

**STUDIES ON POPULATION DYNAMICS OF  
SUCKING INSECT PESTS OF MUSTARD CROP  
(*BRASSICA CAMPESTRIS*)**

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**ABSTRACT**

An experiment on population dynamics of sucking insect pests of mustard crop was conducted. Six varieties of mustard crop viz. Yellow sarsoon, Brown sarsoon, Dark green leaves, Torya Early, Raya Anmol and Rai S-9 were cultivated. Results indicated that sucking insect pests such as *Bemisia tabaci*, (Genn). *Lipaphis erysimi* (Kalt). and *Bagrada picta* (F). appeared from seedling till harvest of the crop. Two peaks in the population of *B. tabaci* and one peak in the population of *L. erysimi* and *B. picta* were recorded. The over all means showed that the maximum ( $6.71 \pm 0.98$ ) per leaf population of *B. tabaci* was recorded on Yellow sarsoon followed by Dark green leaves ( $6.30 \pm 0.61$ ), Brown sarsoon ( $6.19 \pm 0.63$ ), Raya Anmol ( $5.40 \pm 0.55$ ), Torya Early ( $5.38 \pm 0.57$ ) and Rai S-9 ( $3.79 \pm 0.50$ ). The population of *L. erysimi* in descending order was ( $9.27 \pm 2.12$ ), ( $8.09 \pm 1.81$ ), ( $7.93 \pm 1.76$ ), ( $6.37 \pm 1.35$ ), ( $6.13 \pm 1.41$ ) and ( $2.07 \pm 0.36$ ) recorded on Yellow sarsoon, Brown sarsoon, Dark green leaves, Raya Anmol, Torya Early and Rai S-9, respectively. The highest ( $5.38 \pm 0.57$ ) population of *B. picta* was recorded on Torya Early and least on S-9 ( $3.79 \pm 0.50$ ). The analysis of variance showed significant difference in the populations of all sucking insect pests on all six varieties. However, LSD showed non-significant difference in the population of *B. picta* on varieties Yellow sarsoon and Dark green leaves; Torya Early and Raya Anmol. For the population of *L. erysimi* non-significant differences were recorded between Brown sarsoon and Dark green leaves; Torya Early and Raya Anmol. Similar difference was also recorded in the population of *B. picta* on Torya Early and Raya Anmol; Brown sarsoon and Dark green leaves, Yellow sarsoon and Rai S-9. The predators such as spiders, Coccinellids, *Coccinella septempunctata*, *Menochilus sexmaculata*, Lacewing, *Chrysoperla carnea* and Minute pirate bug, *Orius tristicolor* were found active on these insect pests. However, maximum activities were recorded on the varieties having maximum insect pest activities.

**Keywords:** Mustard, *Bemisia tabaci*, *Lipaphis erysimi*, *Bagrada picta* and predators

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## INTRODUCTION

Edible oil is one of the nutritionally essential diet and its consumption is increasing in our country. The edible oil requirements have increased from 0.3 million tones to 1.95 million tones. The per capita consumption of edible oil is around 14-15 kg against an average of 8-9 kg for developing countries. (Agri-stat of Pakistan, 2004-05).

The major oilseed crops include cottonseed, rapeseed/mustard, sunflower and canola etc. The edible oil available in the country from all sources was 3.066 million tons during 2007-08. Local production of edible oil stood at 833 thousand tons, which is 27.2% of the total availability in the country while the remaining 72.8% was made available through imports.

The invasion by insect pests and diseases are one of the important factors responsible for low yield. The mustard crop is more vulnerable to a wide variety of insect pests from sowing till harvest than other oil seed crops. The insect pests of economic importance are, cabbage aphid, *Brevicoryne brassica* (L), mustard aphid, *Lipaphis erysimi* (Kalt.), mustard sawfly, *Athalia proxima* (Klug), cabbage butterfly, *Pieris brassicae* (Linn), Painted bug *Bagrada picta* (K), Mustard leaf eater, *Spodoptera litura* (F), leafminer, *Chromatomyia horticola* (Goureau) Thrip, *Thrip tabaci* and Whitefly, *Bemesia tabaci* (Gennadius) (Verma, *et al.* 1993).

Pardhan (1990) reported that the whiteflies are a limiting factor in the production of mustard and rape seed. Mustard aphid causes considerable damage to rape seed and mustard. Clusters of nymphs and adults may be seen on tender leaves, flower stalks and pods, sucking the sap and damage by giving out honeydew. The infested leaves turn yellowish pale and acquire a curly appearance, the flowers fail to form pods. The Painted Bug, *Bagrada Picta*, (Kir) (Hemiptera: Pentatomidae). suck the sap from the tender parts of the plants. They do not spare fruits in their attempt to satisfy their hunger on plants chosen by them for food. They stay in cluster and take shelter on stems and leaves. The affected plants are deprived of their vitality. It occurs throughout Pakistan that has a special taste for cruciferous plants (Jha.1987). Saljoqi *et al.* (2006) reported that the *Lipaphis erysimi* K. is a worldwide pest on *Brassica* crops. Begum (1995).

Keeping the above points in view the present experiments were conducted to observe the population dynamics of sucking insect pests of mustard for proper pest management. It will increase our understanding

to diagnose the vulnerable stages of the pests that will be helpful for their proper control measures.

## **MATERIALS AND METHODS**

Mustard varieties namely: Yellow sarsoon, Brown sarsoon, Torya Early, Raya Anmol, Dark green leaves and Rai S-9 were grown in 2008 in a Completely Randomized Block Design with four replications. The sub-plot size was 18x6 meter. The row-to-row and plant-to-plant distance was maintained 9 and 6 inches, respectively. All agronomical practices were applied as and when required. To record data on population of insect pests and predators various methods were used, which are stated as follows:

### **White fly, *Bemisia tabaci* (Genn). (Homoptera: Aleyrodidae)**

The population counts of whitefly were made once a week, which started one week after germination and continued till the maturity of the crop. As whitefly developed their colonies on the under side of the leaves, the counting was made on the under side of the leaves. Therefore, 50 leaves were selected from 10 plants. The plants were selected from three randomly selected rows from each sub-plot. The nymphs and adults of whitefly were counted.

### **Mustard aphid, *Lipaphis erysimi* (Kalt).(Homoptera: Aphididae)**

Since aphid attacked the leaves and shoots of the crop, therefore population of aphid was counted on leaves and shoots as well. Its population on the leaves was counted similarly as in case of whitefly. The population on the shoots was counted by putting a square inch metal frame on shoots. The numbers of aphids present within the metal frame were counted. The frame was put 25 times on randomly selected shoots.

### **Painted bug, *Bagrada picta* (F). (Heteroptera: Pentatomidae)**

The population of painted bug was recorded similarly as in case of whitefly. The painted bug appeared on both sides of the leaves; therefore, the leaves were thoroughly examined. Adults as well as nymphs were counted.

### **Natural enemies**

Total number of natural enemies (predators) such as spiders, Coccinellids, Lacewing and Minute pirate bug were found active on these insect pests. Population of natural enemies was recorded by using

sweep net method and visual count. For sweep net method about 20 strokes of sweeping were made. After each five strokes, the predators caught in the net were counted. For visual method 25 plants were randomly observed. The predators found on the plants were counted. This was done for each variety separately.

Table 1. Mean population of whitefly, *Bemisia tabaci* per leaf on different varieties of mustard crop from November 2008 to February 2009.

| Date of observation | Rai S-9   | Raya anmol | D. Green leaves | Yellow sarsoon | Torya early | Brown sarsoon |
|---------------------|-----------|------------|-----------------|----------------|-------------|---------------|
| 15-11-2008          | 2.53±0.69 | 3.86±0.72  | 4.53±0.99       | 2.4±0.66       | 3.13±0.59   | 4.13±0.93     |
| 22-11               | 3.66±0.68 | 5.06±1.00  | 6.26±1.03       | 7.06±1.18      | 4.73±0.95   | 6.13±0.94     |
| 30-11               | 4.06±0.84 | 5.93±1.01  | 7.46±1.34       | 8.73±1.63      | 5.40±0.66   | 7.60±1.16     |
| 6-12                | 2.46±0.57 | 3.53±0.73  | 4.00±0.72       | 4.93±1.11      | 3.40±0.89   | 3.60±0.92     |
| 12-12               | 4.80±1.11 | 6.66±1.08  | 6.40±1.29       | 6.46±0.76      | 6.80±0.76   | 6.73±0.75     |
| 19-12               | 5.73±0.83 | 6.73±0.65  | 7.93±0.28       | 9.00±1.52      | 6.93±0.67   | 7.60±0.56     |
| 26-12               | 6.33±1.15 | 7.66±0.58  | 8.26±0.70       | 11.33±1.88     | 7.06±0.95   | 8.60±0.64     |
| 02-01-2009          | 6.46±1.37 | 8.53±1.50  | 9.66±1.66       | 13.80±2.17     | 8.33±1.53   | 9.46±1.61     |
| 09-01               | 3.46±0.49 | 5.33±0.61  | 7.60±0.48       | 4.53±0.80      | 6.26±0.90   | 7.06±0.81     |
| 16-01               | 3.13±0.43 | 6.20±0.51  | 7.33±0.81       | 4.80±0.62      | 6.93±0.67   | 7.40±0.71     |
| 22-01               | 2.13±0.55 | 3.26±0.72  | 3.53±0.80       | 4.46±0.73      | 3.60±0.76   | 3.20±0.84     |
| 01-02               | 0.80±0.27 | 2.13±0.64  | 2.73±0.85       | 3.13±0.46      | 2.00±0.60   | 2.86±0.91     |
| Mean                | 3.79±0.50 | 5.40±0.55  | 6.30±0.61       | 6.71±0.98      | 5.38±0.57   | 6.19±0.63     |
| S.E                 | C         | B          | A               | A              | B           | AB            |

Means followed by the same letter are not significantly different at P<0.05.

Table 2. Mean population of aphid, *Lipaphis erysimi* per leaf/shoot on different varieties of mustard crop from November 2008 to February 2009.

| Dates of observation | Rai S-9   | Torya early | D. Green leaves | Yellow sarsoon | Raya anmol | Brown sarsoon |
|----------------------|-----------|-------------|-----------------|----------------|------------|---------------|
| 15-11-2008           | 0.86±0.19 | 1.66±0.36   | 1.93±0.43       | 2.53±0.79      | 2.00±0.36  | 2.20±0.32     |
| 22-11                | 1.40±0.32 | 2.06±0.31   | 2.93±0.56       | 3.06±0.78      | 2.46±0.60  | 2.80±0.63     |
| 30-11                | 1.46±0.32 | 1.80±0.31   | 2.33±0.31       | 1.35±0.21      | 3.06±0.83  | 2.60±0.50     |
| 6-12                 | 1.40±0.30 | 4.20±0.96   | 6.40±2.89       | 7.26±1.50      | 4.40±0.97  | 6.00±0.77     |
| 12-12                | 2.53±0.45 | 12.60±2.42  | 16.06±2.41      | 20.33±2.40     | 12.26±2.17 | 17.20±2.15    |
| 19-12                | 3.00±0.76 | 11.86±1.79  | 16.00±2.30      | 18.66±2.46     | 12.13±1.68 | 16.33±2.37    |
| 26-12                | 4.93±1.07 | 14.40±2.71  | 18.13±2.77      | 19.06±2.50     | 14.13±2.64 | 18.00±2.27    |
| 02-01-2009           | 3.60±0.61 | 9.86±1.29   | 12.66±2.18      | 15.20±2.72     | 10.86±1.92 | 12.40±1.75    |
| 09-01                | 2.20±0.42 | 7.40±1.41   | 9.46±1.88       | 12.40±1.61     | 7.06±1.11  | 9.20±1.57     |
| 16-01                | 1.60±0.32 | 3.46±0.88   | 4.20±0.58       | 5.06±1.00      | 3.40±0.63  | 4.66±0.58     |
| 22-01                | 0.93±0.20 | 2.26±0.24   | 2.86±0.49       | 3.40±0.91      | 2.66±0.37  | 3.06±0.69     |
| 01-02                | 0.86±0.29 | 1.80±0.34   | 2.20±0.42       | 2.66±0.68      | 1.86±0.48  | 2.40±0.50     |
| Mean.                | 2.06±0.3  | 6.13±1.47   | 7.93±1.7        | 9.27±2.12      | 6.37±1.3   | 8.09±1.8      |
| S.E                  | C         | B           | AB              | A              | B          | AB            |

Means followed by the same letter are not significantly different at P <0.05.

Table 3. Mean population of painted bug, *Bagrada picta* per leaf on different varieties of mustard crop from November 2008 to February 2009.

| Date of observation | Rai S-9   | Raya anmol | D. Green leaves | Yellow sarsoon | Torya early | Brown sarsoon |
|---------------------|-----------|------------|-----------------|----------------|-------------|---------------|
| 15-11-2008          | 0.80±0.24 | 1.40±0.26  | 1.10±0.27       | 1.00±0.21      | 1.30±0.39   | 1.00±0.33     |
| 22-11               | 0.80±0.24 | 2.30±0.59  | 1.60±0.40       | 1.00±0.25      | 2.50±0.40   | 1.80±0.35     |
| 30-11               | 1.10±0.23 | 2.20±0.46  | 1.50±0.40       | 1.10±0.31      | 2.30±0.44   | 1.80±0.75     |
| 6-12                | 1.30±0.30 | 3.30±0.70  | 1.50±0.26       | 1.30±0.26      | 3.10±0.60   | 2.50±0.54     |
| 12-12               | 1.10±0.31 | 2.40±0.47  | 1.80±0.46       | 1.00±0.25      | 2.50±0.40   | 1.70±0.57     |
| 19-12               | 1.10±0.31 | 2.40±0.47  | 1.80±0.46       | 1.00±0.25      | 2.50±0.40   | 1.70±0.57     |
| 26-12               | 0.70±0.26 | 1.40±0.30  | 1.10±0.40       | 1.30±0.33      | 1.30±0.39   | 0.90±0.27     |
| 02-01-2009          | 0.50±0.22 | 0.70±0.33  | 0.70±0.26       | 0.50±0.16      | 0.80±0.24   | 0.60±0.40     |
| 09-01               | 0.30±0.15 | 0.60±0.26  | 0.50±0.22       | 0.40±0.22      | 0.60±0.26   | 0.30±0.21     |
| 16-01               | 0.20±0.2  | 0.30±0.15  | 0.40±0.16       | 0.30±0.15      | 0.50±0.16   | 0.30±0.15     |
| 22-01               | 0.10±0.1  | 0.40±0.16  | 0.30±0.21       | 0.20±0.13      | 0.40±0.4    | 0.6±0.4       |
| Mean.               | 0.73±0.12 | 1.57±1.57  | 1.10±0.16       | 0.18±0.11      | 1.62±0.29   | 1.21±0.22     |
| S.E                 | C         | A          | B               | C              | A           | B             |

Means followed by the same letter are not significantly different at P < 0.05.

Table 4. Mean population of predators per twenty sweeps on different varieties of mustard crop from November 2008 to February 2009.

| Date of observation | Rai S-9 | Torya early | Yellow sarsoon | Raya anmol | D. Green leaves | Brown sarsoon |
|---------------------|---------|-------------|----------------|------------|-----------------|---------------|
| 5-11-2008           | 0.005   | 0.12        | 0.42           | 0.44       | 0.10            | 0.02          |
| 22-11               | 0.03    | 0.19        | 0.9            | 0.77       | 0.25            | 0.32          |
| 30-11               | 0.03    | 0.24        | 0.42           | 0.47       | 0.38            | 0.29          |
| 6-12                | 0.14    | 0.25        | 0.58           | 0.56       | 0.81            | 0.54          |
| 12-12               | 0.42    | 0.69        | 1.87           | 1.73       | 0.74            | 1.58          |
| 19-12               | 0.41    | 0.68        | 2.62           | 2.69       | 0.93            | 1.76          |
| 26-12               | 0.50    | 0.84        | 1.72           | 1.76       | 1.05            | 1.49          |
| 02-01-2009          | 0.29    | 0.27        | 1.13           | 0.96       | 0.21            | 0.47          |
| 09-01               | 0.05    | 0.13        | 0.45           | 0.28       | 0.08            | 0.33          |
| 16-01               | 0.09    | 0.37        | 0.01           | 0.11       | 0.47            | 0.16          |
| 22-01               | 0.06    | 0.26        | 0.01           | 0.01       | 0.27            | 0.07          |
| 01-02               | 0.04    | 0.19        | 0.01           | 0.02       | 0.16            | 0.16          |
| Mean                | 0.172   | 0.352       | 0.845          | 0.816      | 0.454           | 0.599         |
| S.E.                | 0.052   | 0.070       | 0.241          | 0.240      | 0.098           | 0.181         |

## RESULTS AND DISCUSSION

Occurrence of three sucking insect species on mustard crop was recorded on six varieties of mustard. These insect species were *Bemisia tabaci*, *Lipaphis erysimi* and *Bagrada picta*. All three insects were recorded to occur from seedling till harvest of the crop i.e., 2nd week of November to 1<sup>st</sup> week of February. The peaks in *B. tabaci* population were recorded in last week of November and 1<sup>st</sup> week of January. The

occurrence of *B. tabaci* was recorded on mustard crop just after one week of germination till harvest of the crop. At the beginning the population of *B. tabaci* was low. However it was not below economic threshold level (2 per leaf). After wards the population increased and went beyond economic injury level in the last week of November. The results reported are in agreement with those of Patel and Jhala, (1992) who reported that from November to January were the most favorable months for the reproduction and survival of white flies. (Table-1).

Aphid, *L. erysimi* appeared from 2<sup>nd</sup> week of November till harvest of the crop. At initial stage low population was recorded. There after, it increased slowly and gradually and reached its peak in 2<sup>nd</sup> week of December. Maximum population ( $20.33 \pm 2.40$ ) per leaf was recorded on Yellow sarsoon followed by Brown sarsoon ( $18.00 \pm 2.7$ ), Dark green leaves ( $18.13 \pm 2.7$ ), Torya Early ( $14.40 \pm 2.71$ ), Raya Anmol ( $14.13 \pm 2.6$ ) and Rai S-9 ( $4.93 \pm 1.07$ ). This severity in aphid population was recorded until the second week of the January. After that the population started declining towards the maturity of the crop. On the basis of population recorded, the variety Yellow sarsoon was the most preferred followed by Brown sarsoon, Dark green leaves, Toria Early, Raya Anmol and Rai S-9, the overall mean population per leaf /shoots recorded on these varieties was  $9.27 \pm 2.12$ ,  $8.09 \pm 1.81$ ,  $7.93 \pm 1.79$ ,  $6.13 \pm 4.7$ , and  $2.06 \pm 0.36$ , respectively. (Table-2)

Analysis of variance showed significant difference in the population of *L. erysimi* that appeared on the varieties Yellow sarsoon, Brown sarsoon, Dark green leaves, Torya Early, Raya Anmol and Ria S-9 (Table-2). The results are well supported by Dutta and Dutta (1995) who reported *L. erysimi* as the most important pest of rape seed mustard that commonly occurred on sarsoon, Torya and Rai. Singh and Sachan, (1997) showed a positive correlation between the period of exposure of brown sarsoon to *Lipaphus erysimi* and yield losses. Desh (2002) reported the occurrence of the aphid during two consecutive years i.e. 1993 and 1994 on *Brassica*. Similarly, Rangrez, *et al.* (2002) during post bloom, maximum aphid population per plant was recorded from Yellow sarsoon.

The data in Table-3 showed the population of *B. Picta* on different varieties of mustard. Painted bug appeared from 2<sup>nd</sup> week of November till the maturity of the crop, i-e.3rd week of January. During this period only one peak in the population was recorded in 1<sup>st</sup> week of December, which was the early phase of the crop growth. After that the population started declining towards the maturity of the crop. The results are in agreement with those of (Abu Manzar, *et al.* 1998) who reported that maximum incidence of painted bug was observed on DLC-1 of *B. carinata* and GSB-7027 of *B. napus*. The population abundance indicated that Torya Early was the most preferred variety followed by Raya Anmol, Brown sarsoon, Dark green leaves, Yellow sarsoon and

Rai S-9. The overall mean populations recorded on these varieties were  $1.62 \pm 0.29$ ,  $1.57 \pm 0.30$ ,  $1.21 \pm 0.22$ ,  $1.10 \pm 0.16$ ,  $0.81 \pm 0.11$  and  $0.73 \pm 0.12$ , respectively. Analysis of variance showed highly significant differences in the population of *B. picta* that appeared on varieties Yellow sarsoon, Brown sarsoon, Dark green leaves, Torya Early, Raya Anmol and Ria S-9.

Predators such as spiders, *Coccinellids*, *Chrysoperla* sp. and *Orius* sp. were found active as population of sucking pest complex appeared on mustard crop. These predators were found feeding on aphid, whitefly and painted bug. The investigation proved that the adults as well as immature stages were found feeding on all stages of aphid, whitefly and nymphs of painted bug except *Chrysoperla* sp., whose adult was not found feeding on these insect pests. It was also found that the whitefly was less preferred host of these predators. The population of predators per 20 sweeps on different varieties indicated that, the varieties having maximum activities of sucking insect pests harbored the maximum predator populations from the beginning till the maturity of mustard crop during the month of November to February. (Table-4). The results are in agreement with those of Shah and Baloch (1999), Singh *et al.* (2003), Gencsoylu and Yalc (2004) who also reported the co-existence of these predators and pests in various agro- ecosystems. Jogender (2006) reported *Coccinella septempunctata* was more abundant than *Menochilus sexmaculatus* in the *Brassica* crops. *Menochilus sexmaculatus* population disappeared earlier than *Coccinella septempunctata* which was abundant until end of the crop season. However, maximum activities were recorded on the varieties having maximum insect pest activities was also recorded.

## CONCLUSION

On the basis of the present result, it is concluded that the sucking insect pests namely: *B. tabaci*, *L. erysimi* and *B. picta* attacked all varieties of mustard crop from germination till its maturity. These insect pests showed their less preference to variety Rai S-9. Predators were more active on the varieties having maximum activities of insect pests.

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