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Effect of sowing dates and IPM modules on jassid and blister beetle in okra under mid hills of Himachal Pradesh

Anjali Brice, SC Verma, KC Sharma, PL Sharma and DK Mehta

Abstract
Field trials were conducted during the year 2016 at Research Farm of Department of Seed Science and Technology, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan (HP). The experiment was carried out on okra cv. P-8, sown at three sowing dates *viz.*, 1st June, 15th June, 30th June, 2016 under six IPM modules and untreated control. The results showed that sowing–I recorded the minimum insect pest population (7.94 jassids/plant and 1.17 blister beetles/plant). IPM module-I (Seed treatment with imidacloprid @ 3 ml/kg, foliar spray of imidacloprid @ 0.3 ml/lt at 40 days after sowing (DAS), foliar spray of spinosad @ 0.3 ml/lt at 50 DAS, emamectin benzoate @ 0.4 g/lt at 70 days, foliar spray of spinosad @ 0.3 ml/lt at 80 DAS) provided maximum protection against insect-pests (4.13 jassids/plant and 0.24 blister beetles/plant) while maximum population was in control (5.71 jassids/plant and 0.54 blister beetles/plant).

Keywords: *Amrasca biguttula biguttula*, *Mylabris* sp., pest management, sowing dates

Introduction
Okra, *Abelmoschus esculentus* (L.) Moench is a popular and most common vegetable crop grown in India and in other tropical and sub-tropical parts of the world [1]. In India okra is cultivated over an area of about 507.45 thousand hectares with a production of 5853.02 thousand metric tonnes and in Himachal Pradesh the area under okra cultivation is about 2.76 thousand hectares with a production of about 34.03 thousand metric tonnes [2]. The okra crop is adversely affected by the attack of many species of insect-pests including jassids, fruit borers, aphids and mites [3, 4]. Mites and sucking pests feed on the cell sap from leaves and other tender plant parts including fruits removing the chlorophyll, this greatly hampers the photosynthetic activity of plant leading to poor growth, fruit set and seed quality. Blister beetles feed on the reproductive parts of the plants and can cause significant yield losses [5]. Plant protection measures through seed treatment and foliar application are known to control insect-pests of okra. Imidacloprid is effective against leaf hopper, aphid and whiteflies [6]. The Thiamethoxam is also effective against leaf hopper and other sucking pest when used as seed treatment as well as spray [7]. Chemical methods had been the popular and widely used tactics to combat the pests, however, there are increasing reports of synthetic pesticide tolerance in the pest populations. The problems of toxic residues, bio-accumulation and bio-magnification, detrimental effects on the ecological balance arising out of repeated exposure to broad-spectrum synthetic chemicals have led to alternative safer methods. This has necessitated assessing the effectiveness of some combinations of bio pesticides and chemicals against the insect-pests in okra [8]. Knowing the fact that okra is an important vegetable crop of Himachal Pradesh and investigations on sowing time and application of insecticides as seed treatment and spray of chemicals, botanicals and cow urine for the control of insect-pests of okra in integrated manner has not been studied so far. So, there is an urgent need to standardise sowing time in combination with Integrated Pest Management (IPM) technologies for quality seed production of okra. Therefore the aim of the study was to find out the suitable date of sowing and effective Integrated Pest Management strategies for jassid (*Amrasca biguttula biguttula* Ishida) and blister beetle (*Mylabris pustulata* F.) in okra.

Materials and Methods
The crop was sown at three different sowing dates i.e. 1st June, 2016, 15th June 2016 and 30th

June 2016 with a row to row and plant to plant spacing of 60 x 20 cm under different IPM modules for the management of jassid (*A. biguttula biguttula* Ishida) and blister beetle (*M. pustulata* F.)

The IPM modules followed were Module-I (Seed treatment with imidacloprid @ 3 ml/kg, foliar spray of imidacloprid @ 0.3 ml/lt at 40 DAS, foliar spray of spinosad @ 0.3 ml/L at 50 DAS, emamectin benzoate @ 0.4 g/L at 70 days, foliar spray of spinosad @ 0.3 ml/L at 80 DAS). Module-II (Seed treatment with thiamethoxam @ 3 ml/kg, sowing of maize as trap crop, foliar spray of neem baan EC 10000 ppm @ (2 ml/L) at 40 and 60 days after sowing, foliar spray of *Bacillus thurigiensis* @ 0.3 ml/L at 50, 70 and 80 DAS). Module-III (Seed treatment with acetamiprid @ 2g/kg, foliar spray of neem baan EC 10000 ppm @ 2 ml/L at 40 DAS, foliar spray of emamectin benzoate @ 0.4 g/L at 50 DAS, foliar spray of spinosad @ 0.3 ml/L at 60 DAS, emamectin benzoate @ 0.4 g/L at 70 days, foliar spray of neem baan EC 10000 ppm @ 2 ml/L at 80 DAS). Module-IV (Soil application of carbofuran @ 500g a.i/ha at the time of sowing, foliar spray of imidacloprid @ 0.3 ml/L at 20 DAS, foliar spray of spinosad @ 0.3 ml/L at 50 DAS, emamectin benzoate @ 0.4 g/L at 70 days, foliar spray of spinosad @ 0.3 ml/L at 80 DAS). Module-V (Seed treatment with PSB (Phosphate solubilising bacteria) and azotobacter, soil application of neem cake @ 3.0 t/ha, spray of neem baan EC 10000 ppm @ 2 ml/L at 10 days interval). Module-VI (Seed treatment with beejamrut, soil treatment with jeevamrut, and foliar spray of neemastra at 10 days interval). Control (No seed treatment or sprays).

Preparation of Beejamrut: (for 800 sq mt. area): 5 L cow urine, 5 kg cow dung and 50 g lime was added in 20 L water. The mixture was stirred well and kept overnight. The prepared was mixture used for seed treatment on the next day.

Preparation of Jeevamrut: (for 4000 sq mt. area): 10 kg cow dung, 1 kg gram flour, 1 kg jaggery, 5 L cow urine and half a handful of forest soil was added in 200 L water and thoroughly mixed. Mixture was kept in shade for 48 hours and stirred in clockwise direction every 12 hours. The prepared mixture was then used for soil drenching.

Preparation of Neemastra (for 4000 sq mt. area): 10 L cow urine, 2 kg cow dung and 10 kg neem (any bitter leaved plant) leaves and branches (cut into small pieces) were added in 200 L water and mixed by stirring in clockwise direction. The mixture was covered with gunny bags for 48 hours (no sunlight should fall on the container). The mixture was stirred for 1-2 minutes daily in clockwise direction. After 48 hours the mixture was sieved and kept in a container and used as foliar spray.

The population of jassid, *A. biguttula biguttula* (Ishida) was recorded as per 3-leaf sample basis (second, third and fourth leaf from top) from 5 random plants per plot and then the average number of jassids per plant was calculated. The blister beetle, *M. pustulata* (F.) population was recorded by observing the number of adult beetles per 5 plants in each plot and the average number of beetles per plant was calculated.

Results and Discussion

Jassid population per plant

Data contained in Table 1 revealed that there was a significant influence of sowing dates and IPM modules on jassid population in okra. At sowing-I significantly lower number of jassids were recorded with IPM module-I (3.40 jassids/plant) followed by module-IV (3.58 jassids/plant), module-III (3.93 jassids/plant), module-II (4.18 jassids/plant), module-V (4.44 jassids/plant), module-VI (4.96 jassids/plant). After day- 1 of spray, the mean jassid population was 4.34 jassids/plant which gradually increased to 4.80 jassids/plant at day-3 and 5.54 jassids/plant at day-7 after spray with sowing-I. Minimum jassid population was recorded with module-I which differed significantly with rest of the modules and different days after spray (day-3 and day-7). Jassid population recorded with module-V after day-1 of spray and module-I after day-7 of spray was equal (3.80 jassids/plant) and statistically at par with module-III (3.87 jassids /plant) after day-3 and module-IV (3.93 jassids /plant) after day-7 of spray at sowing-I (Table-1). At sowing- II the mean jassid population was minimum with module-I (3.98 /plant) which differed significantly with rest of the IPM modules. The next best IPM module was module-IV with 4.22 jassids/plant followed by module-III (4.49 jassids/plant), module-II (4.82 jassids/plant), module-V (5.13 jassids/plant), module-VI (5.73 jassids/plant). All the modules were superior over control. Significantly lower number of jassids (5.02 /plant) were recorded after day-1 of spray which increased gradually at day-3 (5.43 jassids/plant) and day-7 (6.24 jassids/plant) after spray with sowing-II. Jassid population recorded with module-II (4.87 jassids/ plant) after day-3 of spray at sowing-II was statistically at par with module-VI (4.93 jassids/ plant) after day-1 of spray and module-III (5.00 jassids/ plant) after day-7 of spray at same sowing. Minimum number of jassids (5.00 jassids/plant) were recorded with module-I (Table-1). The next best IPM module was module-IV (5.13 jassids/plant) followed by module-III (5.42 jassids/plant), module-II (5.53 jassids/plant), module-V (5.80 jassids/plant) and module-VI (6.44 jassids/plant). Significantly lower number of jassids (5.98 /plant) were recorded after day-1 of spray which increased gradually to 6.53 jassids/plant after day-3 and 7.13 jassids/plant after day-7 of spray at sowing-III. Jassid population recorded with module-III after day-1 of spray and module-I after day-3 of spray was equal (5.00 jassids/plant) and statistically at par with module-II (5.07 jassids/plant) and module-V (5.13 jassids/plant) after day-1 of spray as well as module-IV (5.13 jassids/plant) after day-3 of spray at same sowing. Significantly minimum number of jassids (4.90 /plant) were recorded with sowing-I followed by sowing-II (5.56 jassids /plant) and sowing-III with mean 6.55 jassids/plant (Table-1).

The data in Table 2 showed that minimum number of jassids (4.13 /plant) were recorded with IPM module-IV followed by module-I (4.31 jassids/plant), module-III (4.62 jassids/plant), module-II (4.84 jassids/plant), module-V (5.13 jassids/plant) and module-VI (5.71 jassids/plant) in increasing order. Significantly lower number of jassids (5.11/plant) were recorded after day-1 of spray followed by day-3 (5.59 jassids/plant) and day-7 (6.31 jassids/plant) after spray. Minimum number of jassids (3.78 / plant) were recorded with module-I after day-1 of spray which differed statistically with rest of the modules as well as control on same day as well as on day-3 and day-7 after spray (Table-2). The mean jassid population recorded with module-IV (4.00 jassids/ plant) after day-1 of spray was statistically at par with module-I (4.04 jassids/plant) after day-3. Module-III after day-3 recorded 4.56 jassids/plant which was equal to module-I after day-7 and statistically at par with module-V (4.51 jassids/plant) after day-1 of spray. Mean jassid population recorded with module-V after day-3 (5.11 jassids/plant) and module-III after day-7 (5.16 jassids/plant) were statistically at par with each other. In the present study, mean jassid population was minimum with crop grown at sowing-I and maximum mean population was recorded with sowing-III (Table-2). This may be accredited to the favourable environmental conditions available for insect-pests with the late sown crop and also due to coincidence of insect pest occurrence with late crop which enables the pest to rapidly increase its population.

These results were in accordance with the results obtained by [9] who reported that early sown crop recorded the lowest number of jassid while the late sown crop recorded maximum jassid population. Among the different IPM modules minimum jassid population was recorded with module-I. This may be due to use of synthetic insecticides which provide immediate and effective control over insect-pests. These results were in confirmation with the results of [10] who reported that neonicotinoid insecticides were most effective in suppressing the jassid population in okra. Similar results were obtained by [11] who reported that the minimum jassid population and fruit infestation was recorded with imidacloprid treated plots. [12] also reported that synthetic insecticides provided better control of jassid in okra crop. Maximum control of insect-pests was achieved with module-I and it has been found that the mean jassid population gradually increased after 1st day of spray to 7th day after spray in all the IPM modules. This may be due to high initial toxicity of insecticides which gradually decreased with time and thus reduced the efficacy of applied insecticides over time. These findings were in confirmation with findings of [13] who reported reduction in jassid population during initial days of insecticide application which again increased gradually. Similarly [14] reported that insect population increased after a few days of insecticide application.

Blister beetle population per plant

There was a significant effect of sowing dates and IPM modules on blister beetle population in okra (Table 3). At sowing-I, minimum number of blister beetles (0.09/plant) were recorded with module-I. The mean number of blister beetles recorded with module-II and module-V were equal (0.27 blister beetles/plant). After day-1 of spray, the mean blister beetle population was 0.11/plant which increased steadily to 0.27 blister beetles/plant after day-3 and 0.47 beetles/plant after day-7 with sowing-I.In sowing-II significantly minimum number of blister beetles were recorded with module-I (0.27 beetles/plant) followed by module-IV (0.36 blister beetles/plant), module-II (0.44 beetles/plant), module-III (0.40 beetles/plant), module-V (0.47 beetles/plant) and module-VI (0.60 beetles/plant). All the modules were superior over control (Table-3). Mean blister beetle population with module-III (0.40 beetles/plant) was statistically at par with module-IV (0.36 beetles/plant) and module-II (0.44 beetles/plant) and differed significantly with rest of the treatments. The mean beetle population reduced to 0.24 blister beetles per plant after day-1 of spray which gradually increased to 0.44 blister beetles per plant after day-3 and 0.79 blister beetles per plant after day-7 of spray. At sowing-III significantly low blister beetle population was recorded with module-I (0.38 beetles/plant). The blister beetle population recorded with module-IV and module-III was equal (0.49 beetles/plant). Similarly, blister beetle population recorded with module-II and module-V was equal (0.56 beetles/plant). All the modules were superior than control (1.09 blister beetles/plant). The number of blister beetles recorded on day-1 after spray gradually increased to 0.51, 0.96 beetles/plant after day-3 and day-7 after spray, respectively. Significantly minimum number of blister beetles (0.28 /plant) were recorded with sowing-I followed by sowing-II (0.49 beetles/plant) and sowing-III with mean beetle count of 0.61 beetles/plant (Table-3).

It was evident from Table 4 that minimum number of blister beetle population was recorded with module-I (0.24 beetles/plant). The mean number of blister beetle population recorded with module-IV (0.33 beetles/plant) was statistically at par with both module-III (0.36 beetles/plant). Blister beetle population recorded with module-II (0.42beetles/plant) and module-V (0.43 beetles/plant) were also statistically at par with each other. All the IPM modules were superior to control (0.88 beetles/plant). Significantly low blister beetle population (0.24 beetles/plant) was recorded after day-1 followed by day-3 (0.40 beetles/plant) and day-7 (0.74 beetles/plant) after spray (Table-4). Minimum blister beetle population was recorded with module-I (0.07 beetles/plant) after day-1 of spray which differed statistically with rest of the modules and days after spray. Blister beetle population recorded with module-II and module-V after day-1 of spray as well as module-I after day-3 of spray was equal (0.18 beetles/plant). In the present investigations, the population of blister beetle was minimum with sowing-I as compared to sowing-II and sowing-III (Table-4) of okra crop which may be due to less favourable conditions for blister beetle at early sown crop than late sown okra crop.

These results were in accordance with findings of [15] who reported maximum population of blister beetle on okra during last week of July to last week of August. Similarly [16] also reported that blister beetle population on green gram was maximum during the peak rainy season as blister beetles prefer low temperature regime and lower bright sunshine hours and more rainy days. In the present study, the most effective module was module-I which provided immediate control of the insect- pests. Similar results were reported by [5] who observed that synthetic insecticides provided immediate and effective control of blister beetle in pigeon pea crop.

Table 1: Effect of sowing dates and IPM modules on jassid population (numbers/plant) in okra during 2016

IPM Module	Jassid population (numbers/plant)														
	Sowing														
	I (1st June)					II (15th June)					III (30th June)				
	Days after spray														
	Before spray	1	3	7	Mean	Before spray	1	3	7	Mean	Before spray	1	3	7	Mean
M-I	7.87 (2.98)	3.07 (2.02)	3.33 (2.08)	3.80 (2.19)	3.40 (2.10)	9.13 (3.18)	3.67 (2.16)	3.80 (2.19)	4.47 (2.34)	3.98 (2.23)	11.07 (3.47)	4.60 (2.37)	5.00 (2.45)	5.40 (2.53)	5.00 (2.45)
M-II	7.93 (2.99)	3.47 (2.11)	4.20 (2.28)	4.87 (2.42)	4.18 (2.27)	9.33 (3.22)	4.20 (2.28)	4.87 (2.42)	5.40 (2.53)	4.82 (2.41)	11.13 (3.48)	5.07 (2.46)	5.53 (2.56)	6.00 (2.65)	5.53 (2.56)
M-III	7.93 (2.99)	3.33 (2.08)	3.87 (2.21)	4.60 (2.37)	3.93 (2.22)	9.40 (3.23)	4.07 (2.25)	4.40 (2.32)	5.00 (2.45)	4.49 (2.34)	11.13 (3.48)	5.00 (2.45)	5.40 (2.53)	5.87 (2.62)	5.42 (2.53)
M-IV	7.80	3.27	3.53	3.93	3.58	9.33	3.93	4.20	4.53	4.22	11.07	4.80	5.13	5.47	5.13

	(2.97)	(2.07)	(2.13)	(2.22)	(2.14)	(3.22)	(2.22)	(2.28)	(2.35)	(2.28)	(3.47)	(2.41)	(2.48)	(2.54)	(2.48)
M-V	8.00 (3.00)	3.80 (2.19)	4.40 (2.32)	5.13 (2.48)	4.44 (2.33)	9.40 (3.23)	4.60 (2.37)	5.07 (2.46)	5.73 (2.60)	5.13 (2.48)	11.13 (3.48)	5.13 (2.48)	5.87 (2.62)	6.40 (2.72)	5.80 (2.61)
M-VI	8.13 (3.02)	4.33 (2.31)	4.80 (2.41)	5.73 (2.60)	4.96 (2.44)	9.47 (3.24)	4.93 (2.44)	5.60 (2.57)	6.67 (2.77)	5.73 (2.59)	11.20 (3.49)	5.73 (2.60)	6.40 (2.72)	7.20 (2.86)	6.44 (2.73)
Control	8.20 (3.03)	9.13 (3.18)	9.47 (3.24)	10.73 (3.43)	9.78 (3.28)	9.47 (3.24)	9.73 (3.28)	10.07 (3.33)	11.87 (3.59)	10.56 (3.40)	11.20 (3.49)	11.53 (3.54)	12.40 (3.66)	13.60 (3.82)	12.51 (3.67)
Mean	7.98 (3.00)	4.34 (2.28)	4.80 (2.38)	5.54 (2.53)	4.90 (2.40)	9.36 (3.22)	5.02 (2.43)	5.43 (2.51)	6.24 (2.66)	5.56 (2.53)	11.13 (3.48)	5.98 (2.61)	6.53 (2.72)	7.13 (2.82)	6.55 (2.72)

Figures in parentheses represent $\sqrt{x+1}$ transformation
CD (p=0.05) Before spray: NS Sowing : 0.01 Sowing x Spray: 0.02 Sowing x IPM Module: 0.02 Sowing x Spray x IPM Module: 0.04

Table 2: Effect of IPM modules on jassid population in okra during 2016.

IPM Module	**Days after spray**			**Mean**
	1	3	7	
M-I	3.78 (2.18)	4.04 (2.24)	4.56 (2.35)	4.13 (2.26)
M-II	4.24 (2.29)	4.87 (2.42)	5.42 (2.53)	4.84 (2.41)
M-III	4.13 (2.26)	4.56 (2.35)	5.16 (2.48)	4.62 (2.36)
M-IV	4.00 (2.23)	4.29 (2.30)	4.64 (2.37)	4.31 (2.30)
M-V	4.51 (2.34)	5.11 (2.47)	5.76 (2.60)	5.13 (2.47)
M-VI	5.00 (2.45)	5.60 (2.57)	6.53 (2.74)	5.71 (2.59)
Control	10.13 (3.33)	10.64 (3.41)	12.07 (3.61)	10.95 (3.45)
Mean	5.11 (2.44)	5.59 (2.54)	6.31 (2.67)	5.67 (2.55)

Figures in parentheses represent $\sqrt{x+1}$ transformation
CD (p= 0.05) IPM Module : 0.02
Spray : 0.01
Interaction : 0.03

Table 3: Effect of sowing dates and IPM modules on blister beetle population (numbers/plant) in okra during 2016.

IPM Module	**Blister beetle population (numbers/plant)**														
	Sowing														
	I (1st June)					**II (15th June)**					**III (30th June)**				
	Days after spray														
	Before spray	**1**	**3**	**7**	**Mean**	**Before spray**	**1**	**3**	**7**	**Mean**	**Before spray**	**1**	**3**	**7**	**Mean**
M-I	0.27 (1.13)	0.00 (1.00)	0.07 (1.03)	0.20 (1.10)	0.09 (1.04)	0.33 (1.15)	0.07 (1.03)	0.20 (1.10)	0.53 (1.24)	0.27 (1.12)	0.60 (1.27)	0.13 (1.06)	0.27 (1.13)	0.73 (1.32)	0.38 (1.17)
M-II	0.33 (1.15)	0.07 (1.03)	0.27 (1.13)	0.47 (1.21)	0.27 (1.12)	0.47 (1.21)	0.20 (1.10)	0.40 (1.18)	0.73 (1.32)	0.44 (1.20)	0.67 (1.29)	0.27 (1.13)	0.47 (1.21)	0.93 (1.39)	0.56 (1.24)
M-III	0.33 (1.15)	0.00 (1.00)	0.20 (1.10)	0.40 (1.18)	0.20 (1.09)	0.40 (1.18)	0.13 (1.06)	0.33 (1.16)	0.73 (1.32)	0.40 (1.18)	0.67 (1.29)	0.27 (1.13)	0.33 (1.16)	0.87 (1.37)	0.49 (1.22)
M-IV	0.33 (1.15)	0.00 (1.00)	0.13 (1.06)	0.33 (1.16)	0.16 (1.07)	0.40 (1.18)	0.07 (1.03)	0.33 (1.16)	0.67 (1.29)	0.36 (1.16)	0.67 (1.29)	0.20 (1.10)	0.40 (1.18)	0.87 (1.37)	0.49 (1.22)
M-V	0.40 (1.18)	0.07 (1.03)	0.27 (1.13)	0.47 (1.21)	0.27 (1.12)	0.47 (1.21)	0.20 (1.10)	0.40 (1.18)	0.80 (1.34)	0.47 (1.21)	0.73 (1.32)	0.27 (1.13)	0.47 (1.21)	0.93 (1.39)	0.56 (1.24)
M-VI	0.47 (1.21)	0.13 (1.06)	0.33 (1.16)	0.53 (1.24)	0.33 (1.15)	0.53 (1.24)	0.33 (1.16)	0.53 (1.24)	0.93 (1.39)	0.60 (1.26)	0.87 (1.37)	0.40 (1.18)	0.60 (1.27)	1.07 (1.44)	0.69 (1.30)
Control	0.53 (1.24)	0.53 (1.24)	0.60 (1.27)	0.87 (1.37)	0.67 (1.29)	0.73 (1.32)	0.67 (1.29)	0.87 (1.37)	1.13 (1.46)	0.89 (1.37)	0.87 (1.37)	0.93 (1.39)	1.00 (1.41)	1.33 (1.53)	1.09 (1.44)
Mean	0.38 (1.17)	0.11 (1.05)	0.27 (1.12)	0.47 (1.21)	0.28 (1.13)	0.48 (1.21)	0.24 (1.11)	0.44 (1.20)	0.79 (1.34)	0.49 (1.21)	0.72 (1.31)	0.35 (1.16)	0.51 (1.22)	0.96 (1.40)	0.61 (1.26)

Figures in parentheses represent $\sqrt{x+1}$ transformation
CD (p=0.05) Before spray: NS Sowing: 0.01 Sowing x Spray: 0.01 Sowing x IPM Module: 0.02 Sowing x Spray x IPM Module: NS

Table 4: Effect of IPM modules on blister beetle population in okra during 2016.

IPM Module	**Days after spray**			**Mean**
	1	**3**	**7**	
M-I	0.07 (1.03)	0.18 (1.08)	0.49 (1.22)	0.24 (1.11)
M-II	0.18 (1.08)	0.38 (1.17)	0.71 (1.31)	0.42 (1.19)
M-III	0.13 (1.06)	0.29 (1.14)	0.67 (1.29)	0.36 (1.16)
M-IV	0.09 (1.04)	0.29 (1.13)	0.62 (1.27)	0.33 (1.15)
M-V	0.18 (1.08)	0.38 (1.17)	0.73 (1.31)	0.43 (1.19)

M-VI	0.29 (1.13)	0.49 (1.22)	0.84 (1.36)	0.54 (1.24)
Control	0.71 (1.31)	0.82 (1.35)	1.11 (1.45)	0.88 (1.37)
Mean	0.24 (1.11)	0.40 (1.18)	0.74 (1.32)	0.46 (1.20)

Figures in parentheses represent $\sqrt{x+1}$ transformation

CD (p= 0.05) IPM Module : 0.01
Spray : 0.01
Interaction : 0.02

Conclusion

From the study it can be concluded that the crop sown at sowing-I (1st June, 2016) with IPM module-I (Seed treatment with imidacloprid @ 3 ml/kg, foliar spray of imidacloprid @ 0.3 ml/L at 40 DAS, foliar dpray of spinosad @ 0.3 ml/L at 50 DAS, foliar spray of emamectin benzoate @ 0.4g/L at 70 DAS, foliar spray of spinosad @ 0.3 ml/L at 80 DAS) resulted in minimum jassid (*A. biguttula biguttula* Ishida) and blister beetle (*M. pustulata* F.) population in okra crop under mid hill conditions of Himachal Pradesh.

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