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Population of Sucking Insect Pests on Canola (Brassica Napus L) in Peshawar

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Abstract
Experiment conducted at The University of Agriculture Peshawar in winter 2022 aimed to investigate the density of sucking insect pests on canola crops. Data was collected on the population of aphids, whitefly, jassids and thrips, as well as their associated natural enemies. The findings revealed that the highest infestation of aphids occurred during the 2nd week of November, with 3.1 aphids per leaf. This was followed by whitefly, jassids and thrips, with population densities of 2.8, 2.7 and 2.3 per leaf respectively. Aphids exhibited the highest population density among the four sucking insect pests, while thrips had the lowest. Significant differences were observed in the mean numbers of predators between the first two observations, particularly in the population densities of ladybird beetles, green lacewing and syrphid flies at the study site.

INTRODUCTION

Canola is a winter oilseed crop which is scientifically known as Brassica napus and belongs to family Brasscicaceae. Formerly it was known as Cruciferae originated from rapeseed breeding. Canola crop contain 23-35% protein and 40-44% oil content is ranked 2nd after soybean in edible oil consumption (Kandil and Gad, 2012., USDA, 2016). Canola is used in Pakistan as a minor oil crop. For the preparation of medicines and traditional remedies canola can be grown on barren and marginal land as well as in those areas having low soil fertility and rainfall. Canola has the ability to tolerate salt and that's why it is also known to be drought resistance (Flanders and Abdu, 1985., Shannon and Grieve 1999). Family Brassicaseae have 3000 species including 333 genera's. (Warwick and Shehbaz, 2006). In our country rapeseed and mustard are the important oil producing crops[1]. Canola can be grown in different agro climate condition also tolerate both drought and stress condition. In Europe both Brassica napus and Brassica compestris are cultivated but in Canada mostly spring season cultivation occurs. Brassica napus mostly grown in China in spring season while in India and sub content Brassica junica is dominate and Brassica carinata is mostly grown in Ethiopia.(Prakash and, Hinata 1980). High amount of protein and free amino acid has been responsible for susceptibility to canola aphid while the ascorbic acids and glucosinolates are have negative impact on pest population. (Malik, 1981, labana *et al,* 1983). Insect pest infestation in Pakistan almost up to 80 percent and sever infestation can lead to total destruction of the crop and due to their high attacked the crop become no viable for further germination. (Rustamani *et al.,* 1988). In Pakistan the total area under Canola cultivation was 243.000 hector with a total production 231,000 tons while in khayber Pakhtunkhwa the total area under canola cultivation was 17000 hectare with production of 8000 tons and the average yield was 493kg/h (Anon 2013-2014). In ancient time rapeseed was a lubricating agent because of high amount of Gluco sinolates and Erusic acid (Charlton *at al.,* 1975). The consumption of canola has been recorded 2000BC and has been grown in Europe since the 13th century and was used as oil crop for Lamps. Family Brassicaseae classified into four species, i.e. B. napus B. carinata B. junicea and B. compestris. The annual production of canola 24.61 million metric tons has been recorded from 14 million hectares growing areas. Which fulfill 12% of the world wide edible consumption. (Colton and Sykes 1992). Canola is the main component of our regular food, consumed as edible oil. Pakistan has become the third leading importer of cooking oil throughout the world. Due to the high amount of requirements the current production of oil seed does not fulfill the world requirement. Aslam *et al.* 2002-2005. Canola has important chemical composition like tri-sulphide di-sulphide and sulphide properties have some negative impact on the insect pests' economic importance. Canola crop mostly attack and effected by majors and minors insect pests i.e. Flea beetles, head caterpillar, butterflies and diamond back moth and as also effected by sucking insects like thrips, jassid, whitefly and aphids. By the infestation of the above insect pests the yield of the crop highly effected and can lead to yield losses. For the control and bitter market values, formers used different high toxicant pesticides against insect pests which are harmful to man animal and environment. (AVRCD, 2011). Aphids' population has been increasing for last few years and become a regular pest in Pakistan (Aheer *et al.,* 2008). The aphid population attained peak level in the mid-March, varied on test cultivars of wheat during the month of February-April and peak level of aphids was noted during third week of March, also observed peak aphid's population at milk stage i.e. during third week of March and began to decline at dough stage i.e. At the end of March. Aphid population increased exponentially from end of February to end of March and declined from end of March to beginning of April in case of crop planted at various dates (Aslam *et al.,* 2005). Aphid Caused 100 percent losses in grain production in Pakistan during 1987 where attack was very severe (Anon., 1987). It is found that five aphid's species damaging wheat crop viz. Sitobionavenae (Fab), Schizaphis graminus (Roudoni), Rhopalos iphumrufiab dominalis (Sasaki), Rhopalo siphumpadi (L.) and Rhopalosi phummaidis (Fitch). Aphids caused direct damage by feeding deeply within the leaf whorl and inject a toxin in the plant which appears to destroy the chloroplast membrane and indirect damage by transmission of several plant viruses (Aheer *et al.*, 2006). Coccinellidae family species are a well-known group of insect predators and 75 species have been recorded from Pakistan (Rafi *et al.,* 2005). Most ladybird beetles are predaceous, as larvae and adults, feeds on aphids. They are frequently quite common, particularly on vegetation where aphids are numerous (Mohyuddin, 1981). Chrysoperla carnea the green lacewing is a predator of exposed eggs and small larvae of all the lepidopterous pests, aphids, jassids and mealy bugs. It has an advantage over egg parasitoid that it can feed on both egg and larvae stage of pests and also its host range is much broader[1]. According to Kannan (1999)natural enemies encountered preying on aphids were chrysopids, coccinellids and syrphids, the first of these being the most important and dominant predators. Messina and Sorenson (2001) reported that lacewings reduced the aphid population on some plants and their effectiveness was 84%. The most dominant species of parasitoids are Aphidious colemani, Aphidius ervi, Diaertilla rapae and Aphidius morticaiae.

MATERIALS AND METHODS

Field Experiment: Research study were conducted for determining the efficacy of chemical and botanical extracts for the management of canola aphid at NDF (new developmental farm) at The University of Agriculture Peshawar during year, 2022.

Experimental Procedure: The experiment was laid out in Randomized Complete Block Design (RCBD) which was replicated three times[2-6]. Treatment size was kept 3m×10m. Total Plot size of the experiment was kept 18m×30m. R-R and P-P distances were kepted 30cm and 15cm.

Collection of Aphids and Natural Enemies: Aphids were collected from the plants in a petri dish with the help of fine camel hair brush and transfer them into a bottle having alcohol. Natural enemies were collected with the help of insect hand net and were placed in killing jar having ethyl acetate as killing agent. The collected specimens were then brought into the entomological research laboratory for further research.

Insect Identification: The Collected insects were brought into the Department of Entomology, The University of Agriculture and Peshawar for proper identification. The collected specimens were identified with the help of existing laboratory collection and entomological keys[6-10]. Graduated cylinder.

Whitefly Bemisia Tabaci (GENN). (Homoptera., Aleyrodidae): The population dynamic of whitefly will be made once a week which started one week after the germination and will be count till the maturity of the canola crop. Whiteflies devolved their colonies under side of the leaves. And data will be recorded from under side of the leaves. 5o randomly leaves will be selected from 10 plants and the 10ts will be selected randomly from 3 different location within the plot and sub plots. Nymph and adult of whiteflies will; also be counted from the selected plants.

Aphid (Lipaphis Erysimi Kalt.) (Aphididae., Homoptera): When aphid attacked the leaves and the shoot of canola the population densities of canola aphid were counted on the leaves and the shoots as well. And data was recorded from under side of the leaves[11-15]. 50 randomly leaves were selected from 10 plants then 10 were also selected randomly from 3 different location within the plot and sub plots. Nymph and adult of aphids also be counted from the selected plants, the population on the shoots was counted by putting a white shed on the shoot. The numbers of aphids present within the sheet were counted.

Jassid (Tudtude Amrasca) Devastant Cicadellidae Hemiptera: The population of painted bug was recorded similarly as in case of whiteflies. The painted bug appears on both sides of the leaves therefore the leaves will be examining thoroughly adult as well as nymph will be counted.

Thrips (Thrips Tabaci) Lindeman Thysanoptera Thripidae: The population of painted bug was recorded similarly as in case of whiteflies[16-20]. The painted bug appears on both sides of the leaves therefore the leaves will be examining thoroughly adult as well as nymph will be counted.

Natural Enimies: Total numbers of natural enemies (predators) such as spiders, coccinellids lacewings and minute pirate bugs will be found actively on these insect pests. Population of natural enemies' was recorded by using sweep net method and visual count for sweep net method about 20 stroke of sweeping will be made after each five stroke the predators will be caught in the net will be counted the predators found on the plant will be counted.

Collection of Pollinaters: During blossoming stage a huge numbers of insect pollinators visited the field so the pollinator's will be collected with the help of hand net for further studies. Collected specimen will precisely label and then will preserve in the department of entomology[17-25]. And the will be identified with the help of available literature. After the identification the specimen will be submitted to department of entomology at the university of agriculture Peshawar.

Analysis of Data: The recorded data since wowing till harvesting of the crop will be analyzed by Statistics-8.1 mean will be separated at alpha 5% after the application of LSD[2].

RESULTS AND DISCUSSIONS

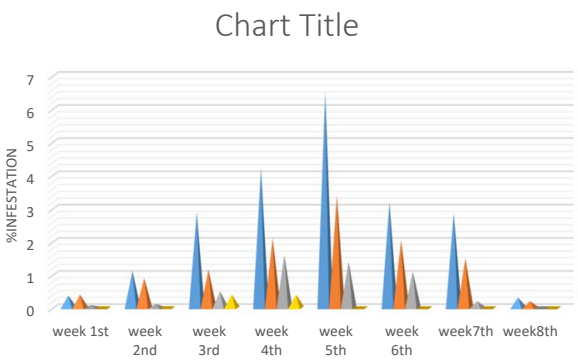

Fig. 1: Time Intervals (Weeks) and their Interaction on the Average Number of Aphid, Whitefly, Jassid and Thrips Leaf-1 on Canola Crop at the Agricultural Research Institute ARI During 2018

(Fig. 1) showed the effectiveness of interaction of the time interval×canola crop on average number of Aphids, Whitefly, Jassids and Thripsleaf-1 in different canola crop. The data regarding the overall mean number of Aphids, Whitefly, Jassids and Thripsleaf-1 recorded on time intervals revealed that lowest Whitefly infestation leaf-1 were observed on 3rd week of October, followed by Thrips, on 3rd week of October Aphids and Jassid respectfully. Here the weather is too hot that is why the numbers of sucking insects are low and also the natural enemies are absent. The data regarding the overall mean number of Aphids, Whitefly, Jassids and Thrips leaf-1 recorded on weekly intervals revealed that highest aphids infestation nleaf-1 were observed on 2nd week of November, followed by Whitefly, on 2nd week of November Jassids and Thrip respectfully[26-30]. During November the weather is favorable to multiple the sucking insect pest like Aphids, Whitefly, Jassids and Thrips leaf-1 and also non availability of bio-control agents that is why the population of sucking insect pest are multiplying quickly instead of decreasing.

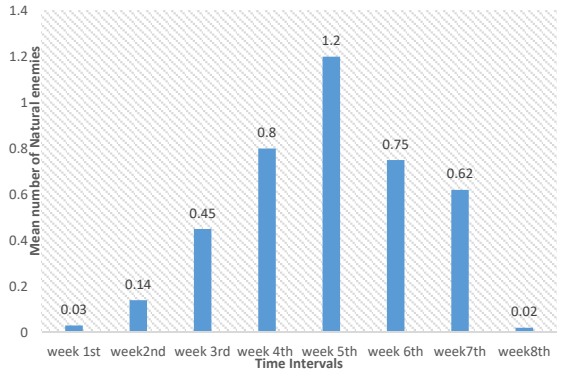

Fig. 2: Time Intervals (Weeks) and their Interaction on the Average Number of Natural Enemies Leaf-1 on Canola Crop

(Fig. 2) showed the mean numbers of the various natural enemies are present and significant differences of mean number of natural enemies were found between observations. Any significant differences of mean numbers of predators were found between 1st two observations green lacewing and syrphid fly populations and lady beetles densities in study site. In during study year per cent praying capacity of predatory lady beetles was significantly higher, as compare to others natural enemies. Per cent praying capacity of green lacewing and syrphid fly was lower, in all treatments[31-33]. Percent praying capacity of Diaeretiellarapae and Aulacorthumcolemani was cooperatively equal to the green lacewing and syrphid fly populations and lady beetles respectively, in all treatments. The data regarding the overall mean number of natural enemies leaf-1 recorded on weekly intervals revealed that highest natural enemies leaf-1 were observed on 1st week of November. During any natural enemies monitoring program, if these predators and parasites are present and aphid numbers are declining, then chemical intervention could be delayed.

The insect pests of canola other than aphids were recorded from its time of germination till harvest. The percentage population per square meter recorded on different dates at weekly interval is given in (Table 2). Some of them are major pests while others are minor ones. Cabbage caterpillar and leaf-miner were found serious insect pests in Peshawar. These findings are somewhat similar to those of the other investigators. Anonymous 1993) observed Phytomyza and P. brassicae as serious pests[34]. Semi-looper and painted bug were also recorded as minor pests in the present study. Former pest is not comparable to the findings of Harvir *et al.* (1993). They recorded this as a major pest. The latter pest cannot be compared, as no literature of such a nature was available. The results (Table 2) also reveal that painted bug appeared in 4th week of February and continued up to end of 3rd week of March. The bug infestation gradually increased up to 8th March 1999. From these onward it started decreasing. Its population varied from 0-0.58% with an average of 0.14% per square meter. These figures indicate it was a minor pest. The observation is dissimilar to Harvir *et al.* (1993) who observed it as major pest. This may be due to climatic conditions, cultivars or any other conditions prevailing to the areas. Cabbage caterpillar infestation was observed from 2nd week of February till 10th of April (Table 1). Its population gradually increased up to 4th week of March. From there onward infestation went on decreasing. The population varied from 1.29-75.08 with an average of 23.68% per sq. m. The result for pest incidence is somewhat similar to that of Anonymous (1993), who reported that P. Brassicae was observed on mustard crop from 3rd week of February up to the end of March. He also reported that it was the peak period of infestation. The little change in pest appearance period may be due to environmental conditions of both areas. The result of cabbage semi-looper was observed in the 2nd and 3rd week of February. It was a minor pest. Literature on the semi-looper as pest is not available., hence the results of this insect cannot be discussed. The leaf-miner appeared in the field in last week of February and continued up to 2nd week of April 1999. The population varied from 17.62-25.96 with an average of 18.72% per sq. m. The present results agreed somewhat to that of anonymous (1993) who observed Phytomyza sp. on mustard from 1st week of December but remained very low till 2nd week of March. The peak period of infestation was 2nd week of April.

Summary: The Experiment was conducted at the University of Agriculture Peshawar, Peshawar Pakistan during September-December, 2022. The trend of these sucking insects i.e. Aphids, Whiteflies, Jassids and Thrips in Canola Crop was studied. Infestation of sucking insect pests (Aphids, Whiteflies, Jassids and Thrips) was recorded on weekly basis during the day time in the morning from 8:00-10:00 am. Data was recorded on randomly ten selected Canola Plants/ leaf per sub plot where two different methods (Visual Observation, Jerk Method). However the population density of Aphid is high among sucking insect pest in canola crop in Peshawar and the population density of natural enemies of canola insects pests in relatively low as compare to the sucking insects pest of canola.

CONCLUSIONS

All the genotypes were infested with sucking insect pest and no one was completely free of (aphid, whitefly, jassid and thrips) infestation. In present study data was recorded the population of thrips was found low as compared to the others sucking insect pest while the population of aphid was found highest as compared to the rest of the sucking insect pest.

Recommendation: In the 2nd and 3rd week of October close attention should by paid to the sucking insect pest appearance on the brassica crop and control measures applied necessary, if may help to minimize the possible use of insecticides and to improve future integrated pest management program.

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