Seasonal Incidence of Insect Pests on Mungbean (Vigna radiata) in Correlation with Meteorological data

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ABSTRACT

**Background:** Mung bean is important pulse crop in India due to its nutritional value. Its grain contains protein, fat, carbohydrate, vitamin and minerals therefore human uses it in various ways in food. Mung bean crop cultivated in kharif, rabi and summer season in India. Various species of insect pests are infested to mung bean crop and cause very harmful effect to crop and farmer. These pests decrease productivity and quality of mung bean.

**Methods:** Field experiment was carried out for the study of seasonal incidence of insect pests on RMG-62 variety of green gram during kharif season 2019. Mung bean was grown on a plot size of 25 m x 25m with 50 cm row to row and 20 cm plant to plant spacing. Randomly selected 20 plants from weekly interval to record population of insect pests. The population of jassid and whitefly was recorded by counting number of pests on 2 upper, 2 middle and 2 lower leaves of a plant whereas population of aphid was recorded by counting number of aphid on 10 cm twig/plant.

**Result:** The mean population of aphid, jassid and whitefly were recorded. Incidence of aphid started during 33rd standard week with 0.9 aphid/10cm twig/plant, jassid and whitefly started during 32nd standard week with 0.3 jassid/6 leaves/plant and 2.1 whitefly/6 leaves/plant, respectively. Peak mean population of aphid, jassid and whitefly reached during 36th standard week with 10.2 aphid/10cm twig/plant, 10.1 jassid/6 leaves/plant and 14.1 whitefly/6 leaves/plant, respectively. Simultaneously six species of insect pests also infested green gram, these were Mylabris pustulata, Helicoverpa armigera, Trichoplusia ni., Lampides boeticus, Spoladea recurvallis and Diaphania indica. The population of aphid, jassid and whitefly positively correlated with temperature. Population of aphid and whitefly had positive correlation with humidity, whereas jassid population had positive correlation with minimum humidity and negative correlation with maximum and average humidity. All three pests expressed negative correlation with rainfall.

**Key words:** Aphid, Insect pests, Jassid, Mungbean, Seasonal incidence, Whitefly.

INTRODUCTION

Mungbean or green gram, Vigna radiata is important pulse crop in India after chickpea and pigeon pea (Ved et al. 2008). It is used as fresh green pods, dry seeds as vegetables due to presence of protein, vitamin and mineral (Das et al. 2014). Mungbean grains contain 24.2% protein, 1.3% fat and 60.4% carbohydrate (Hussain et al. 2011). It is also consumed as fresh sprout, seeds used for making soups, bread and biscuits (Sehrawat et al. 2013).

Mungbean is an important kharif pulse crop grown in the arid and semi-arid regions of India. India is the largest producer and consumer of mungbean, which is grown in 4.26 million hectare with an annual production of 2.01 million tones and yield 472 kg/hectare. More than 80 per cent of mungbean production comes from 10 states of India. These are Rajasthan, Madhya Pradesh, Maharashtra, Bihar, Karnataka, Tamil Nadu, Gujarat, Andhra Pradesh, Odisha and Telangana. Rajasthan with 42.23 per cent area and 39 per cent of production is largest mungbean producing state in India during 2017-18. In Rajasthan, mungbean grown in 17.19 lakh hectare area and production is 7.42 lakh tones (Anonymous, 2018).

Mungbean grow easily in Rajasthan because it has ability to drought tolerance, grow in harsh climate and minimum rainfall, rapid growth, early maturation, restore soil fertility by nitrogen fixation and increase soil fertility (Sharar et al. 2001).

Many insect pests attack mungbean crop causing extremely elevated losses to the crop and its production. Hence insect pests act as a limiting factor in production of mungbean (Panchabhavi and kadam, 1990). Dar et al. (2002) reported Bemisia tabaci, Empoasca kerri, Aphis craccivora and Ophiomyia phaseoli on mungbean and urdebean of which Bemisia tabaci was major pest during summer season. The insect pests noted on mungbean involve jassid (Empoasca motti, Pruthi), thrips (Caliotrips indicus, Bagnall), whitefly (Bemisia tabaci, Genn.), semiolooper (Plussia orichalcea, Fab.), green bug (Nezara viridula, Linn.), stemfly (Ophiomyia phaseoli, Tryon.), pod borers (Helicoverpa armigera, Hubner and Maruca testulalis, Geyer), tortricid moth (Cydia ptychora, Meyr), galerucid beetle (Madurasia obscurella, Jacoby) and...
The seasonal incidence of insect pests of mungbean in the semi-arid region of Rajasthan was studied by Nitharwal and Kumawat (2013). The incidence of jassid (Empoasca motti Pruthi) and whitefly (Bemisia tabaci Genn.) was observed during 36th standard week with 10.1 jassid/6 leaves/plant. The correlation of jassid population with minimum and maximum temperature, minimum, maximum and average humidity and rainfall were 0.277, 0.300, 0.048, 0.051, 0.005 and -0.305, respectively.

Whitefly (Bemisia tabaci Genn.) incidence on mungbean crop was noted during 32th standard week with 2.1 whitefly/6 leaves/plant. The peak population of whitefly was recorded during 36th standard week with 14.1 whitefly/6 leaves/plant. The correlation of whitefly population with minimum and maximum temperature, minimum, maximum and average humidity and rainfall were 0.492, 0.488, 0.141, 0.171, 0.163 and -0.099, respectively.

The population of aphid, jassid and whitefly increased gradually with the increase in temperature and reached at peak level during 36th standard week. Thereafter decline in the population of these insect pests was observed with the decrease in both temperatures. Therefore the population was positively correlated with the maximum temperature. Similar results were found in the case of population of aphid and whitefly with humidity, whereas the population of jassid was negatively co-related with minimum and average humidity. The aphid, jassid and whitefly population showed negative co-relation with rainfall.

Similar results were observed by other authors; Kumar et al. (2004) reported the peak population of whitefly in first two week of May on mungbean and second two week of September on urdbean with a positive correlation with temperature and sunshine hours. Umbrakar et al. (2010) reported that green gram crop infested by gram pod borer [Helicoverpa armigera (Hubner)], incidence of pest started from 31th standard week and reached at peak in 37th standard week. Pest population had positive correlation with maximum temperature and negative with minimum temperature, humidity and rainfall.

The major insect pests of mungbean recorded in the semi-arid region of Rajasthan were jassid (Empoasca motti), whitefly (Bemisia tabaci) and thrips (Calothrips indicus). The incidence of insect pests started from first week of August and remained active throughout the crop season. The peak population of these pests was observed in the first week of September (Nitharwal and Kumawat, 2013).

The seasonal incidence of insect pests of mungbean during kharif season indicated that the population of jassid and whitefly started from 31st standard week with 0.4/cage jassid and 0.2/cage whitefly. The peak population of jassid and whitefly ranged from 0.4-5.8/cage and 0.2-7.4/cage respectively. The incidence of thrips, blister beetle, tobacco caterpillar, epilachna beetle were also reported (Singh and Yadav, 2013).

Yadav et al. (2015) reported incidence of whitefly on green gram started from 38th standard week and attained peak population in 39th standard week. Whitefly population showed positive correlation with temperature, humidity and rainfall.
Seasonal Incidence of Insect Pests on Mungbean (Vigna radiata) in Correlation with Meteorological data

Table 1: Seasonal incidence of insect pests on mungbean during kharif season-2019.

| Standard observation | Date of week | Aphid/10cm twig/plant | Jassid/6 leaves/plant | Whitefly/6 leaves/plant |
|----------------------|--------------|-----------------------|-----------------------|------------------------|
| 32                   | 09/08/2019   | 0.3                   | 2.1                   | 2.1                    |
| 33                   | 16/08/2019   | 2.4                   | 6.4                   | 6.4                    |
| 34                   | 23/08/2019   | 6.2                   | 9.7                   | 9.7                    |
| 35                   | 30/08/2019   | 8.9                   | 10.1                  | 10.1                   |
| 36                   | 06/09/2019   | 10.1                  | 14.1                  | 14.1                   |
| 37                   | 13/09/2019   | 7.4                   | 10.3                  | 10.3                   |
| 38                   | 20/09/2019   | 6.3                   | 8.4                   | 8.4                    |
| 39                   | 27/09/2019   | 4.3                   | 5.5                   | 5.5                    |
| 40                   | 04/10/2019   | 3.2                   | 3.2                   | 3.2                    |
| 41                   | 11/10/2019   | 2.6                   | 2.3                   | 2.3                    |

Kumar et al. (2016) reported that mungbean crop is infested by jassid (Empoasca kerri), whitefly (Bemisia tabaci) and thrips (Taeniothrips sp.) and incidence of these insect pests started from 15th standard week and remained up to 22nd standard week. Peak population of insect pests were recorded in 20th standard week. Jassid population had positive correlation with temperature and negative correlation with humidity.

Bairwa and Singh (2017) investigated that the population dynamics of major insect pests of mungbean in relation to abiotic factors during kharif season 2014-2015 revealing the peak population of Bemisia tabaci, Caliothrips indicus, Maruca vitrata, Aphis craccivora and Empoasca kerri in 35th standard week. The maximum temperature had positive correlation with population dynamics of E. kerri, A. craccivora, C. indicus and M. vitrata. E. kerri had positive correlation with rainfall while all other insect had negative correlation with rainfall. E. kerri and all other insect showed negative correlation with sunshine.

Mohapatra et al. (2018) observed that black gram, Vigna mungo (Linn.) crop was mainly infested by whitefly (Bemisia tabaci), jassid (Empoasca kerri), bihar hairy caterpillar (Spilosoma oblique Walker) and tobacco caterpillar (Spodoptera litura F.). The maximum population

Table 2: Weekly recorded meteorological data during the kharif season-2019.

| Date of observation | Temperature (°C) | Relative humidity (%) | Rainfall (mm) |
|---------------------|------------------|-----------------------|---------------|
|                     | Min. | Max. | Min. | Max. | Avg. |               |
| 09/08/2019          | 30   | 38   | 41   | 57   | 49.5 | 0.0           |
| 16/08/2019          | 26   | 36   | 50   | 71   | 62.1 | 78.0          |
| 23/08/2019          | 28   | 39   | 22   | 46   | 33.8 | 0.0           |
| 30/08/2019          | 26   | 34   | 35   | 59   | 46.8 | 7.9           |
| 06/09/2019          | 29   | 40   | 37   | 60   | 49.1 | 0.0           |
| 13/09/2019          | 28   | 40   | 35   | 54   | 45.6 | 0.0           |
| 20/09/2019          | 27   | 37   | 43   | 68   | 55.2 | 0.90          |
| 27/09/2019          | 27   | 38   | 39   | 71   | 55.5 | 0.0           |
| 04/10/2019          | 20   | 31   | 29   | 53   | 40.8 | 11.9          |
| 11/10/2019          | 22   | 36   | 18   | 41   | 29.3 | 0.0           |

Table 3: Correlation coefficient (r) of insect pests with abiotic factors.

| Abiotic factors         | Aphid | Jassid | Whitefly |
|-------------------------|-------|--------|----------|
| Minimum Temperature (°C) | 0.309 | 0.277  | 0.492    |
| Maximum Temperature (°C) | 0.373 | 0.300  | 0.488    |
| Minimum Humidity %      | 0.084 | -0.048 | 0.141    |
| Maximum Humidity %      | 0.100 | 0.051  | 0.171    |
| Average Humidity %      | 0.088 | -0.005 | 0.163    |
| Rainfall (mm)           | -0.349| -0.305 | -0.099   |

*Correlation is significant at 0.05 level.
of pests was observed during 39th standard week. All insect pests under study had positive correlation with temperature and rainfall and negative correlation with relative humidity.

Singh et al. (2019) investigated seasonal incidence of sucking insect pests of green gram during kharif 2015, the peak population of jassid and whitefly during first week of September. Jassid and whitefly population showed negative correlation with minimum temperature, relative humidity and rainfall but with maximum temperature jassid had negative correlation and whitefly had positive correlation.

Rajawat et al. (2020) reported that black gram crop was infested by whitefly and aphid. The incidence of whitefly started from 5th week of July and reached at peak in 4th week of August and aphid started from 2nd week of August and reached at peak in 2nd week of September. Both pests had positive correlation with temperature and negative with humidity and rainfall.

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