Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2019; 7(4): 187-191

Received: 26-05-2019
Accepted: 29-06-2019

MR Misal
Department of Agriculture Entomology, College of Agriculture, Badnapur, VNMKV, Parbhani, Maharashtra, India

BV Patil
Department of Agriculture Entomology, College of Agriculture, Badnapur, VNMKV, Parbhani, Maharashtra, India

SS Gote
Department of Plant Pathology, College of Agriculture, Badnapur, VNMKV, Parbhani, Maharashtra, India

Gawande SG
Department of Agriculture Entomology, College of Agriculture, Badnapur, VNMKV, Parbhani, Maharashtra, India

Khaire PB
Department of Plant Pathology, College of Agriculture, Badnapur, VNMKV, Parbhani, Maharashtra, India

Correspondence
MR Misal
Department of Agriculture Entomology, College of Agriculture, Badnapur, VNMKV, Parbhani, Maharashtra, India

Ecofriendly management of *Chrysodeixis acuta* in soybean

MR Misal, BV Patil, SS Gote, Gawande SG and Khaire PB

Abstract
Bio-rational studies were carried out for *Chrysodeixis acuta* in soybean with eight treatments. The results found that, after three sprayings significantly reduction in *C. acuta* population was found in experimental plots treated with chlorpyriphos 20EC @ 2ml/lit compare to rest of treatments. Simple pooled mean of *C. acuta* seventh days after sprayings, Chlorpyriphos 20EC @2ml/lit (0.3 larvae/mrl) was statistically superior in controlling *C. acuta* population and at par with NSKE 5% (0.5 larvae/mrl), Neem oil 5% (0.7 larvae/mrl), Pongamia oil 2% (0.8 larvae/mrl) and mechanical control (1.5 larvae/mrl). Intercrop (Sorghum 2.7 larvae/mrl) found effective in reduction of *C. acuta* population. It was statistically superior compare to rest of the treatments and at par with Trap crop (Castor 3.5 larvae/mrl). The highest population of *C. acuta* (3.8 larvae/mrl) was noticed in untreated control.

Keywords: Biorational, *C. acuta*, chlorpyriphos 20EC, trap crop (castor), intercrop (sorghum)

Introduction

Soybean [*Glycine max* (L.) Merrill.] is an important leguminous crop. Native of soybean is in Asia and the first known records, indicate that soybean emerged as a domesticated crop around the eleventh century B. C. in China (Hymowitz, 1970) [7]. They named it as a "yellow jewel" which feeds China's entire population. Soybean was introduced in India in 1870-80 (Andole, 1984) [2]. The soybean crop is one of the remarkable success stories in Indian agriculture.

It is one of the most important oilseed cash crops of India. It is a fascinating crop with innumerable possibilities of not only improving agriculture, but also supporting industries. It is a unique crop with high nutritional value, providing 40 per cent protein and 20 per cent edible oil besides minerals and vitamins. Soybean oil is used as a raw material in manufacturing antibiotics, paints, varnishes, lubricants etc. Soybean meal is used as protein supplement in human diet, cattle and poultry feeds (Alexander, 1974) [1]. Soybean is a major oil seed crop of the world grown in an area of 113.01m ha with production of 283.79 mt and productivity of 2.51 t/ha (Anonymous, 2013) [3]. India contributes more than 90 per cent of the world's acreage.

In India, soybean occupies an area of 109.714 lakh ha with production potential of 114.907 lakh tons. Major production comes from Madhya Pradesh (57.168 lakh t) followed by Maharashtra (39.456 lakh t). Other soybean producing states are Andhra Pradesh, Karnataka, Chhattisgarh and Gujarat (SOPA, 2016) [10]. In India in the year 2012-13, soybean cultivation reached to 12.03 mha recording production of 12.98 mt with an average of 1079 kg/ha. In Gujarat, the area under soybean was 14,000 hectares and the yield was 714 kg per ha with total production of 10,000 tones (Anon., 2003) [4].

Soybean is mainly rich in amino acids like leucine, methionine and threonine that the human body requires. For vegetarians, it is known as "poor man's meat". It also contains good amount of potassium, sulphur and vitamin E. Due to absence of sugar content, it is considered to be very suitable diet for diabetic patients.

Soybean crop having luxuriant growth with succulent leaves attracts the number of insect pests for feeding, oviposition and shelter. About 150 insect pests cause damage to soybean in various parts of Madhya Pradesh, out of which about a dozen of insect pests cause serious damage to the crop from sowing to the harvest (Singh and Singh, 1992) [11].

Among them green semilooper, *Chrysodeixis acuta* (Walker), tobacco caterpillar, *Spodoptera litura* (Fabricius) and pod borer, *Helicoverpa armigera* are major foliage feeder insects which voraciously feeds on foliage, flower and pods causing significant yield loss.

To avoid losses caused by these defoliator pests, various chemical control measures have been attempted earlier, which were found effective temporarily.

However, indiscriminate use of chemicals led to the problems like pest outbreak, development of resistance by pest to insecticides, elimination of natural enemies, risk to human and animal health besides environmental pollution. Hence, in the present investigation biorationals were used to manage major defoliator pests of soybean.

Materials and Methods

The present investigation was carried out in field condition on the field of Department of Agricultural Entomology, College of Agriculture, Badnapur during *Kharif* season 2017.

The experiment was laid out in Randomized Block Design (RBD) in three replications with a plot size of 5.0 × 3.0 m. leaving a gang way of 1meter around plots. The soybean variety MAUS-71 was sown at a spacing of 45×5cm. Application of pesticides was imposed 30 and 45 days after germination. Observation on larval population of *C. acuta* was recorded at three randomly selected spots on one meter row length crop in each treatment leaving the border rows. Larval count was made by shaking the plant gently over a white cloth placed between rows. The population data were transformed to $\sqrt{x+0.5}$ value before analysis. To compare the efficacy of treatment both standards check as well as untreated check will be maintained.

Treatments details for the evaluation of biorationals against defoliators pests of soybean. NSKE 5%, Neem oil 5%, Pongamia oil 2%, mechanical control, trap crop (castor), intercrop (sorghum), chlorpyriphos 20EC @2ml/lit and untreated control.

Results and Discussion

Chrysodeixis acuta

The initial larval population of *C. acuta* before imposing the treatment ranged from 5.3 to 6.0 larvae per mrl and differences were non-significant. First, third and fifth day after Ist spray significant reduction of *C. acuta* population was observed. At seventh day after spray chlorpyriphos 20EC @2ml/lit recorded the least larval population (0.3 larvae/mrl) which was significantly superior over the untreated control followed by NSKE 5% (0.4 larvae/mrl), Neem oil 5% (0.6 larvae/mrl) and Pongamia oil 2% (0.8 larvae/mrl). However, all treatments were significantly superior over untreated control. The lowest *C. acuta* were recorded in mechanical control 1st (0.3 larvae/mrl), 3rd (0.4 larvae/mrl), 5th (1.0 larvae/mrl), and 7th day (1.3 larvae/mrl) after Ist mechanical controls. Intercrop (sorghum) were found most effective in reducing *C. acuta* (3.7 larvae/mrl) after fourteenth days after spray as shown in (Table 1 and Fig.1) followed by trap crop (castor 4.1 larvae/mrl)). At fourteenth days after spray the chlorpyriphos 20EC @2ml/lit recorded the lowest larval population (2.7 larvae/mrl) compared to standard check and was superior. Untreated control recorded the highest population of (4.6 larvae/mrl).

After second spray the larval population significantly varied among the all treatments after first, third, fifth, seventh, tenth days, highest larval population was recorded in untreated control whereas 7th days after spray chlorpyriphos 20EC @2ml/lit (0.3 larvae/mrl) recorded the lowest larval population, the trend during second spray was similar as that with first spray and at par with NSKE 5% (0.6 larvae/mrl), Neem oil 5% (0.8 larvae/mrl) and Pongamia oil 2% (0.9 larvae/mrl). The lowest *C. acuta* were recorded in mechanical control 1st (0.3 larvae/mrl), 3rd (0.6 larvae/mrl), 5th (1.1 larvae/mrl) and 7th day (1.8 larvae/mrl) after IInd mechanical controls. Intercrop (sorghum) was found most effective in reducing *C. acuta* larvae and lowest *C. acuta (*1.9 larvae/mrl) were recorded in fourteenth days after IInd spray as shown in (Table 1 and Fig.2) followed by trap crop (castor 2.9 larvae/mrl).

After third spray the larval population significantly varied among the all treatments, the trend during third spray was similar as that with first and second spray, chlorpyriphos 20EC @2ml/lit was significantly superior over all other treatments after first, third, fifth, seventh, tenth and fourteenth days after spraying (2.7, 2.2, 1.8, 0.3 0.8, 0.3 larvae/mrl) and at par with NSKE 5% (0.7 larvae/mrl), Neem oil 5% (0.8 larvae/mrl) and Pongamia oil 2% (0.9 larvae/mrl) 7 days after spray. The lowest *C. acuta* was recorded in mechanical control 1st (0.3 larvae/mrl), 3rd (0.4 larvae/mrl), 5th (1.0 larvae/mrl), and 7th day (1.3 larvae/mrl) after IIInd mechanical controls. Intercrop (sorghum) were found most effective in lowest *C. acuta (*0.6 larvae/mrl) were recorded in fourteenth days after IIInd spray as shown in (Table 2 and Fig.3) followed by trap crop (castor (1.1 larvae/mrl).

The pooled data of three sprayings presented in (table 2 and fig. 4) revealed that. The larval population of *C. acuta* was uniformly distributed in all the plots one day before imposing the treatment ranged from 5.3 to 6.0 larvae per mrl. However significant reduction in the larval population was recorded Ist (0.3 larvae/mrl), 3rd (0.5 larvae/mrl) and 5th (1.0 larvae/mrl) days after spraying in the treatment of mechanical control while lowest larval population of *C. acuta* registered with the treatment of chlorpyriphos 20EC @2ml/lit 7th (0.3 larvae/mrl) and 10th (1.0 larvae/mrl) day after sprayings and which was at par with the NSKE 5% (0.5 larvae/mrl), Neem oil 5% (0.7 larvae/mrl) and Pongamia oil 2% (0.8 larvae/mrl) after seven days. However the least larval activity of *C. acuta* noticed in the treatment of Intercrop (sorghum 1.8 larvae/mrl)) followed by chlorpyriphos20EC @2ml/lit, trap crop (castor 2.7 larvae) fourteenth days after sprayings.

Bhosle *et al*., (2008) [5] reported that the localized IPM module for soybean pests which collection and destruction of *C. acuta* along with leaves effective in managing the pest. Nath *et al*., (2011) [9] studied that the azadirachtin was found to reduce feeding behavior of *C. acuta* on soybean. The Indian neem tree, *Azadirachta indica* (Meliaceae), is a promising source of botanical insecticides. Due to their relative selectivity, neem products can be recommended for many integrated pest management programs (Biswas *et al*., 2002) [6]. Trap crop provide many benefits, including increasing crop quality, attracting beneficial insects, enhancing biodiversity and reducing insecticidal use (Moshefi P. and Almasi A. B. (2016) [8]. Hence the present findings are in agreement with the earlier work of above scientist.

Table 1: Ecofriendly management of *C. acuta* on soybean.

T. No	Treatments	Average larvae/mrl												
		First spray							Second spray					
		1DBS	1DAS	3DAS	5DAS	7DAS	10DAS	14DAS 1DBS	1DAS	3DAS	5DAS	7DAS	10DAS	14DAS
T_1	NSKE 5%	5.7 (2.48)	5.3 (2.41)	4.3 (2.19)	3.0 (1.87)	0.4 (0.97)	1.3 (1.35)	3.6 (2.01)	3.4 (1.98)	2.7 (1.77)	2.0 (1.58)	0.6 (1.02)	1.7 (1.47)	4.0 (2.12)
T_2	Neem oil 5%	6.0 (2.54)	5.6 (2.45)	4.6 (2.25)	3.1 (1.88)	0.6 (1.02)	1.7 (1.47)	3.8 (2.06)	3.7 (2.04)	2.8 (1.79)	2.1 (1.61)	0.8 (1.13)	1.7 (1.47)	4.1 (2.15)
T_3	Pongamia oil 2%	6.0 (2.55)	5.6 (2.46)	4.6 (2.25)	3.3 (1.95)	0.8 (1.12)	2.0 (1.58)	4.3 (2.20)	4.2 (2.17)	3.2 (1.93)	2.3 (1.68)	0.9 (1.17)	2.1 (1.60)	4.2 (2.17)
T_4	Mechanical control.	5.8 (2.50)	0.3 (0.91)	0.4 (0.97)	1.0 (1.22)	1.3 (1.34)	2.7 (1.77)	4.6 (2.25)	0.3 (0.91)	0.6 (1.02)	1.1 (1.27)	1.8 (1.51)	3.0 (1.87)	3.7 (2.03)
T_5	Use of trap crop, castor.	5.7 (2.48)	5.6 (2.46)	5.4 (2.44)	5.2 (2.39)	4.9 (2.32)	4.8 (2.30)	4.1 (2.15)	4.0 (2.12)	3.8 (2.07)	3.7 (2.04)	3.1 (1.90)	2.9 (1.84)	2.9 (1.82)
T_6	Intercrop (4 rows of soybean x 2 rows of sorghum).	5.4 (2.43)	5.3 (2.41)	5.1 (2.36)	4.7 (2.27)	4.2 (2.17)	3.7 (2.03)	3.0 (1.86)	3.0 (1.84)	2.8 (1.79)	2.7 (1.76)	2.2 (1.65)	2.0 (1.58)	1.9 (1.54)
T_7	Chlorpyriphos 20EC @2ml/lit.	5.7 (2.48)	5.2 (2.39)	4.0 (2.12)	2.3 (1.68)	0.3 (0.91)	1.1 (1.27)	2.7 (1.77)	2.6 (1.74)	2.3 (1.66)	1.4 (1.39)	0.3 (0.91)	1.2 (1.31)	3.0 (1.86)
T_8	Untreated control.	5.3 (2.36)	5.3 (2.38)	5.4 (2.41)	5.3 (2.38)	5.0 (2.30)	4.9 (2.29)	4.6 (2.20)	4.6 (2.22)	4.3 (2.16)	4.1 (2.11)	3.6 (1.96)	3.4 (1.95)	3.6 (1.96)
	SE(m) ±	0.15	0.13	0.14	0.13	0.13	0.13	0.16	0.15	0.15	0.12	0.12	0.12	0.14
	C.D. at 5%	**N S**	0.39	0.42	0.39	0.39	0.39	0.48	0.45	0.45	0.36	0.36	0.36	0.42
	C.V.	10.32	10.14	11.22	11.40	14.89	12.71	13.23	13.69	14.63	12.41	14.50	12.50	12.19

Fig. in parenthesis are √x+0.5 transformed values.

Table 2: Ecofriendly management of *C. acuta* on soybean.

T. No	Treatments	Average larvae/mrl												
		Third spray						Simple pooled mean of three sprayings						
		1DAS	3DAS	5DAS	7DAS	10DAS	14DAS	1DBS	1DAS	3DAS	5DAS	7DAS	10DAS	14DAS
T_1	NSKE 5%	3.7 (2.04)	3.2 (1.92)	2.0 (1.58)	0.6 (1.02)	1.1 (1.27)	0.7 (1.07)	5.7 (2.48)	4.1 (2.14)	3.4 (1.97)	2.3 (1.68)	0.5 (1.02)	1.4 (1.36)	2.8 (1.75)
T_2	Neem oil 5%	3.8 (2.06)	3.4 (1.98)	2.2 (1.65)	0.7 (1.08)	1.2 (1.30)	0.8 (1.13)	6.0 (2.54)	4.4 (2.20)	3.6 (2.02)	2.5 (1.72)	0.7 (1.09)	1.5 (1.42)	2.9 (1.79)
T_3	Pongamia oil 2%	3.9 (2.09)	3.6 (2.01)	2.3 (1.68)	0.8 (1.13)	1.4 (1.39)	0.9 (1.17)	6.0 (2.55)	4.6 (2.25)	3.8 (2.07)	2.6 (1.77)	0.8 (1.15)	1.8 (1.52)	3.1 (1.85)
T_4	Mechanical control.	0.3 (0.91)	0.4 (0.97)	1.0 (1.22)	1.3 (1.35)	1.6 (1.43)	1.0 (1.22)	5.8 (2.50)	0.3 (0.89)	0.5 (0.98)	1.0 (1.24)	1.5 (1.40)	2.4 (1.70)	3.1 (1.84)
T_5	Use of trap crop, castor.	2.9 (1.83)	2.9 (1.83)	2.7 (1.77)	2.6 (1.74)	2.2 (1.65)	1.1 (1.25)	5.7 (2.48)	4.2 (2.15)	4.0 (2.12)	3.9 (2.08)	3.5 (1.99)	3.3 (1.93)	2.7 (1.75)
T_6	Intercrop (4 rows of soybean x 2 rows of sorghum).	1.9 (1.54)	1.8 (1.48)	1.9 (1.54)	1.8 (1.51)	1.3 (1.34)	0.6 (1.02)	5.4 (2.43)	3.4 (1.94)	3.2 (1.90)	3.1 (1.87)	2.7 (1.78)	2.3 (1.66)	1.8 (1.49)
T_7	Chlorpyriphos 20EC @2ml/lit.	2.7 (1.77)	2.2 (1.64)	1.8 (1.51)	0.3 (0.91)	0.8 (1.13)	0.3 (0.91)	5.7 (2.48)	3.5 (1.98)	2.8 (1.81)	1.8 (1.52)	0.3 (0.89)	1.0 (1.24)	2.0 (1.52)
T_8	Untreated control.	3.4 (1.93)	3.7 (1.97)	2.9 (1.80)	2.8 (1.78)	2.6 (1.75)	1.8 (1.50)	5.3 (2.36)	4.4 (2.21)	4.5 (2.22)	4.1 (2.13)	3.8 (2.06)	3.6 (2.02)	3.3 (1.93)
	SE(m) ±	0.14	0.15	0.11	0.10	0.09	0.09	0.15	0.08	0.08	0.07	0.10	0.08	0.07
	C.D. at 5%	0.42	0.45	0.33	0.30	0.27	0.27	**N S**	0.25	0.26	0.23	0.30	0.26	0.22
	C.V.	13.46	14.93	12.00	12.97	11.04	13.51	10.32	7.50	7.94	7.70	12.25	9.36	7.27

Fig. in parenthesis are √x+0.5 transformed values, DBS-Day before spraying, DAS-Day after spraying

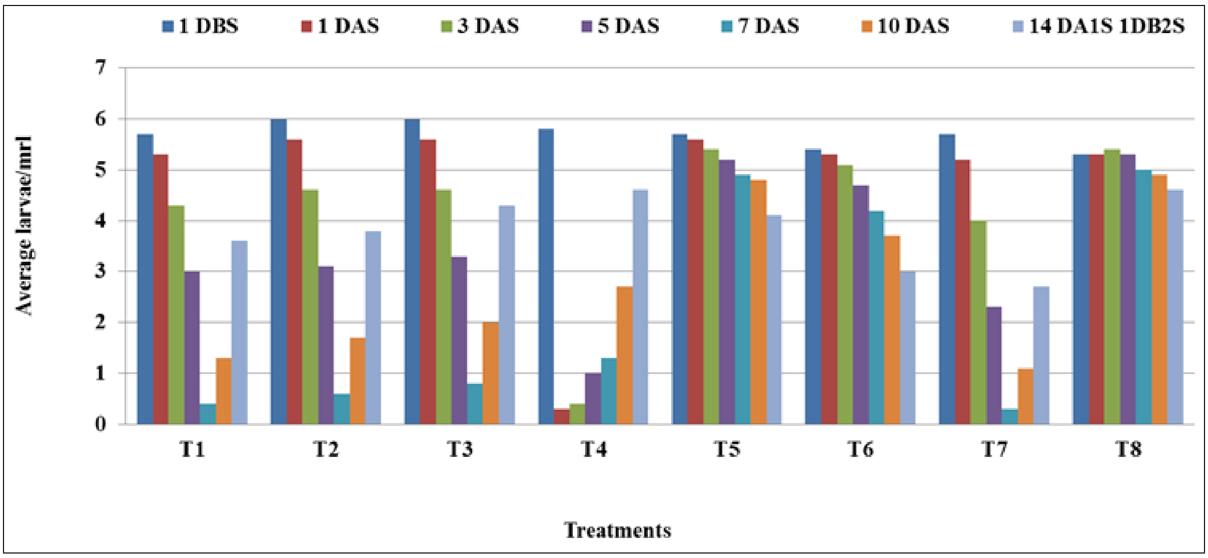

Fig 1: Population of *C. acuta* after first spray

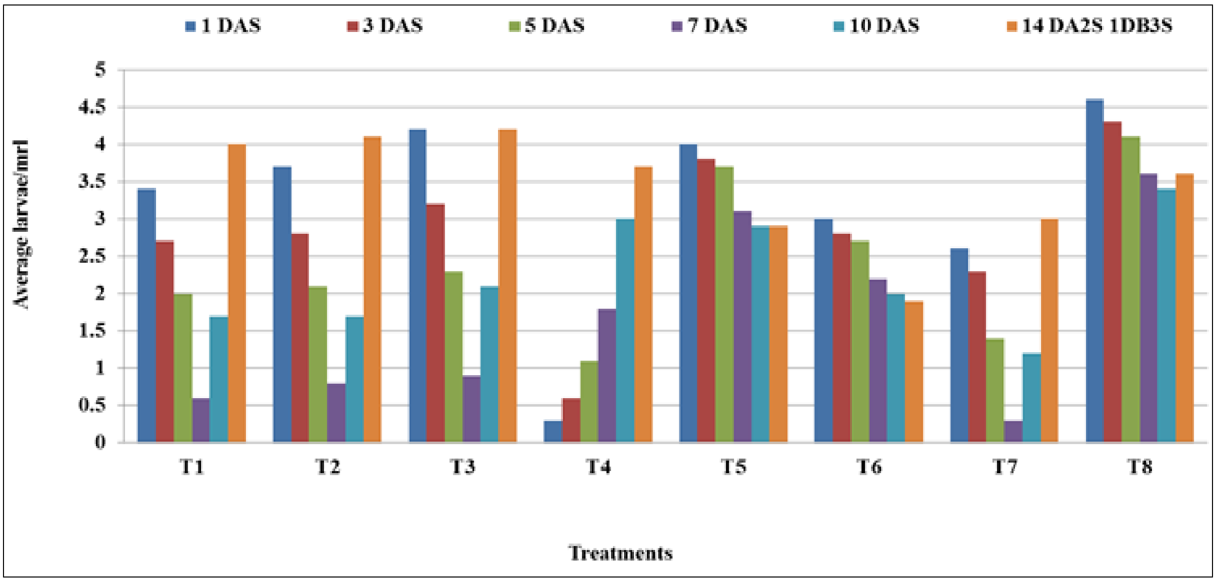

Fig 2: Population of *C. acuta* after second spray

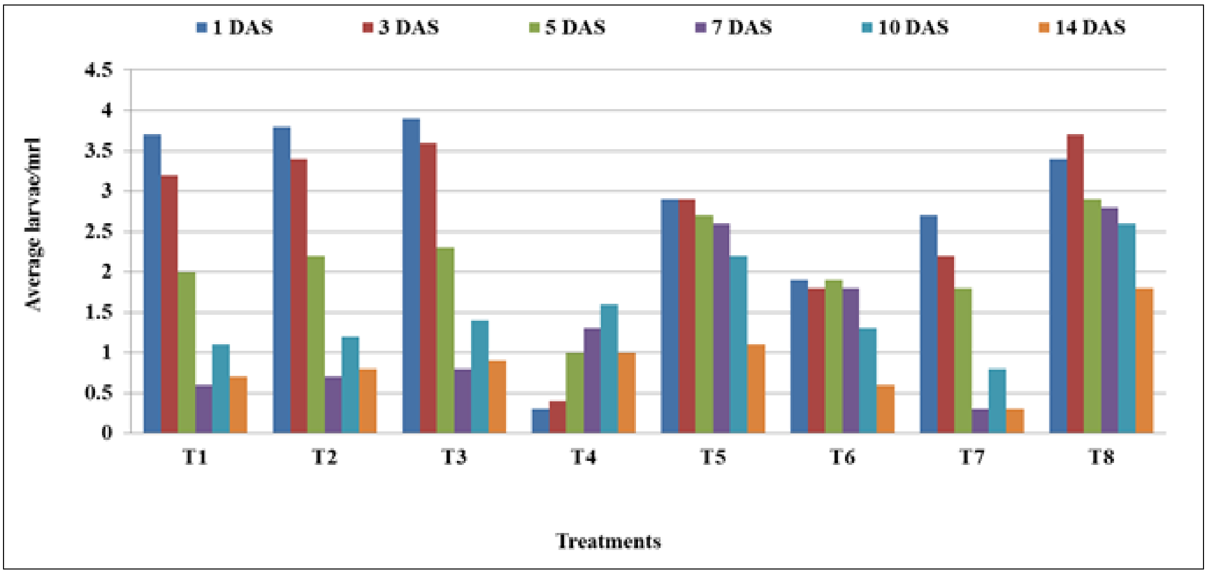

Fig 3: Population of *C. acuta* after third spray.

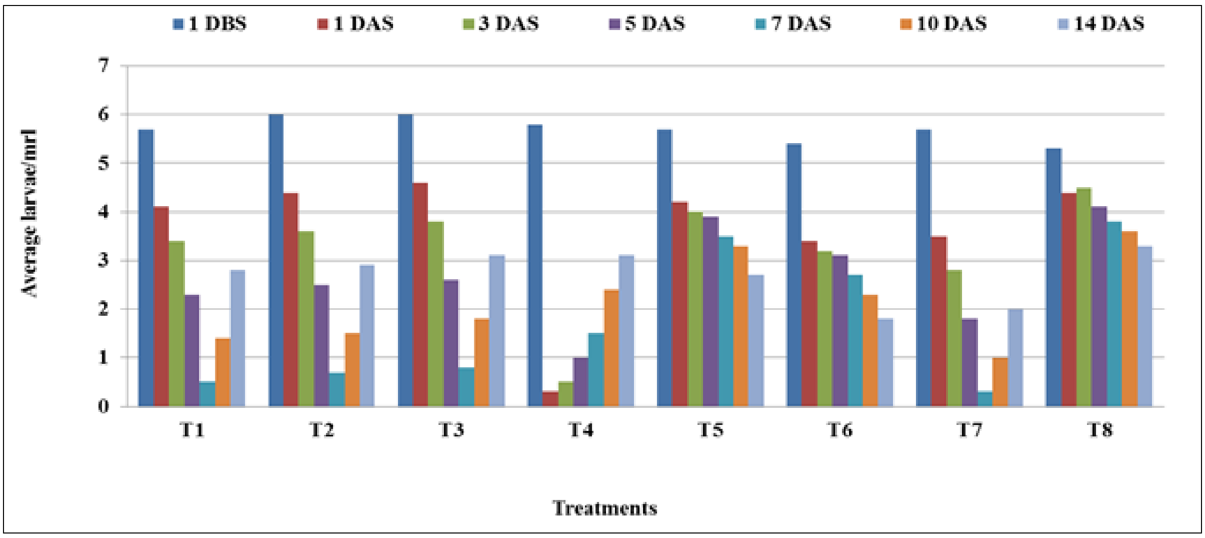

Fig 4: Population of *C. acuta* (Pooled mean of three sprayings).

Acknowledgement

I am not but consider myself lucky to have worked under the guidance of knowledge hungry, excellence pursuing and ever helpful personality of Prof. B. V. Patil, Major guide and Associate Professor College of Agriculture, Badnapur. Vasantrao Naik Marathwada Agricultural University, Parbhani. I would be more thankful to him for his excellent guidance, constant encouragement, keen interest and constructive criticism throughout the course of investigation.

References

1. Alexander MV. Soybean in Virginia experimentation division Virginia Polytech. Institute, State University, 1974, 4.
2. Andole VC. Soybean, It's cultivation, uses and values in dietetics, 1984, 29.
3. Anonymous. FAO Statistical data, 2013. http://faostat.fao.org.
4. Anonymous. Oilseed situation in, 2003, 2005. http://www.agricoop.nic.in.
5. Bhosle BB, Bhede BV, Patange NR, Kambale SK, Baig KS. IPM in soybean, M.A.U. Extn, 2008. Folder No. 2/2008.
6. Biswas K, Chattopadhyay I, Banerjee RK, Bandyopadhyay U. Biological activities and medicinal properties of neem (*Azadirachta indica*). Cur. Sci. 2002; 82:1336-1345.
7. Hymowitz T. On the domestication of soybean. Economic Botany. 1970; 24:408-421.
8. Moshefi P, Almasi AB. Trap cropping. Int. Journal Res. Stu. In Agril. Sci. 2016; 2:1.
9. Nath G, Singh K. Effect of Foliar Sprays of Biopesticides and Vermiwash of Animal, Agro and Kitchen Wastes on Soybean (*Glycine max* L.) crop. Botany Research International. 2011; 4(3):52-57.
10. SOPA. The soybean processors of India. www.Sopa.Org, Indore, M.P, 2016.
11. Singh KJ, Singh OP. Influence of stem Tunnelling by the maggots of *Melanagromyza sojae* (Zehnt.) on yield of soybean. Journal of Insect Science. 1992; 5(2):198-200.