

Insect Pests and Natural Enemies Associated with Berseem (*Trifolium alexandrinum* L.) in Cotton Field

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Abstract

Berseem clover (*Trifolium alexandrinum* L.) is annual winter leguminous forage it also known as trap crop which attract the predators and parasitoids of insect pests. The irrational use of pesticides reduced pests and natural enemies and destroyed the delicate balance between pests and predators in field crops. The study was carried in Rabi growing season during 2012. The cotton was sprayed with highly hazardous pesticides for pest control, after the harvesting of cotton, 25 kg/ha barseem seeds were broadcast in irrigated soil beds. Barseem crop was investigated for pest and natural enemies on every week, 5 plants checked at 20 different locations after 14 days (2 weeks) of germinations and 13 week were recorded throughout the three cutting periods. Insect pests, which appear on berseem crop, were: aphid, leaf minor, dusky bug, thrip, whitefly, crocket, and cutworm, their populations varied with one another during whole study period. The average pest populations were recorded aphid, leaf minor, dusky bug, thrip, whitefly, crocket, and cutworm (6.18, 0.56, 0.45, 0.35, 0.33, 0.21, and 0.49 respectively). Whereas the natural enemies were; rove beetles, lady bird beetle, ant, spider, big eyed, and green lace wing (1.83, 1.31, 0.70, 0.63, 0.34, and 0.15 respectively). In berseem agro ecosystem at cotton field showed that some cotton pest were occurred on berseem and infest the crop in the initial period of growth and when the climate was become cold and natural enemies appear in agro ecosystem of berseem these pests were controlled.

Keywords: Pests, Natural Enemies, Berseem, Cotton

1. Introduction

Berseem clover or Egyptian clover (*Trifolium alexandrinum* L.) is an annual winter leguminous forage species well adapted to semi-arid conditions of the Mediterranean areas (Iannucci et al. 1996). It helps to enhance soil fertility and soil physical characteristics (Graves et al. 1996). The plant forage know as one of the superior grass in mineral and protein contents (Laghari et al. 2000). Also it cultivate to obtain forage and seed. Berseem clover which is also known as a cool season clover (Rethwish et al. 2002) is grown in both spring and fall growing season as direct cropping, intercropping or in crop rotation, berseem known as trap crop for natural enemies which attract the predators and parasitoids of pest, it also grown on the sides of main crop to enhance the natural enemies in main crop.

Farmers apply different pesticides as alone, as well as in combinations, without confirming their compatibility on their own experience, without any consulting/suggestion of agriculture experts to get the maximum yield/hector on their farms. The irrational use of pesticides reduced pests and natural enemies as well as crop come under stresses and yield decreases. (Wagan et al. 2014b). several pesticide resistance problems have been found in area where the injudicious chemical poisons are applying for pest control (Rueda and Shelton, 1995) Uses of pesticides lead a direct toxic effect the environment, human health, and other beneficial insects/pests by accumulating in the biosphere, also an indirect effect. Evidence shows that leading to a decrease in animal fertility, affects long-term freshwater biodiversity (Rola and Pingali, 1993; Antle and Pingali, 1994; and Tjornhom et al., 1997). The rapid increase in pesticide consumption has destroyed the delicate balance between pests and predators in cotton growing areas of Pakistan without contributing any productivity improvements. The best examples are the experiences with the major outbreaks of the Cotton Leaf Curl Virus (CLCV) in early 1990s, Burewala Strain of Cotton Virus and Mealy Bug in the beginning of 2000s which have done colossal damage to cotton crop (Poswal et al. 1998). The appearance of insect pests on crop under natural agro ecosystem, the natural enemies occurs later on and continue their predatory habit till the pest populations comes under control, also the same time agro ecosystem encourage the activities of predators (Wagan et al. 2014 a)

On the basis of irrational use of pesticides on cotton and major pest outbreak, the present study design to know the agro eco-system on berseem grown in cotton field. It was hope that the results will be encouraging those who are interesting in improving the natural balance and organic farming.

1.1 Materials and Methods

Field investigation was carried in Rabi growing season to evaluate the insect pest and natural enemies in agro ecosystem of berseem at cotton field areas, near the village Khadim Hussain Shah, Deh Bhimpur, Taluka

Hyderabad, Pakistan during 2012. The study area is subtropical humid region, with average 7.9oC to 40.8oC temperature and 50% to 81% RH.

The cotton was sprayed with highly hazardous pesticides for pest control, the cotton crop harvested on 16th October when the insect pest attack was severed and no further boll formation occurred, crop debris and weeds were burned after harvesting and land was ploughed 3 times before the sowing of barseem. Barseem seeds 25 Kg/ha broad cast in irrigated soil beds on 19th October, the germinations were completed in 5 day. Only Urea fertilizer (40kg N/ha) was applied after 20 days of germinations and every 30 days of intervals (10 days after each cutting). Crop was irrigated by canal water on every 10th day interval during hot weather and 15days interval in cool weather.

Data collection

Barseem crop field was investigated after 14 days (2 weeks) of germinations for pest and natural enemies on every week and 13 week were recorded throughout the three cutting periods, 5 plants were checked at every 20 different randomly selected locations spread throughout the field from the inner rows. The crop was observed early in the morning when all insects were passive, natural enemies were recorded first then insect pests were count.

Statistical analysis and calculation

The present investigation carried on insect pests and natural enemies associated with berseem in cotton field; therefore we record the insects and using Microsoft Excel 2010 to calculate the average, and figures drawing.

1.1.1 Results

The results of field investigation on agro eco-system of berseem at cotton field are given below:

Insect pests

During present studies the insect pests, which appear on berseem crop, were: Whitefly, Thrip, aphid, Leaf minor, Dusky Bug, Cricket, and Cutworm. Their population varied with one another during whole study period.

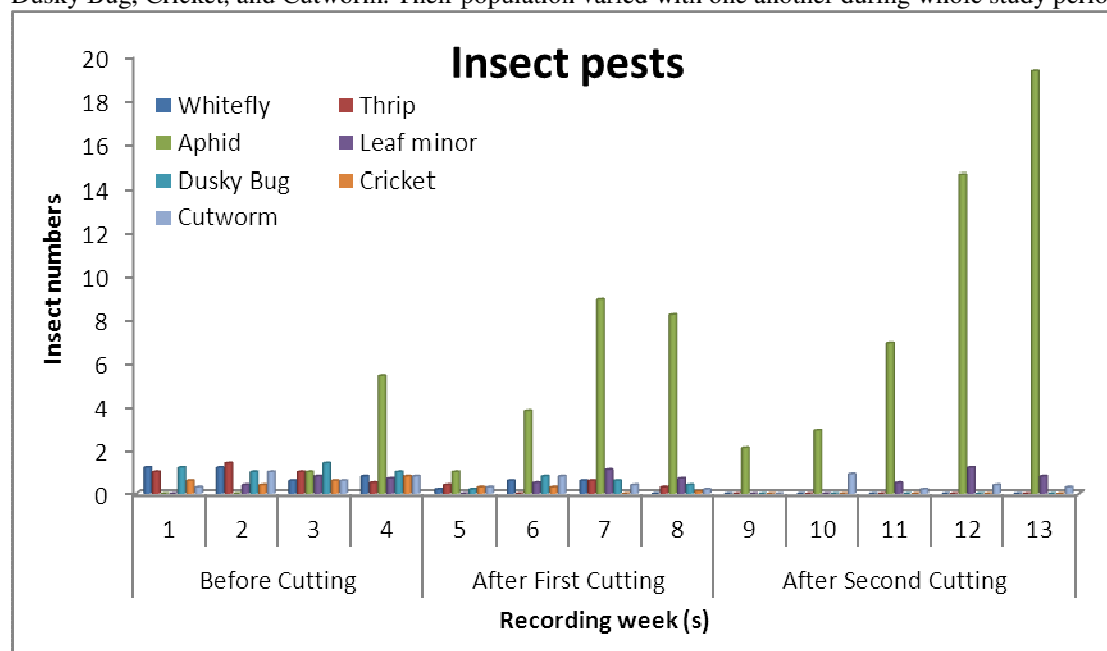


Fig. 1. Weekly observed insect pest at during different cuttings of fodder.

Whitefly appeared on berseem fodder crop during 1st week of observation (14th day of germination), 1.2 adults per plant and will decrease with plant growth, the infestation of whitefly was recorded from 1st to 7th week of observations. The overall mean population 0.33/plant was recorded (Fig. 1).

Similarly, the thrip also recorded the same time as whitefly with 1/plant in 1st observation; it was remain on the crop up to 8th week of investigation. Thrips population remained comparatively low throughout on the berseem; the mean population 0.35/plant was recorded (Fig. 1).

Aphid found in the field during 3rd week of investigation, the population of this pest increasing rapidly but later on it was controlled by natural enemies also under controlled with cutting of fodder. The peak population 19.3/plant was observed in last investigation. Over all mean of this pest 6.18/plant were recorded (Fig. 1).

Leaf minor considers as major pest of berseem and mustard, but in this climate the infestation was not severe, the average population was recorded 0.56/plant, while the maximum population was recorded in 12th

week of observation (Fig. 1).

Dusky bug of cotton also observed in berseem fodder, and remain in crop up to 8th week of observations, an average mean populations was 0.45/plant recorded. The maximum infestation was recorded during 3rd week of observations before 1st cutting (Fig. 1).

Cricket is a seedling pest of crops and infestation occurs after germinations, in berseem the pest occurred from 1st week of observation till 8th week before 3rd cutting, the maximum population 0.8/spot was recorded in 4th observations. The average populations of cricket on barseem 0.21/spot observed (Fig. 1).

Cutworm is a major seedling pest of vegetable and berseem in dry soil, the maximum occurrence on berseem was 1/spot, during 2nd week of observation, and overall average population 0.49/spot was recorded (Fig. 1).

Natural enemies

The natural enemies recorded were: rove beetles, lady bird beetle, ant, spider, big eyed, and green lace wing, their populations were fluctuated throughout study period

Rove beetle was activating from 3rd week of observation to the last week, maximum populations 4.3/spot was recorded during last (13) observation. The average population 1.83/spot which showed agro ecosystem favor this predator as compared to other natural enemies (Fig. 2).

The 2nd active predators were lady bird beetles; they were occurred on 4th week of observations and continue their predatory habits till last observation. The maximum population was recorded 4.7/spot during 13th and the average population was recorded 1.31/spot (Fig. 2).

Ants also played a vital role in decreasing the population of sucking insect pests. Ant's population was recorded from first week to last observation which show the agro ecosystem encouraged their activities, their peak population 1.2/spot reached during 3rd week and average 0.70/spot was observed (Fig. 2).

Different species of spiders were present from 1st week to last observation, the maximum populations 1.3/spot were recorded in 6th week, after 2nd cutting of fodder. However, the average population 0.63/spot was recorded (Fig. 2).

Big eyed bug was one of the predators which present in crop only 6 weeks, it occur in 3rd week and remain active up to 8th week before second cutting of fodder. The average population 0.34/spot was recorded (Fig. 2).

Green lace wing is a voracious feeder on jassid and whitefly in cotton field, therefore the activity was recorded during the presence of cotton pest. The predator population was recorded very low on berseem and average population 0.15/spot was observed during all recordings (Fig. 2).

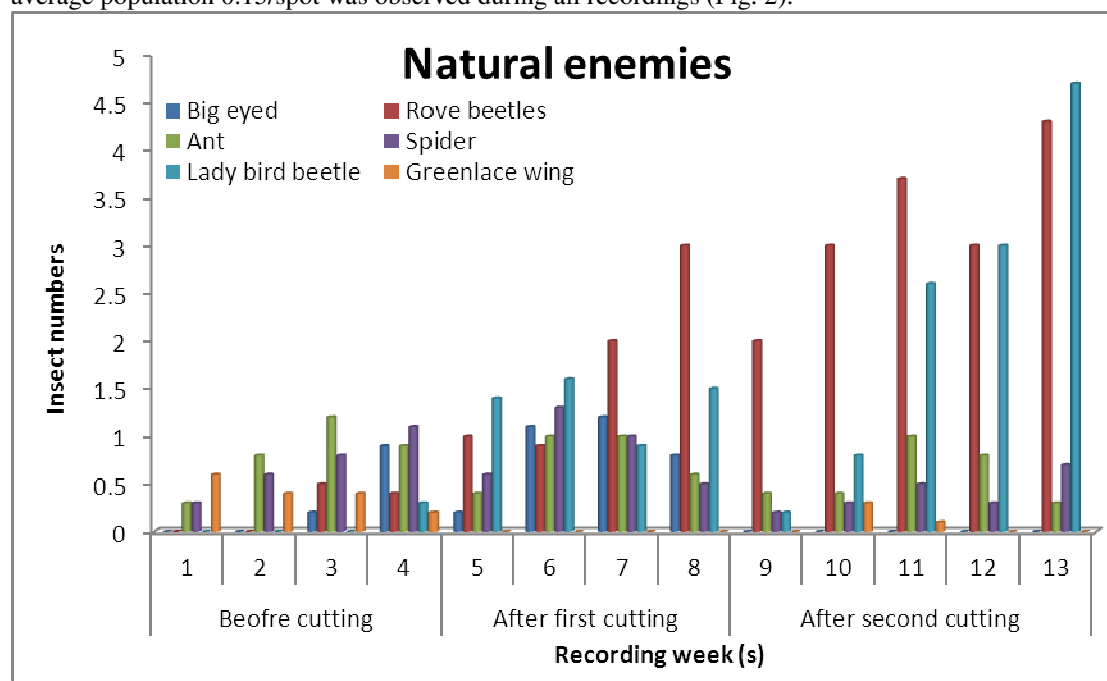


Fig. 2. Weekly observed of natural enemies during different cutting periods.

Plant Height

Data in fig. 3 show that the height of berseem was increasing gradually during all cutting periods. Berseem plants attended their maximum height 54.8cm during last week of observation, after second cutting (Fig 3).

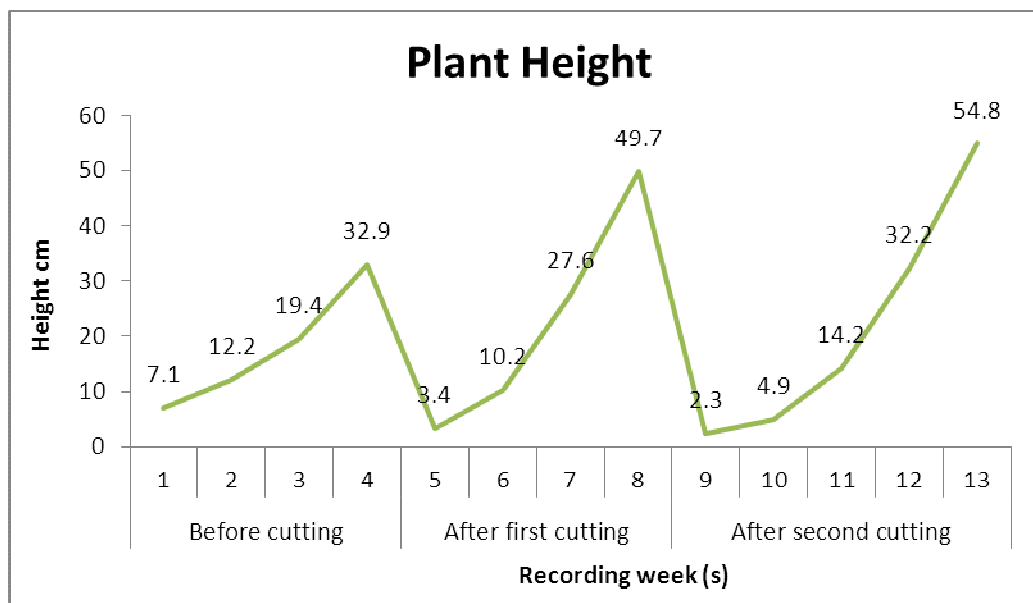


Fig. 3. Weekly berseem stems height during different cutting periods.

Leaves

The berseem plant have no branches and leaves found on stem, the maximum number of leaves 8.7/plant was recorded in 8th observation, after first cutting period. The average number of leaves 5.65, 5.78, and 4.42 were recorded before first cutting, after first and second cutting respectively (Fig. 4).

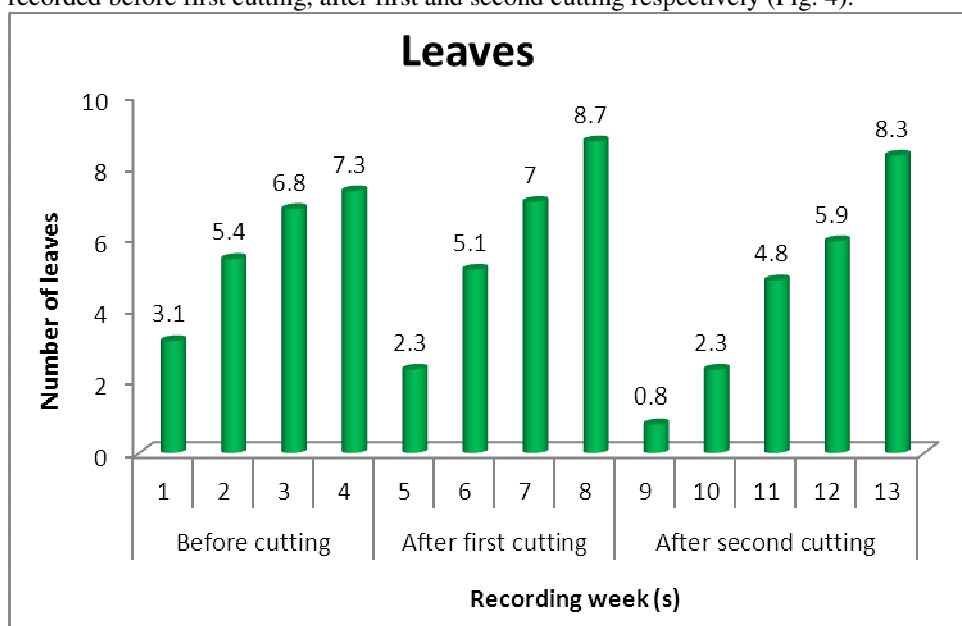


Fig. 4. Weekly berseem plant leaves during different cutting periods.

1.1.2 Discussion

During present studies on berseem agro ecosystem at cotton field showed that some cotton pest i.e. whitefly, thrip, and dusky bug, were occurred on berseem fodder crop and infest the crop in the initial period of growth and when the climate was become cold and natural enemies appear in agro ecosystem of berseem these pests were escaped from berseem. In addition leaf minor, cricket, and cutworm were also infested the berseem at different time periods, and controlled by predators under natural balance, therefore it can be say that non-use of synthetic pesticides, crop create the natural balance of pest-predators. Different insect and non-insect predators including rove beetle, lady bird beetles, ants, spiders, big eyed bug, and green lace wing were seemed active at throughout the study period which proved that berseem crop provides agro ecosystem to natural enemies, where they continued their predatory habits to control the pest populations during all fodder cutting periods. Same results described by Hussain (1999) The use of pesticides especially, in the cotton growing areas of the country

has destroyed the bio-control agents and the populations of natural enemies of the insects and pests have declined up to 90%. Bugg and Dutcher (1989a&b), Bugg et al (1990) lady beetles and other beneficial insects feed soft bodied insects on cover crops. Wagan et al. (2014 a) natural enemies occurs on insect pests and continue their predatory habit till the pest populations comes under control when they appears on crop under natural agro ecosystem, the agro ecosystem encourage the activities of predators. Bugg et al. (1990 & 1991) big eyed bug are opportunistic predators of a wide range of insects and mites and can build up in cool-season cover crops, such as arrow leaf clover, berseem clover (*Trifolium alexandrinum*), and subterranean clovers, and may disperse to adjoining vegetable crops when the clovers die in early summer. Kennedy and Mackie (1925) mentioned that many (unspecified) pest insects can build up on berseem clover with potential adverse effects to other crops should these pests disperse.

Conclusion

It is concluded that; Berseem crop infested by insect pests from previous crop till the natural enemies adopt the agro ecosystem, berseem encourage the activities of predators insects, therefore many predator insect and non-insect species found in berseem agro ecosystem than other crop/plant.

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