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Research Article

ECOLOGICAL IMPACT OF PB-ROPES ON POPULATION OF *THRIPS TABACI* AND ITS NATURAL ENEMIES

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ABSTRACT
Cotton is most important fiber crop of Pakistan. Cotton contributes 1.6% in GDP of Pakistan. The sucking and chewing insect pests attack on the cotton and cause yield reduction. Among sucking pests, *Thrips tabaci* is the major one. The study was conducted to observe the ecological impacts of PB ropes on population dynamics of *T. tabaci* as well as beneficial fauna on cotton. The study was conducted at MNS University of Agriculture Multan at experimental farm Multan on an area of 27 acres. The experimental plot was divided into 3 blocks and each block consisted of 3 acres. Cotton variety NIAB-878 was cultivated as test crop and data was recorded on weekly bases from 20 random selected plants in each sub-plot for sucking insect pests and 10 plants for beneficial insects. The results revealed that population of *T. tabaci* remained significantly lower in double application of PB-ropes in a season treated plots as compared to treatment i.e., one application of PB-ropes + insecticides, while higher population was recorded in untreated block, managed through use of pesticides. The study resulted that all recorded green lacewing and *Geocoris* were showed negative correlation with *T. tabaci* and kept its population at minimum level as compared with control.

Keywords: Cotton, Beneficial Fauna, PB- ropes, Management strategies, Pakistan.

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1. INTRODUCTION
Cotton (*Gossypium hirsutum*) is the major source of business and international trade for Pakistan (Saleem *et al.*, 2018). Millions of people in Pakistan are linked directly and indirectly with agriculture. Pakistan is providing a good quality of lint fiber and also adds 65% of its share in production of oil (Asif *et al.*, 2013; Shivanna *et al.*, 2009; Ozyigit *et al.*, 2007). Cotton is grown on 2.48 million hectares with annual production of 9.91 million bales. The production of cotton is very low as compared to other developed countries such as China, USA and Australia (Anonymous, 2017-18)

The cotton production is highly affected through biotic and abiotic factors. Among abiotic factors, sucking insect pests (Hamayoon *et al.*, 2013) like jassid (*Amrasca biguttula biguttula*), thrips (*Thrips tabaci*), whitefly (*Bemisia tabaci*) and aphid (*Aphis gossypii*) are the major insect pests responsible for yield losses (Arshad and Suhail, 2010). The severe attack of these sucking insect pests can caused 15-30% losses in cotton (Abro *et al.*, 2004; Amjad and Aheer, 2007) production.

Among sucking insect pests, thrips species such as tobacco thrips, western flower thrips, tomato thrips are very important

sucking pest and attack on cotton crop (Arif *et al.*, 2005; Zhang *et al.*, 2014) but *Thrips tabaci* is serious threat to cotton industry. The cotton quality and quantity (Mamoon *et al.*, 2012) are highly affected by severe attack of *Thrips tabaci* all over the globe.

During severe attack of thrips, cotton growth (Miyazaki *et al.*, 2017) can reduce which directly affect the production. Thrips suck cell sap from plant parts such as leaves (Bayhan *et al.*, 2006; Hofs *et al.*, 2004) and excessive sap sucking caused plant death (Ramzan *et al.*, 2019). The various management strategies such as cultural, botanicals, biologicals, entomopathogens and chemicals have adopted by various researchers to manage the cotton thrips on small and large scale (Lei and Wilson, 2004).

The chemicals (pesticides) are excessively used by farmers to control the insect pests but non-judicious use of these chemical become harmful for beneficial fauna such as parasitoids and predators. It can cause resistance in pests, health hazards (Mohammad *et al.*, 2010) and environmental problems (Pervez and Omkar, 2003; Prema *et al.*, 2018)**.**

The present study was conducted by using eco-friendly approaches such as PB ropes to check their effectiveness against *T. tabaci* population. The aim of present study was to observe the effect of PB ropes alone and in combine with insecticides against thrips population and conserved the natural enemies such as parasitoids and predators.

2. Material Methods

2.1. Study area

A study was conducted at an area of 27 acres located at Research Farm of MNS-University of Agriculture, Multan during cotton season 2018. To evaluate the ecological impact of PB-ropes on biological fauna (green lacewings and *Geocoris* spp.) as well as on population dynamics of thrips, cotton variety NIAB-878 was sown in second week of April by using drill system (dibbling method). Total research area was divided into three blocks and each consisted of 9 acres. There was three treatments and each treatment replicated thrice in Randomized Complete Block Design (RCBD).

Followed treatments were use as:

T1= PB Ropes@ 120 / acre + Insecticides (Flonicamide) @ 60 g / acre

T2= Only PB Ropes @ 120 / acre installed

T3= Control

2.2. Data recording

On weekly basis, data of thrips and natural enemies population were recorded from randomly selected plants early in the morning (7:00 am). For this purpose, fifteen leaves from fifteen randomly selected plants were checked from individual plot. Adults and nymphs population of thrips were counted from upper, middle and lower leaf of three consecutive plants from five various places. Data of natural enemies were taken from whole randomly selected plants. The current study was followed Ashfaq *et al.* (2010) method.

2.3. Statistical analysis

The recorded data was analyzed by using the analysis of variance in "Statistix 8.1" (Analytical Software, 2005) and mean difference was evaluated with Turkey-HSD test at 5% interval by using two-way ANOVA.

3. Results

The results showed that during 1st week of July, population of thrips was maximum (12.20±1.02a) in plot T3 while minimum (4.85±0.97c) in plot T2 which treated with PB-ropes as compared to plot T3 where no PB-ropes installed. During the study, 5.55±0.94b mean population of thrips were recorded in plot T1 (PB-ropes + Insecticide) as shown (**Fig. 1**). In third week of July, maximum P= 0.2459 was recorded.

In treatment T3, highest (11.56±1.37a) thrips population was recorded in the month of August with P=0.0000 value while lowest (1.53±0.33b) in treatment T2 as compared to treatment T1. During the study, it was observed that in the treatment T1 minimum

(2.08±0.52b) mean population of thrips (*Thrips tabaci*) recorded in fourth week of August.

In control treatment (T3), minimum (4.46±0.73a) population was recorded in third week of September while maximum (7.53±0.83a) in second week of October. The mean population for thrips in treatment T2 and T1 were 0.58±0.15b and 0.63±0.15b, respectively with 0.0000 P value. The population of thrips was increased from last week of July to October specifically in control block while population of thrips developed to some extent but remained under check in other treatments. Statistically significant difference was found between T1 (PB-ropes + insecticides) and T2 (PB-ropes + PB-ropes).

During the study, significant negative correlation was found between natural enemies such as *Geocoris*, Green lacewing and thrips (*Thrips tabaci*) population. The mean population of thrips was compared with mean population of *Geocoris* and showed negative correlation with equation value ($y=-0.0282x+0.6682$ $R^2 = 0.3199$) in treatment T1 (PB-ropes + insecticides) (**Fig.3**) and T3 (**Fig.5**) while value **(**$y=-0.2186x + 2.2623$) in treatment T2 (**Fig.4**).

Control block also showed negative values because of pesticidal sprays population of thrips remained lower. Green lacewing population was also significantly effective with negative value of equation in T1 ($y = -0.2059x + 3.663$) and T3 with slight difference in value of equation in treatment T2 ($y = -0.3865x + 4.5923$) given in **fig. 6, 7 , 8**. Mean population of *Geocoris* species from July- October are shown in **fig. 2**. while green lacewing (Fig. 9)

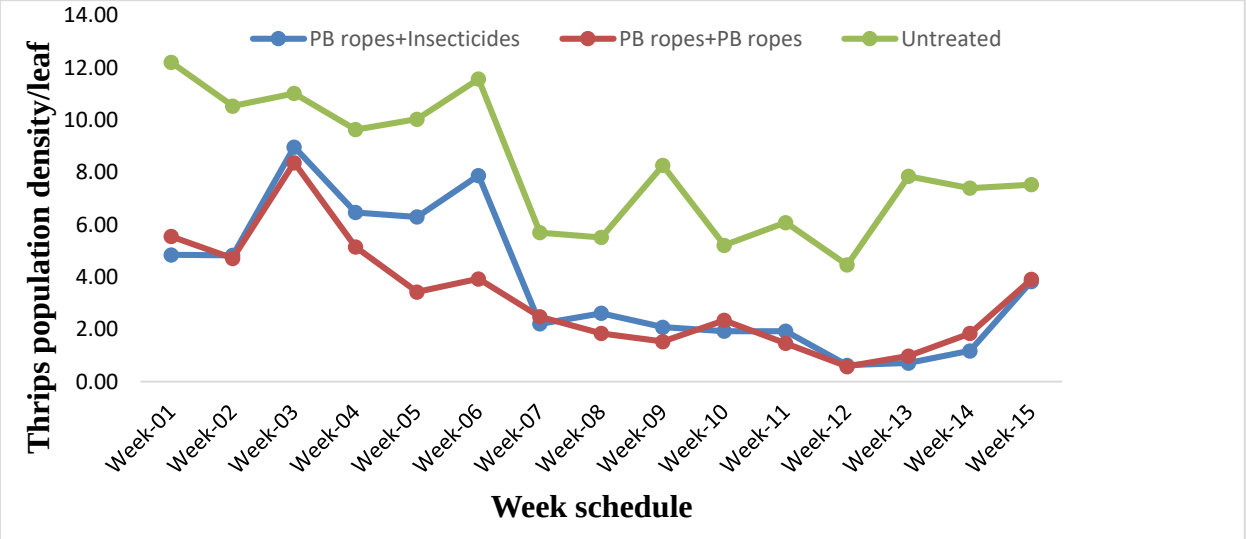

Fig. 1. Mean population of Thrips from July-October in different treatments

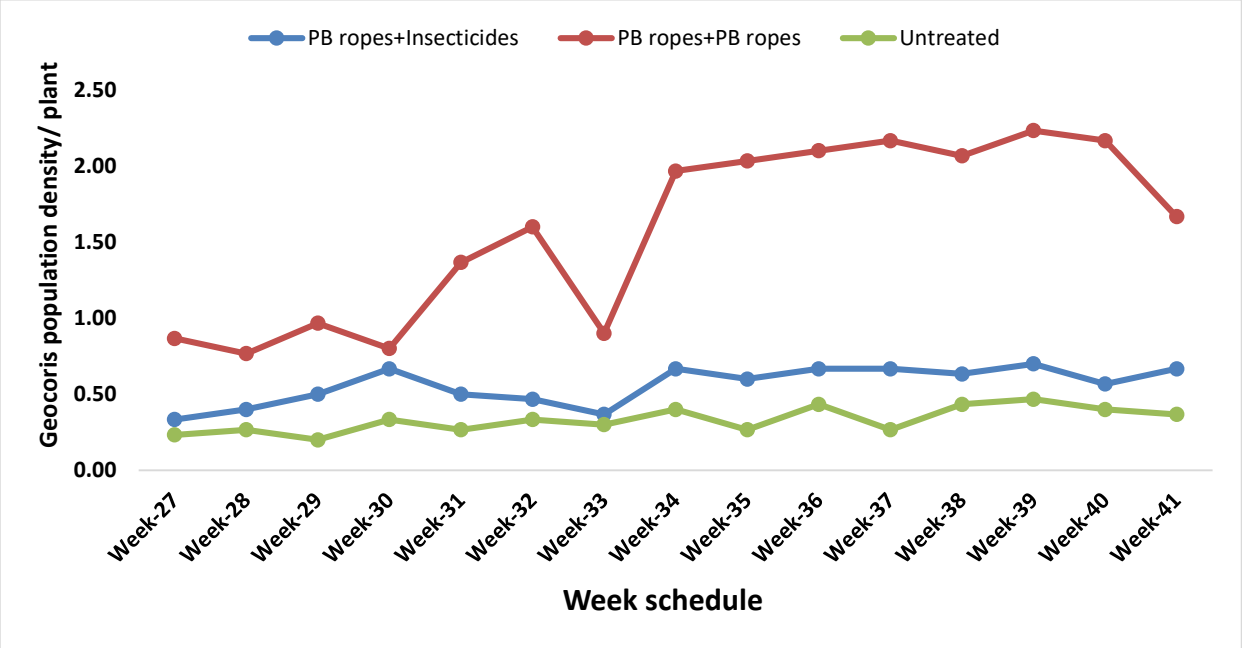

Fig.2. Mean population density of Predator *Geocoris* species from July- October, showing higher population mean in treatments and untreated plot

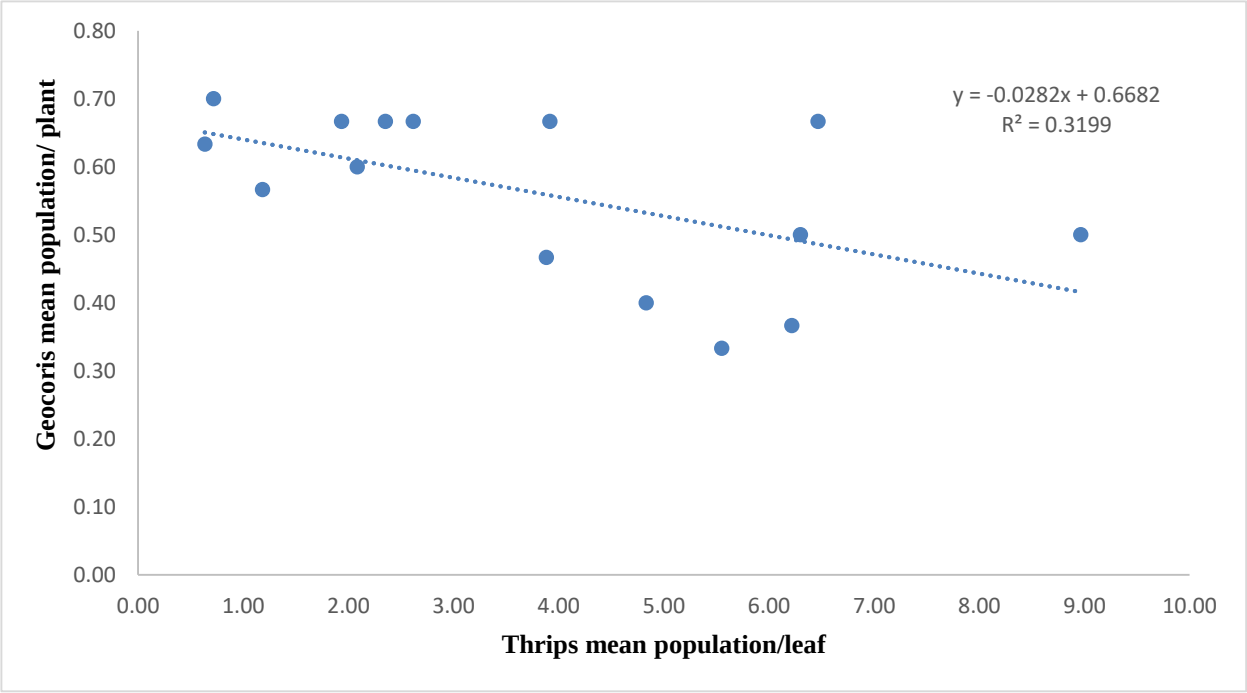

Fig.3. Correlation between mean populations of Geocoris/plant and thrips mean population/leaf of treatment T1 in field of cotton

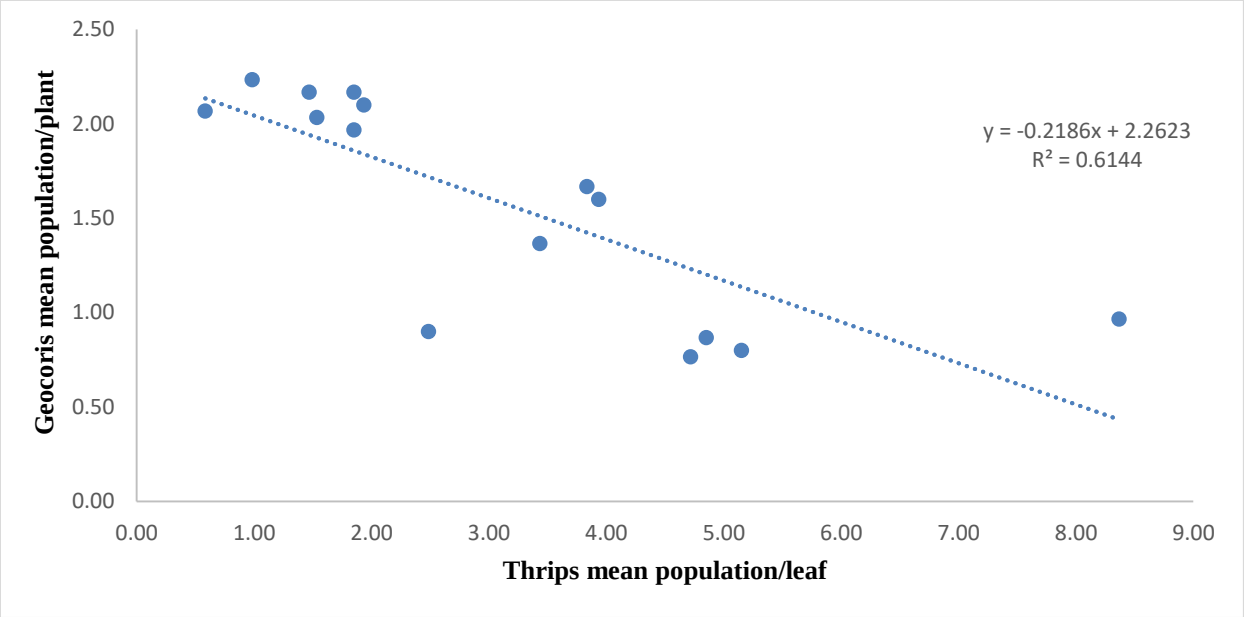

Fig.1. Correlation between mean populations of Geocoris/plant and thrips mean population/leaf of treatment T2 in field of cotton

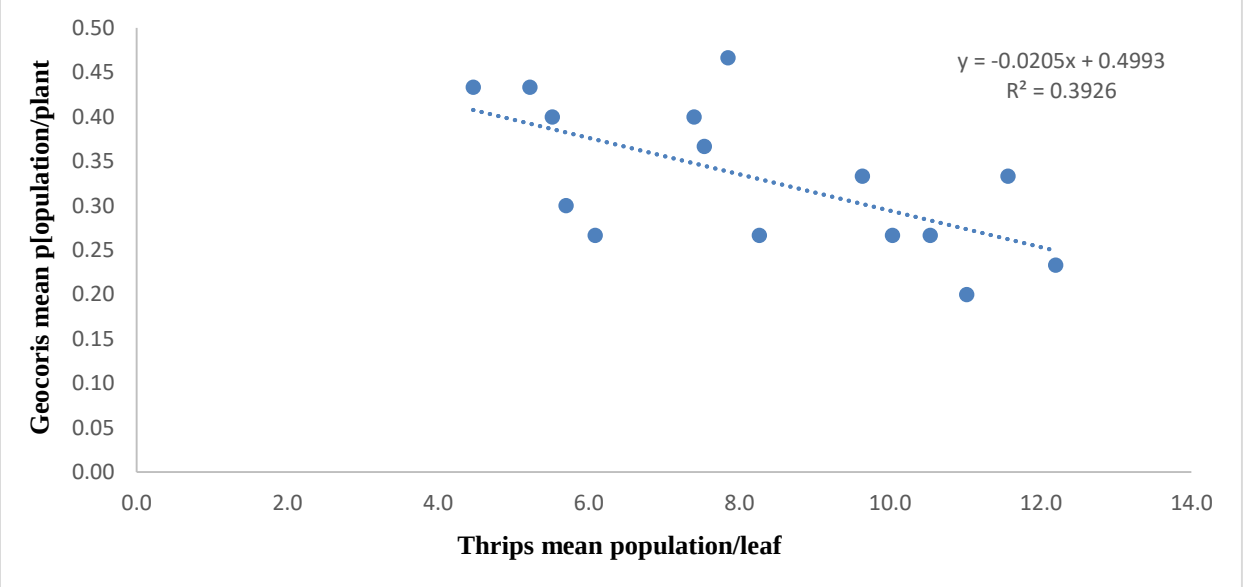

Fig.5.Correlation between mean populations of Geocoris/plant and thrips mean population/leaf of treatment T3 in field of cotton

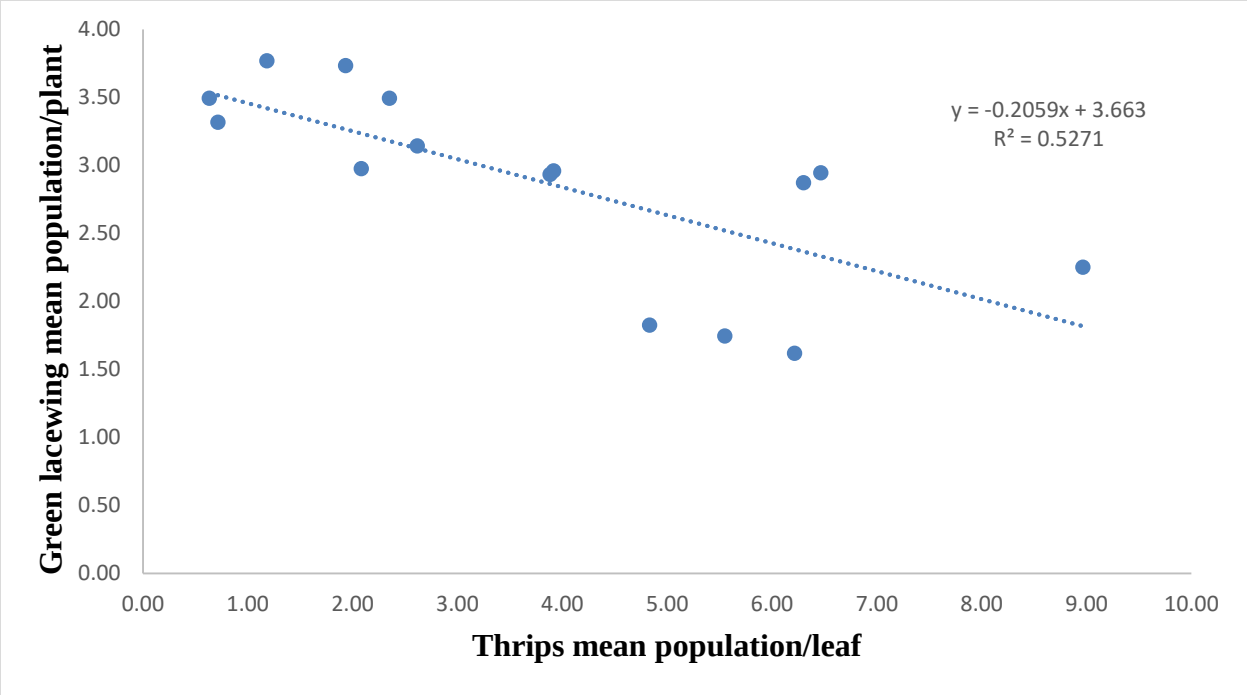

Fig.6.Correlation between mean populations Green lacewing/plant and thrips mean population/leaf of treatment T1 in field of cotton

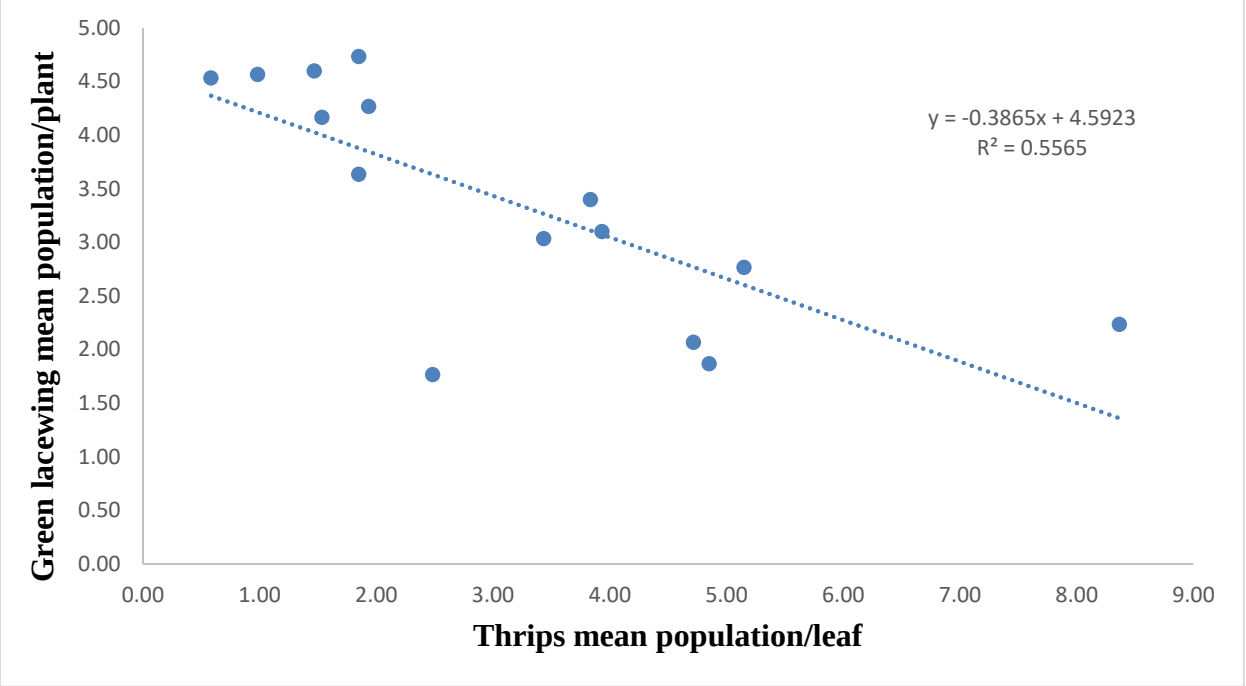

Fig.7.Correlation between mean populations Green lacewing/plant and thrips mean population/leaf of treatment T2 in field of cotton

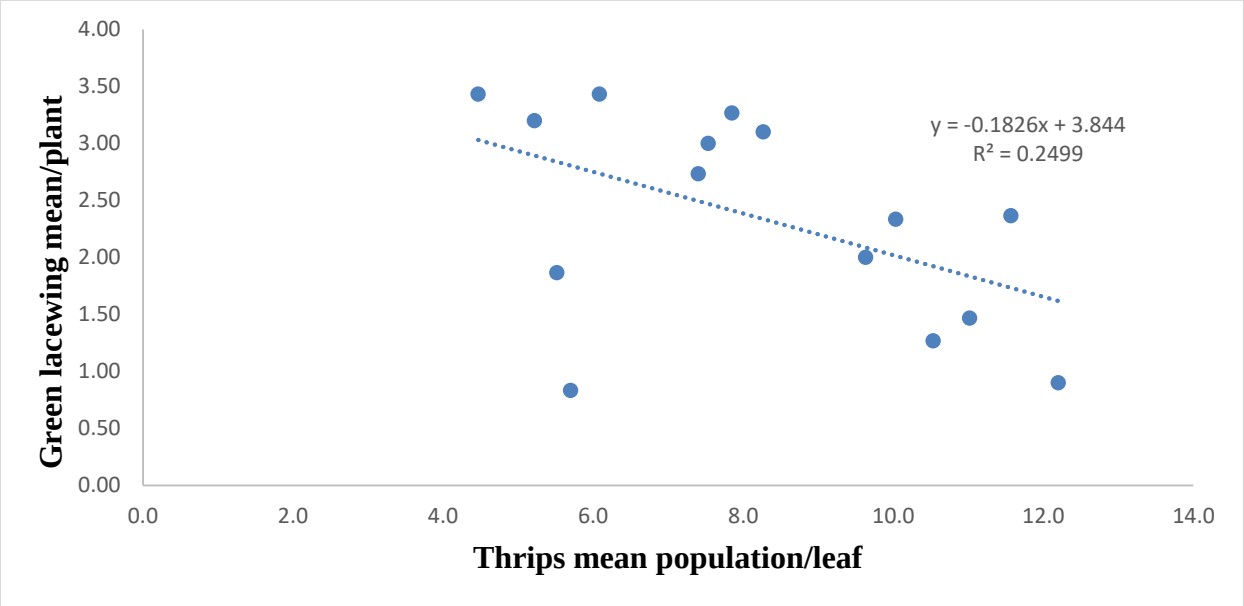

Fig.8. Correlation between mean populations Green lacewing/plant and thrips mean population/leaf of treatment T3 in field of cotton

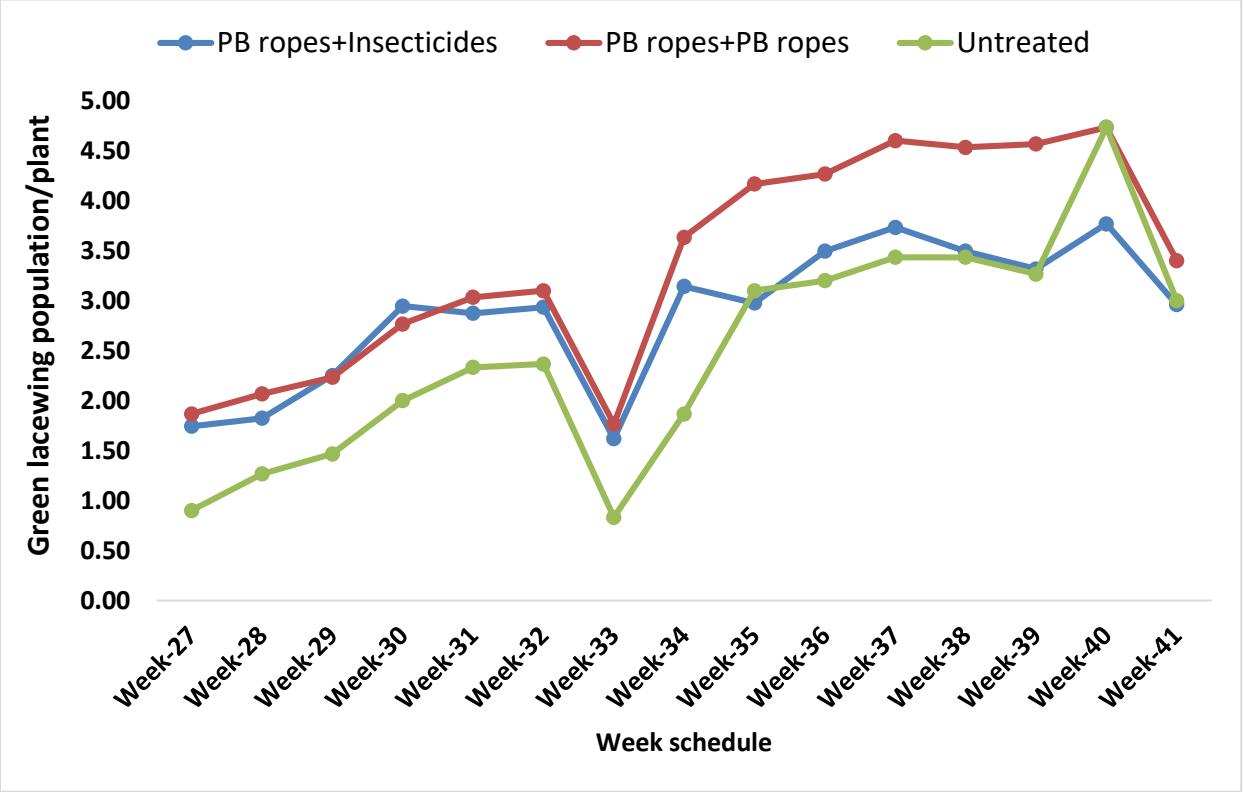

Fig.9. Mean population density of Green lacewing from July- October

4. Discussion

Cotton plays key role in the economy of Pakistan. There are various insect pests such as sucking as well as chewing pest damage the horticultural and agricultural crops especially cotton across the globe. Different management strategies such as cultural, physical, mechanical, biological, botanical and chemicals are used to control insect pest all over the world (Ramzan *et al.,* 2019). Among all these management strategies, chemical control is extensively used against insect pests. Integrated pest management is the best approach to control insect pest all over the globe. The current study was conducted to check the ecological impact of PB-ropes on population of *Thrips tabaci* and its natural enemies. Thrips is the major sucking pest of cotton and various natural enemies play key role in pest control. Thrips sucks the cell sap from cotton leaves (Khaliq *et al.,* 2014; Hasan *et al.,* 2013) and caused severe economic losses (Khaliq *et al.,* 2014). The similar findings were reported by many scientists (Raza *et al.,* 2015). In the current study, integrated pest management such as chemical and biological (natural enemies and PB-ropes) were used to check the thrips and natural enemies population in cotton field. The study showed that population of thrips was found maximum in 1st week of July in T3 while minimum in plot T2 that treated with PB-ropes as compared to plot T3 where no PB-ropes installed. The population of natural enemies was increased with increase in hosts. Our findings are similar with findings of early researchers (Solangi *et al.,* 2005). PB-ropes were installed against *Pectinophora gossypiella* to check mating disruption on population its densities (Lykouressis *et al.*, 2004). Population of pest was less in treated plot as compared to control. Our findings are in line with the findings of other researchers (Lykouressis *et al.,* 2004).

5. Author contribution

HG conducted the study and wrote the manuscript, MAS planned the study, MI, UNU, AM, HTG and MQ critically reviewed the manuscript while MHM helped in data collection.

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7. Conflict of interest

Authors have no conflict of interest.

8. Funding

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9. References

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