Population dynamics and management of leaf hopper on okra cv. Arka Anamika

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Abstract:
A field experiment was conducted at Agricultural Research Field, School of Agriculture, LPU during 2017-18 to find out the fluctuation of leaf hopper and its suitable management with new molecule insecticides. A hopper incidence start from 19^{th} SMW and population was remained throughout crop period which peak at 24^{th} SMW. In sole insecticides, Thiamethoxam 25% WG @ 2.40g/lit was the best among all the treatments which reduced 49.39 and 71.07% leafhopper population over control during first and second spraying respectively followed by Spinosad 45 SC @ 0.88ml/lit and Imidacloprid 17.8 SL @ 2.24 ml/lit.

Introduction:

Okra is known as a villager's vegetable because of its distinct seed protein which produces the higher ratio of amino acid as compares to soyabean (Habtamu *et al*. 2014). This crop is susceptible to many insects on the different growth stages which affect productivity. Up to 72 species are recorded like *Earias vittella, Bemisia tabaci, Helicoverpa armigera, Acrocercops bifasciata, Thrips tabaci, Aphis gossypii, Amarasca bigattula biguttula, Anomis flava, Sylepta derogate*on on okra which considered as major pests and caused significantly heavy damage (Rao and Rajendran,2003; Rajveer *et.al.* 2016; Shabozoi *et. al.* 2009; Mallick *et al*.2016; Ahmed *et.al.* 2010).

Mallick *et al*., (2016) recorded 40-60% yield loss by sucking and pod borer in early-stage but up to 69% yield loss by major pest visited in early and later stage of okra (Narasa, 2015). At a later stage, fruit borers and *H. armigera* cause considerable losses to the crop to the tune of 91.6% (Pareek and Bhargava, 2003) and overall damage accounted to 48.9% in pod yield due to the insect pest (Kanwar and Ameta, 2007). Farmers can be used only synthetic insecticides for the management of pests. The numbers of insecticides are available in the market for the management of sucking pest which can cause many major problems like destruction of natural enemies, toxic residues, development of resistance and environmental disharmony. To overcome these problems discover new molecule chemicals with selective insecticidal properties, low toxicity to non-target, well suited in integrated pest management.

Material and methods:

A field experiment conducted at Agricultural Research Farm, School of Agriculture, Lovely Professional University, Phagwara, Punjab during 2017-18. The research field is located at 31^0 15' North latitude, 75^0 32' East and at 228 meter above mean sea level. Arka anamika variety grown at 2^{nd} week of February in 2 x 2 m^2 area and spacing was maintained 40 x 30 cm. Recommended fertilizers dose were applied for uniform crop growth. Experiment was arranged in RBD with seven treatments (T_1=Spinosad 45 SC @ 0.88 ml, T_2= Imidacloprid 17.8 SL @ 2.24 ml, T_3=Thiomethoxam 25WG @ 1.60 ml, T_4=Lambda cyhalothrin 4.9 CS @ 2.50 ml, T_5=Acetamprid 20 SP @ 2.00 ml, T_6=Thiomethoxam25 WG + Imidacloprid 17.8 SL @ 1.90 ml and T_7= Control) replicated in three times. Incidence of the nymph and adult of hopper was recorded from randomly five plants at three canopy levels (lower, middle and upper) of leaves in twice a week at different crop growth stage of okra. Insecticides were applied when hopper reached at economic threshold level (ETL) with the help of hand spray. The reduction percent over control was calculate by using following formula; $Reduction\ \%\ over\ control = \frac{\text{UTP}-\text{TP}}{\text{UTP}} \times 100$ Where, UTP= Untreated Plot, TP= Treated plot. Analysis of variance of the data was done for each experiment under completely randomized block design (RBD) by SPSS of statistical packages (22.0 version).

Result:

An average leafhopper population was ranged from 1.32 to 38.83 per plant with an overall mean was 22.66 per plant and incidence was started from 19th standard meteorological weeks (SMW) up to the maturity of crops (Fig 1). The population of leafhopper was gradually increased from 19th SMW up to 23rd SMW and attained its peak (38.83/six leaves) during 24th SMW due to favourable temperature (25–39^{0}C) and relative humidity (36.57-83.57%). The population increased regularly due to the high temperature which was suitable for the hopper. After attained its peak population its remains slightly declined because crops going to harvest as well as green leaves availability was less. A hopper population was found positive correlation with minimum temperature (r=0.436), minimum relative humidity (RH) (r= 0.817) and maximum RH (r= 0.725) while maximum temperature (r= 0.549) was found negative correlation (Fig 1). Among the abiotic factors, only RH has observed a significant correlation with the leafhopper population

Result presented in table 1, the average leafhopper population was ranged from 16.20 to 33.73 per five plants and all the treatments were found non-significant during pre-spraying time. The highest reduction percentage over the control was recorded in the application of mixed insecticides (T_6). Among the sole insecticides, the highest reduction percentage (49.39% and 71.07%) of leafhopper over the control when Thiomethaxom 25% WG @ 1.60 g applied followed by Spinosad 45 SC @ 0.88 ml while lowest reduction percentage over the control recorded from Lambda cyhalothrin 4.9 CS @2.50 ml (36.70% and 63.80%) after first and second spraying respectively (Table 1)

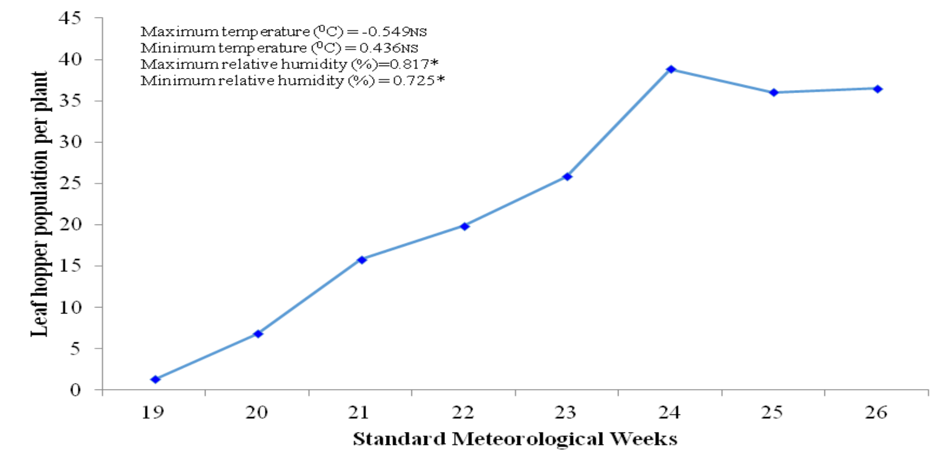

Fig 1: Population dynamics of leaf hopper on okra during 2017.

Table 1: Reduction percentage of leaf hopper over the control during post spraying

Treatments	Pre spraying	Post Spraying	
		First spraying	Second spraying
T_1-Spinosad 45 SC @ 0.88 ml	18.73	47.07	69.30
T_2- Imidacloprid 17.8 SL @ 2.24 ml	19.60	40.71	66.65
T_3- Thiomethoxam 25WG @ 1.60 g	21.00	49.39	71.07
T_4- Lambda cyhalothrin 4.9 CS @ 2.50 ml	21.07	36.70	63.80
T_5- Acetamprid 20 SP @ 2.00 ml	20.07	42.57	65.85
T_6- Thiomethoxam25 WG + Imidacloprid 17.8 SL @ 1.90 ml	16.20	55.32	79.99
T_7- Control	33.73	--	--

All treatments had found a significantly reduced leafhopper population as compared to control. A treatments were arranged based on effectively in descending order Thiomethoxam 25 WG + Imidacloprid 17.8 SL @ 1.90 ml > Thiomethoxam 25WG @ 1.60 g > Spinosad 45 SC @ 0.88 ml > Imidacloprid 17.8 SL @ 2.24 ml > Acetamprid 20 SP @ 2.00 ml > Lambda cyhalothrin 4.9 CS @ 2.50 ml (Table 1).

Discussions:

A vegetable is important contains in our daily food which provides vitamins, minerals, carbohydrates for balancing diets. Vegetables are important not only in India but also other countries (Khan *et al*., 2001) and 21-72 insect pests were recorded on different growth sage of okra (Rao and Rajendran, 2003; Rajveer *et.al.* 2016; Shabozoi *et. al*. 2009; Mallick *et al*.2016). The incidence of leafhopper start from 19th SW and till remained throughout the crop period. Hopper nymph population was present on lower side of leaf reported by Sharma and Sharma (1997). The population increased regularly due to the favorable temperature and RH which resulted in hopper peaked at 24^{th} SMW. Weather parameters play an important role in the build-up hopper population throughout the season (Ahmed *et al*., 2010). A hopper population was found a positive correlation with minimum temperature, maximum and minimum relative humidity during 2018 but maximum temperature exhibited a negative correlation. Present finding was similar accordance with Sharma and Sharma (1997); Rehman *et al.* (2015); Arun *et al.* (2017) found that negative correlation with maximum temperature and positive significant correlation with relative humidity at morning hours but Purohit *et al.* (2006) reported that all the abiotic factors found positive correlation with hopper population. The results are in contrast with Singh *et al*. (2013) who reported a negative correlation between leafhopper population and relative humidity.

Insole insecticide treatments, application thiometaxam 25 WG @ 0.04% was found superior against hopper in both sprayings. This result was correlated with Singh *et al*., (2013) who revealed that the mean leafhopper population was obtained lowest in the treatment of thiamethoxam @ 35 g a.i/ha. Raghuraman and Gupta (2006) reported that neonicotinoids were found effective against hopper in malvacae family crop plants. Application of imidacloprid 17.8 SL @ 2.24 ml/lit also found significantly effective against hoppers in both spraying and the present result in corroboration with Kumar *et.al.* (2001). In present study, application of Thiamethoxam observed better than Imidacloprid during both sprays. This result contrast with Yasmin *et al.*, (2009) who reported that Imidacloprid shows better results to reduce the sucking pest as compared to Thiomethoxam. This may due to the time of spraying and formulation available made by different pesticide companies. Sole insecticides (Thiamethoxam 25WG, Spinosad 45SC, Imidacloprid 17.8SL, Acetamprid 20SP and Lambda cyhalothrin 4.9 CS) were found effective against to leafhopper and present result correlated with Patil *et.al.* (2014) who observed that the application of Thiamethoxam 25WG was found effective against leafhopper fallowed by Lambda cyhalothrin 5 EC.

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