

Varietal Susceptibility of Mung and Mash Beans to Insect Pests in Sindh, Pakistan

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Abstract:

Research experiment on the varietal susceptibility of Mung and Mash beans to insect pests, was carried out at experiment farm, Rice Research Institute, Dokri, Sindh-Pakistan during Kharif season of 2013. The Mung bean variety C-23 and Local Mash bean variety were sown in a randomized complete block design with four replications. The results indicated that the insect pests viz. thrip, whitefly, aphid, gram pod borer and hairy caterpillar attacked on both the mung bean and mash bean crops. In infested plants, population of thrips was significantly more than other insect pests. The mung bean variety C-23 was more susceptible than the mash bean against these insect pests. It is suggested that these crops may be protected against the insect pests by cultivating resistant varieties.

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INTRODUCTION

The *Asiatic vigna* or “mung bean” group consists of several related species which have long been cultivated in regions throughout central, southern and eastern Asia. All are annual, short duration plants and are grown primarily for their edible dry seeds, although the immature fruits and seeds are occasionally used as green vegetables and the plants as fodder or green manure. Green gram (*Vigna radiate* L. Wilczek) and black gram (*V. mungo* L. Hepper) are the most widely utilized species of the group (Hashmi, 1994).

Throughout Asia, green gram and black gram are used primarily for food and in many countries they provide a major source of protein in cereal based diets. The dried seed may be eaten whole or split, cooked or milled and ground into flour. Whole or split are used to make “Dal” soups, curries and are added to various spice or fried dishes. The flour is used to make noodles, breads and biscuits, an important green gram by-product is starch noodles which are transparent, easy to cook and stores well (Khosro, 1994). Mungbean is an important pulse crop having high nutritive value. Its seed contains 24.2% protein, 1.3% fat and 60.4 % carbohydrate. It is a short duration crop and can be grown twice a year i.e. in spring and autumn seasons (Hussain *et al.* 2011).

Mungbean is vulnerable to a wide variety of insect pests throughout its growing season. Some reports suggested that a total of 64 species of insect pests attacking mung bean. Amongst them aleyrodid, *Bemisia tabaci*, *Empoasca kerri*, the aphid, *Aphis craccivora*, the acrtiid, *Diacrisia oblique*, the chrysomelid, *Modurasia obscurella*, the agromyzid, *Ophiomyia phaseoli*, the lycaenid, *Euchrysops canejus* and the pyralid, *Maruca testulalis* are of economic importance (Rajput *et al.*

1993, Hassan *et al.* 1998). Mung and mash beans suffer heavily due to attack of insect and mite pests viz., whitefly, jassid aphid, thrips, gram pod borer and mites (Chhabra and Korner 1994).

The present studies were, therefore conducted at experiment farm of Rice Research Institute, Dokri, Sindh-Pakistan during Kharif season of 2013 to study the varietal susceptibility of mung and mash beans to insect pests.

MATERIALS AND METHODS

Comparative study on the varietal susceptibility of mung and mash beans to insect pests was carried out at Latif Experimental Farm, Sindh Agriculture University, Tandojam during the Kharif season of 2013. Seeds of Green gram or Mungbean variety C-23 and Black gram or mash mean local variety were obtained from Agriculture Research Institute, Tandojam. The crop was sown by drilling method during the 23rd of the July 2013. The design of the experimental area was randomized complete block design (RCBD) with two varieties (treatments) and each variety was replicated four times. Each replicate or plots comprised of 4 ridges of 2 ft. The distance between ridge to ridge and between plants was maintained one foot and 3-4 inches respectively. Observations were started at two week after germination on 12 August 2013. The data was recorded twice a week.

The observations of thrips and one species of aphids were made when the plants were 19 days old, population of aphids was recorded when the plants were 54 days old. For recording the gram pod borer, *H. armigera* and Hairy caterpillars, twenty plants randomly selected from each replication and 5 leaves per plant were observed. Data was recorded twice in a week and average population per plant of thrip, aphids, *H. armigera* and hairy caterpillar were calculated. For the collection and observation of thrip and

aphids the Aspirator was used and preserved in formaline. The larvae and pupae of *H. armigera* and hairy caterpillar were reared under the cage and in, Petri dishes respectively. The data were analyzed statistically.

RESULTS

Taxonomic position of insect pests associated with Mung and mash beans during August to November, 2013 were recorded and shown in Table 1.

Table 1. Taxonomic status of recorded insect pests on Mung and mash beans

Common Name	Technical Name	Family	Order
Pea Thrip	<i>Caliothrips indicus</i> (Bagnal)	Thripidae	Thysanoptera
Whitefly	<i>Bemisia tabaci</i> (G)	Aleurodidae	Homoptera
Aphid	<i>Aphis craccivora</i> (koch)	Aphididae	Homoptera
Hairy caterpillar	<i>Diacrisia obliqua</i> (WLK)	Arctiidae	Lepidoptera
Gram pod borer	<i>Helicoverpa armigera</i> (Hbner)	Noctuidae	Lepidoptera

A. Sucking insect pests

***Pea Thrip, Caliothrips indicus* (Bagnal)**

The population build-up of pea thrip on Mungbean variety C-23 and Mash local is shown in Tables 2 and 3 respectively. The pea thrip started its appearance on Mungbean from 12th August 2013 to 2nd November 2013 (Table, 2) and on Mash local variety upto 16th October 2013 (Table 3). Population pattern reveals one peak in Mungbean (C-23 variety) which appeared on 16th October when the population was recorded 31.04 thrips per plant (Table-2). On Mash local variety there was one peak during first week of October when the population was recorded 10.85 thrips per plant. However, constant presence of the pest from August to October and November does not rule out the possibility of the occurrence of over-lapping generation.

Whitefly, *Bemisia tabaci* (G)

The population builds up of whitefly on both C-23 variety of mungbean and local variety of Mash bean is given in the Tables 2 and 3. Whitefly started their appearance on both pulses. It appeared on Mung bean C-23 variety from 12th August upto 2nd October 2013 and on Mash bean from 12th August upto 16th October 2013. Population pattern of whitefly reveals one well defined Peak on C-23 variety of mungbean during the 2nd week of October on 9-10-2013 (4.22 ± 0.25 per plant). Similarly the peak population of whitefly on mash bean was observed during the second week of October i.e. on 13-10-2013 (0.52 ± 0.13 per plant).

Aphid, *Aphis craccivora* (koch)

The population build up of aphid was recorded on both mungbean and mash bean during August to November 2013. The results are given in Tables 2 and 3, respectively. The data reveals that the aphid appeared on C-23 variety of Mungbean from 16th September 2013 upto 2nd November 2013 and on mash bean from 29th August upto 16th October 2013. Population pattern revealed a well defined peaks during the 2nd week of October (1.38 ± 0.27) and 4th week of October (2.34 ± 0.04) on C-23 variety. Aphid population on mashbean variety remained very low.

B. Chewing insect pest

Hairy caterpillar, *Diacrisia obliqua* (WLK.)

The populations build up of hairy caterpillar on both mungbean and a mash bean variety during August to November 2013 is given in the Tables 2 and 3, respectively. The insect appeared on Mungbean variety from 26th August upto 2nd November 2013 and it was observed that the attack of this insect on Mungbean was little bit more than mash bean. Population pattern reveals well defined peaks throughout the study period i.e Mungbean

during 13-10-2013 (0.26 ± 0.02) and on mash bean on 9-10-2013 (0.23 ± 0.01).

Gram pod borer, *Helicoverpa armigera* (Hb.)

The population builds up of *H. armigera* on both mungbean and mash bean were observed and is shown in Tables 2 and 3 respectively. The pod borer population appeared on Mungbean i.e. from 29th August 2013 upto 2nd November 2013 and on mash bean from 16th August to 16th October 2013. Population pattern reveals well defined peaks in both pulses during August to November i.e on mungbean during 3rd week of September (23 ± 0.04) and on mashbean during 3rd week of September (0.13 ± 0.02) and during 1st week of October (0.13 ± 0.01).

Table 2. Population density of various insect pests (x ± SE) on C-23 variety of Mungbean.

Observation dates	Mean number of insects per plant (mean ± S.E)				
	Pea Thrip	Whitefly	Aphid	Hairy caterpillar	Gram pod borer
12-08-2013	2.04 ± 0.11	0.45 ± 0.08	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
15-08-2013	1.67 ± 0.13	0.42 ± 0.10	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
19-08-2013	2.23 ± 0.34	0.18 ± 0.06	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
22-08-2013	2.39 ± 0.32	0.43 ± 0.11	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
26-08-2013	1.78 ± 0.20	0.08 ± 0.03	0.0 ± 0.0	0.03 ± 0.03	0.0 ± 0.0
29-08-2013	1.30 ± 0.12	0.22 ± 0.07	0.0 ± 0.0	0.03 ± 0.03	0.07 ± 0.03
02-09-2013	1.25 ± 0.17	0.22 ± 0.03	0.0 ± 0.0	0.08 ± 0.01	0.04 ± 0.02
05-09-2013	1.1 ± 0.11	0.11 ± 0.02	0.0 ± 0.0	0.09 ± 0.01	0.04 ± 0.02
09-09-2013	1.58 ± 0.25	0.07 ± 0.02	0.0 ± 0.0	0.06 ± 0.01	0.03 ± 0.02
12-09-2013	4.35 ± 0.19	0.10 ± 0.02	0.0 ± 0.0	0.06 ± 0.01	0.22 ± 0.02
16-09-2013	7.43 ± 1.04	0.09 ± 0.02	0.06 ± 0.06	0.07 ± 0.02	0.23 ± 0.04
19-09-2013	9.95 ± 0.71	0.18 ± 0.03	0.04 ± 0.03	0.05 ± 0.03	0.23 ± 0.04
23-09-2013	9.37 ± 1.77	0.24 ± 0.04	0.07 ± 0.03	0.04 ± 0.01	0.20 ± 0.03
26-09-2013	10.35 ± 1.47	0.07 ± 0.02	0.10 ± 0.02	0.08 ± 0.03	0.18 ± 0.02
30-09-2013	12.89 ± 0.99	0.05 ± 0.03	0.08 ± 0.03	0.09 ± 0.02	0.18 ± 0.05
02-10-2013	14.83 ± 0.45	0.73 ± 0.18	0.20 ± 0.05	0.08 ± 0.02	0.07 ± 0.01
06-10-2013	14.6 ± 0.53	2.23 ± 0.28	0.29 ± 0.07	0.13 ± 0.02	0.08 ± 0.02
09-10-2013	16.2 ± 0.57	4.22 ± 0.25	0.08 ± 0.02	0.23 ± 0.03	0.07 ± 0.02
13-10-2013	11.83 ± 1.59	2.67 ± 0.14	1.38 ± 0.27	0.26 ± 0.02	0.08 ± 0.01
16-10-2013	31.04 ± 1.35	1.13 ± 0.09	0.50 ± 0.06	0.24 ± 0.03	0.06 ± 0.02
20-10-2013	22.46 ± 1.08	1.11 ± 0.19	1.13 ± 0.19	0.12 ± 0.02	0.08 ± 0.01
23-10-2013	3.51 ± 0.33	0.72 ± 0.15	0.87 ± 0.04	0.13 ± 0.02	0.10 ± 0.01
27-10-2013	1.93 ± 0.26	0.44 ± 0.08	2.34 ± 0.04	0.13 ± 0.09	0.07 ± 0.01
02-11-2013	0.71 ± 0.04	0.12 ± 0.03	0.37 ± 0.04	0.07 ± 0.02	0.03 ± 0.01
$\bar{x} \pm S.E$	7.80 ± 0.84	0.86 ± 0.08	0.53 ± 0.06	0.10 ± 0.02	0.11 ± 0.02

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Observation dates = P < 0.01
 Insect pests = P < 0.01

Table 3. Population density of various insect pests (x ± SE) on local variety of Mash bean.

Observation dates	Mean number of insects per plant				
	Pea Thrip	Whitefly	Aphid	Hairy caterpillar	Gram pod borer
12-08-2013	1.86 ± 0.33	0.16 ± 0.06	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
15-08-2013	2.02 ± 0.24	0.27 ± 0.05	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
19-08-2013	0.03 ± 0.14	0.08 ± 0.03	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
22-08-2013	1.84 ± 0.08	0.12 ± 0.05	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0
26-08-2013	1.13 ± 0.12	0.08 ± 0.03	0.0 ± 0.0	0.03 ± 0.01	0.0 ± 0.0
29-08-2013	0.19 ± 0.16	0.24 ± 0.02	0.07 ± 0.03	0.03 ± 0.01	0.0 ± 0.0
02-09-2013	0.81 ± 0.25	0.06 ± 0.02	0.09 ± 0.03	0.02 ± 0.01	0.0 ± 0.0
05-09-2013	0.77 ± 0.19	0.04 ± 0.02	0.08 ± 0.03	0.02 ± 0.01	0.0 ± 0.0
09-09-2013	1.67 ± 0.22	0.08 ± 0.02	0.08 ± 0.03	0.02 ± 0.01	0.02 ± 0.01
12-09-2013	5.66 ± 0.54	0.15 ± 0.02	0.08 ± 0.02	0.02 ± 0.01	0.04 ± 0.01
16-09-2013	4.21 ± 0.34	0.04 ± 0.01	0.06 ± 0.02	0.06 ± 0.02	0.02 ± 0.01
19-09-2013	5.47 ± 0.46	0.05 ± 0.01	0.03 ± 0.01	0.04 ± 0.01	0.13 ± 0.02
23-09-2013	5.50 ± 0.73	0.09 ± 0.02	0.06 ± 0.02	0.05 ± 0.01	0.12 ± 0.02
26-09-2013	7.11 ± 1.70	0.10 ± 0.01	0.05 ± 0.01	0.06 ± 0.01	0.12 ± 0.03
30-09-2013	9.25 ± 2.27	0.05 ± 0.01	0.06 ± 0.02	0.06 ± 0.01	0.11 ± 0.05
02-10-2013	10.85 ± 2.22	0.09 ± 0.02	0.13 ± 0.03	0.06 ± 0.01	0.08 ± 0.04
06-10-2013	9.22 ± 0.62	0.03 ± 0.01	0.11 ± 0.02	0.13 ± 0.01	0.13 ± 0.01
09-10-2013	10.45 ± 0.53	0.14 ± 0.02	0.12 ± 0.01	0.23 ± 0.01	0.57 ± 0.05
13-10-2013	8.0 ± 1.92	0.54 ± 0.01	0.05 ± 0.01	0.04 ± 0.01	0.13 ± 0.02
16-10-2013	3.53 ± 1.45	0.52 ± 0.13	0.08 ± 0.01	0.04 ± 0.01	0.12 ± 0.02
$\bar{x} \pm S.E$	4.57 ± 0.18	0.14 ± 0.02	0.08 ± 0.02	0.05 ± 0.01	0.12 ± 0.02

Observation dates = P < 0.01
 Insect pests = P < 0.01

DISCUSSION

The present studies indicated that mungbean and mash bean crops are vulnerable to the attack of many insect pests, i.e., thrips, whitefly, aphid, gram pod borer and hairy caterpillar. These insect pests can cause economic losses to the above mentioned crops. Similarly Hassan *et al.* (1998) also reported that whitefly, thrips, aphids, *Heliothis* and *Tetranychus* mites were the major pests of mung and mash varieties. The mungbean variety NM-13-1 showed comparatively higher yield loss (18.31%) than other varieties.

Similar studies were conducted by Hassan *et al.* (1998) they tested four varieties of mung bean (NM-19-19, NM 20-21, NM, 13-1, 6601 and one variety of mash bean (bnash 48) against whitefly, jassid, thrips, aphids, *Heliothis* and *tetranychus* mites indicated significantly higher population of the aforesaid pests on variety NM13-1 than others. The remaining varieties were statistically at par with one another in respect of whitefly, thrips and gram pod borer. Significantly lower population of jassid and aphid was observed on variety NM 19-19. The variety NM 13-1, showed comparatively higher yield loss (18.31%) followed by Mash-48 (17.42%) and 6001 (15.9%). The variety NM 19-19 showed comparatively lower yield loss (7.77%) followed by NM 21-21 (9.20%). During present study it has been suggested that only those varieties of mung and mash beans may be cultivated which are resistant to insect pests. In severe cases of infestation of insect pests on mungbean and mash crops, the control measures may be adopted. Related to present study some attempts have also been made in India and Pakistan to determine varietal response of beans to insect pest by (Afzal *et al.*, 2000; and Chkabra and Kooner, 1994).

CONCLUSION

- Results indicated that the insect pests viz. thrip, whitefly, aphid, gram pod borer and hairy caterpillar attacked on both the mung bean and mash bean crops.
- In infested plants, population of thrips was significantly more than other insect pests.
- The mung bean variety C-23 was more susceptible than the mash bean against these insect pests.

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