DAS, among the varieties, significantly the highest percent leaf area damage (15.0%) was recorded from the variety BARI Mung-6. The second highest damage leaf area was recorded in BU Mung-1 (13.33%), which was statistically similar with GK Mung-27 (13.00%), IPSA Mung-5 (12.67%) followed by Binamoog-2 (12.33%) and BARI Mung-5 (12.00%). BINA Mung-2 (12.33%) was statistically similar with BARI Mung-5 (12.00%). However, the lowest percent leaf area damage (9.33%) was found in the variety of BU Mung-1 followed by BARI Mung-2 (10.00%), BU Mung-2 (11.00%) and IPSA Mung-12 (11.00%). BU Mung-2 was statistically identical with local mung.

At 30 DAS, among the varieties, significantly the highest percent leaf area damage (24.0%) was recorded from the variety local mung. The second highest damage leaf area was recorded in IPSA Mung-12 (22.67%) and BINA Mung-2 (22.67%) followed by GK Mung-27 (22.33%), IPSA Mung-5 (22.0%), BU Mung-2 (21.33%) and local mung (21.33%). BU Mung-2 was statistically identical with local mung and which was statistically similar with Binamoog-2 (23.67%), BARI Mung-6 (22.67%), IPSA Mung-5 (22.67%), BARI Mung-6 (22.67%), IPSA Mung-12 (22.67%), GK Mung-5 (22.0%) and BARI Mung-5 (22.0%). However, the lowest percent leaf area damage (14.0%) was found in the variety of BARI Mung-5 (16.67%) followed by BU Mung-1 (19.33%) and BARI Mung-2 (18.67%).

At 37 DAS, among the varieties, significantly the highest percent leaf area damage (26.33%) was recorded from the variety BARI Mung-6, which was statistically similar with BARI Mung-2 (26.33%). The second highest damage leaf area was recorded in BU Mung-1 (25.00%) followed by IPSA Mung-27 (24.33%), BARI Mung-5 (24.07%), BINA Mung-2 (24.00%) and GK Mung- 27 (23.67%). BU Mung-1 was statistically similar with IPSA Mung-27, BARI Mung-5, Binamoog-2 and GK Mung-27. However, the lowest damage leaf area (21.33%) was recorded in the variety of local Mung. The second lowest damage leaf area IPSA Mung-12 (22.67%), which was statistically similar with BU Mung-12 (22.67%).

From the average mean percentage of leaf area damage of all varieties, it was observed that the varieties of BARI Mung-6, GK Mung-27, Binamoog-2 and IPSA Mung-5 had the highest percentage of leaf area damaged by flea beetle which indicated that these varieties were more susceptible to flea beetle infestation than other varieties. On the other hand, the varieties, BU Mung-1, BU Mung-2, BARI Mung-2, IPSA Mung-12 and BARI Mung-5 had the lowest percent leaf area damaged by flea beetle which indicated that these varieties were marginal leaf area damage by flea beetle. Among all tested varieties, none showed complete absence of leaf area damage by flea beetle. However, local Mung showed comparatively least leaf area damage (13.95%) by flea beetle. From the results of Table 2, it was evident that the percent leaf area damaged by flea beetle increasing gradually with the age of plant because of availability of maximum number of leaves in plant.

Table 2. Damaged severity of flea beetle attacking mungbean in different dates of observation during the year of 2016

Varieties name	% Damaged leaf area by flea beetle/plant at				Mean % damaged leaf area
	16 DAS	23 DAS	30 DAS	37 DAS	
BARI Mung - 2	5.00 bc	10.00 de	18.67 de	26.33 a	15.00
GK Mung - 27	4.67 b-d	13.00 b	22.33 ab	23.67 b	15.92
Binamoog - 2	8.00 a	12.33 bc	22.67 ab	24.00 b	16.75
IPSA Mung - 5	5.00 bc	12.67 b	22.00 ab	24.33 b	16.00
IPSA Mung - 12	3.00 d	11.00 cd	22.67 ab	22.67 bc	14.84
BU Mung - 1	5.33 bc	13.33 b	19.33 cd	25.00 b	15.75
BU Mung - 2	5.33 bc	11.00 cd	21.33 bc	22.67 bc	15.09
BARI Mung - 5	6.00 b	12.00 bc	16.67 e	24.07 b	14.84
Local mung	3.67 c	9.33 e	21.33 bc	21.33 c	13.95
BARI Mung - 6	6.33 ab	15.00 a	24.00 a	26.33 a	17.92
Level of significance	**	**	**	**	NS
CV (%)	22.19	8.03	7.26	5.87	10.64

** Significant at 1 % level, NS- Non significant

Means within column followed by the same letter are not significantly different from one another by LSD test. Values are average of three replications.

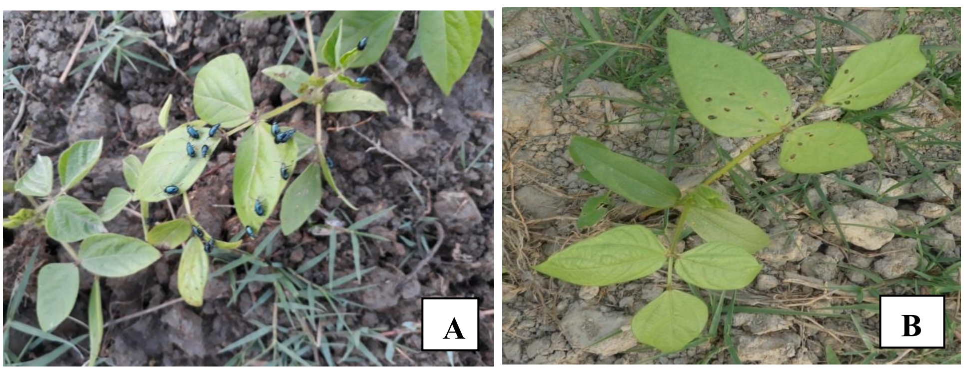

Fig. 1. Flea beetle incidence (A) and damage (B) on mungbean.

Population fluctuation of flea beetle with weather parameters on local variety of mungbean

The results of the seasonal fluctuation of flea beetle infestation are shown in Fig. 2. Flea beetle infestation started in the 3rd week of February on local variety of mungbean. The figure revealed that the population of flea beetle gradually increased with temperature and relative humidity and it was reached maximum in the 4th week of February at active vegetative stage of the crop. After 4th week of February beetle population declined gradually up to the 2nd week of March in 2016 (Figure 2) then reached to zero at 3rd week of March end of the season. This might be due to prevailing high temperature and relative humidity. The present findings are in agreement with Sharma and Dutta (1997).

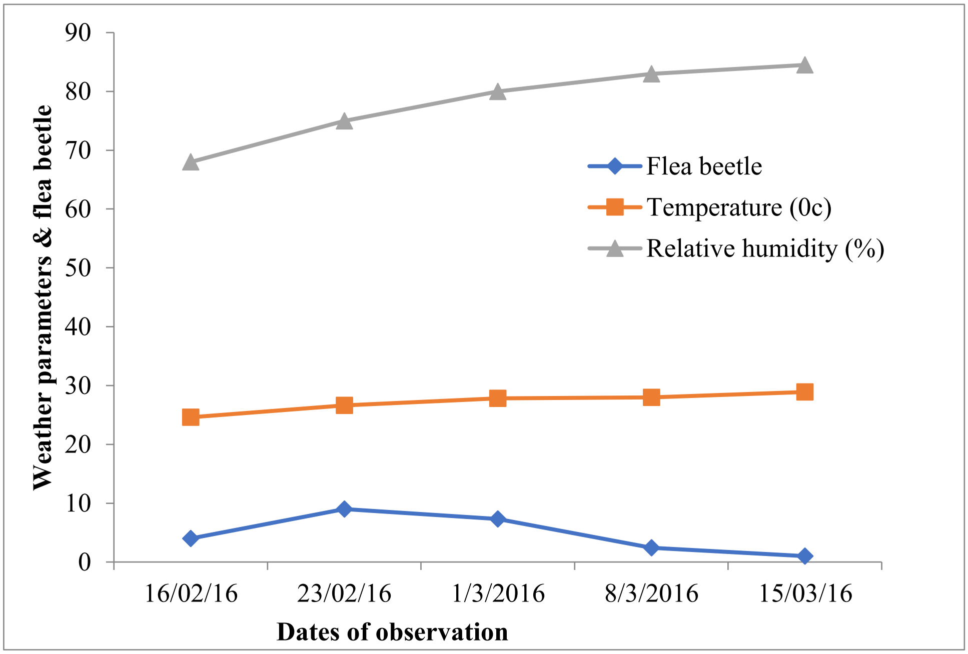

Fig. 2. Trend in population fluctuation of flea beetle with mean temperature (^{0}C) and mean relative humidity (%) on local variety of mungbean during 2016.

Relationship between flea beetle population and yield

Fig. 3 illustrated that there was a negative correlation between number of flea beetle and total yield. It indicated that with the increase of flea beetle there was progressive fall in the yield of mungbean. A linear regression was fitted between flea beetle abundance and total yield. The correlation coefficient (r) was 0.53 and the contribution of the regression (R^2 = 0.289, when Y = -36.188x + 854.02) was 29.90%.

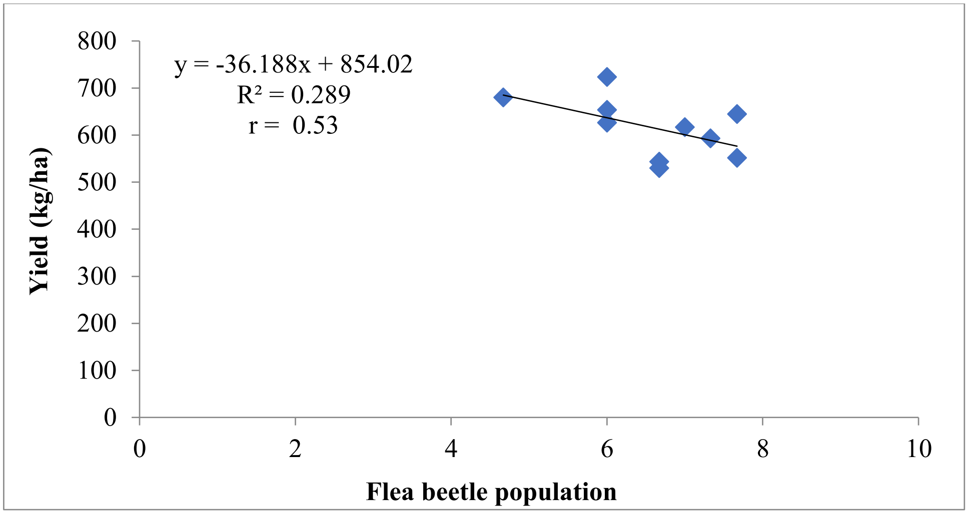

Fig. 3. Relationship between flea beetle population and yield of mungbean.

It was evident that BARI Mung-5 and BARI Mung-6 were superior mungbean variety among tested varieties in terms of flea beetle incidence and infestation, and showed the best performance regarding yield which is similar to the findings of Islam *et al*. (2021) and Islam *et al*. (2008). The results of the present study are comparable with results of experiment conducted by Khan *et al*. (2018) where they found mutant MBM-347-13 had the lowest number of flea beetle indicating lower susceptibility to flea beetle. They also found flea beetle abundance gradually increased with decreasing average temperature. Abdullah-Al-Rahad et al. (2018) found that among the varieties, BARI Mung-6 showed the least whitefly and aphid population and indicated highest resistance against whitefly and aphid infestations at different stages than all other varieties. The highest seed yield (1.82 t ha^{-1}) was recorded from BARI Mung-6, while the lowest (1.30 t ha^{-1}) was recorded from BARI Mung-4. It means that BARI Mung-6 was superior to other varieties in terms of lowest whitefly and aphid infestation and maximum yield. A group of researchers observed that the incidence and development of all insect pests are much dependent upon the prevailing weather conditions, such as temperature, relative humidity and precipitation (Aheer *et al*., 1994; Yadav and Singh, 2013 and Yadav *et al*., 2015).

Conclusion

Among 10 tested mungbean varieties, no variety was found free from insect attack and leaf area was damaged by Flea beetle. Beetle populations increased with increasing temperature and relative humidity. BARI Mung- 5 and BARI Mung-6 were comparatively better tolerance to Flea beetle.

References

Abdullah-Al-Rahad, M., M. S. Rahman, T. Akter, J. Akter, M. A. Rahman and S. M. S. Aziz. 2018. Varietal screening of mungbean against whitefly and aphid. *J. Biosci. Agric. Res.* **18**(1): 1478-1487.

Aheer, G.M., K. J. Ahmed and A. Ali. 1994. Role of weather in fluctuating aphid density in wheat crop. *J. Agril. Res*. **32**(1): 295-301.

Asante, S. K., M. Tamo and L. E. N. Jackai. 2002. Integrated management of cowpea insect pests using elite cultivars date of planting and minimum insecticide application. *Afr. Crop Sci. J.* **3**(1): 23–25.

BARI (Bangladesh Agricultural Research Institute). 2011. Krishi Projokti Hatboi (In Bangla), Gazipur, Bangladesh. pp. 260-263.

Ghafoor, A., Ahmad, Z. and Quyyum, A. 2003. Black grain (*Vigna mungo* L. Hepper) germplasm catalogue, plant genetic resources programme, PARC/JIGA, Ohio, p.17.

Hoorman, J.J., Islam, R. and Sundermeier, A. 2009. Sustainable crop rotations with cover crops, Ohio State University, Extension Fact Sheet Agriculture and Natural Resources, SAG, Green Global Foundation, Online Journal of Tejgaon, Dhaka, Bangladesh. pp.9–19.

Hossain, M. A., J. Ferdous, M. A. Sarkar and M. A. Rahman. 2004. Insecticidal management of thrips and pod borers in mungbean. *Bangladesh J. Agric. Res.* **29**(3): 347-356.

Hossain, M. A. 2015. Efficacy of some insecticides against insect pests of mungbean (*Vigna radiata* L.) *Bangladesh J. Agril. Res.* **40**(4): 657-667.

Islam, M.S., M. A Latif, and M. Ali. 2008. Field resistance of different varieties of mungbean against insect pest complex. *Bangladesh J. Entomol*. **18**(2): 23-33.

Islam, K.N., M M. H. Khan, M. M. Islam, M. M. Uddin and M. A. Latif. 2021. Prevalence on the infestation of flea beetle (*Phyllotreta nigripes*) against different varieties of mungbean. *Acta Sci. Malays*. *(ASM)* **5**(2): 56-61.

Iftekhar, M.S. and M. R. Islam. 2004. Managing mangroves in Bangladesh: A strategy analysis. *Journal of Coastal Conservation* **10**: 139-146.

John Colvin, N.R.L. 2010.. Control of flea beetles and other key insect pests of leafy salad Brassica crops. Fact sheet Field Vegetables. Horticultural Development Company funded project No. FV 301. University of Greenwich.

Kabir, M. M., M. A. Hossain, T. Farhat, S. Yasmin and N. F. Rahman. 2014. Effects of different botanicals and chemicals on the incidence of sucking insect pests and the impact on mosaic disease of mungbean. *Int. J. Res. Dev.* **3**(5), 62–68.

Khan, M.M.H., M. M. Islam, M. Asaduzzaman and M. N. Uddin. 2018. Mutants and weather parameters affecting the population dynamics of three major insect pests of mungbean. *SAARC J. Agri*. **16**(2): 1-12.

Lambridges, C.J. and I. D. Godwin. 2006. Mungbean. In: Chittarajan K. (eds.) Genome mapping and molecular breeding in plants. *Wagenigen*, **3**: 69–90.

Shafique, M., S. Nadeem, M. Hamed, B. M. Atta, B.M. and T. M. Shah. 2009. Performance of some advance desi chickpea genotypes against pod borer, Helicoverpa armigera (Hubner) resistance. *Pakistan J. Zool*. **41**(4): 277-280.

Sharma, K. K. and S. K. Dutta. 1997. A comparison of population trends of pod sucking bugs on two summer green gram varieties. *J. Agric. Sci. Society North East India* **10**(2): 206-210.

Swaminathan, R., K. Singh and V. Nepalia. 2012. Insect pest of green gram *Vigna radiata* (L.) wilczek and their management. *In*: *Agricultural Science* c2012 Apr.

Tamang, S., P. Venkatarao and G. Chakraborty. 2017. Varietal screening of mungbean cultivars for resistance/tolerance against insect pest under terai agro- ecological zone of West Bengal. *Int. J. Plant Prot*. **10**(1): 7-15.

Yadav, N.K. and P. S. Singh. 2013. Seasonal abundance of insect pests on mungbean and its correlation. *J. Entomol. Res*. **37**(4): 297-299.

Yadav, S. K., M. Agnihotri and R. S. Bisht. 2015. Seasonal incidence of insect-pests of blackgram, *Vigna mungo* (L.) and its correlation with abiotic factors. *Agril. Sci. Digest.* **35**(2): 146-148.