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RESEARCH ARTICLE :

Biorational and chemical management of defoliators on soybean

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SUMMARY : The present study was conducted during *Kharif*, 2010 and 2011, at Marathwada Agriculture University (MKV) Parbhani, Maharashtra, to study the biorationals insecticides for soybean defoliators. During this experiment per cent defoliation due to defoilators was ranged from 16.08 to 18.22 per cent and 9.69 to 17.93 per cent a day before the first spray and second spray, respectively. At 3 days after first and second sprays lowest per cent defoliation due to defoilators was found in Emamectin benzoate 5SG@ (10.11%) and Indoxacarb 14.5 % (8.93 %), respectively. At 14 DAS, the defoliation was lowest in Emamectin benzoate 5SG@ (9.99 %) and Rynaxypyr 20 SC (8.02 %), respectively after first and second sprays.

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KEY WORDS :
Defoliators, Soybean, Rynaxypyr, Chlorpyriphos, Emamectine benzoate

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BACKGROUND AND OBJECTIVES

Soybean [*Glycine max* (L.) Merill.] is a multipurpose oilseed crop of the world which has higher content of proteins. Soybean is the third largest oil seed crop of India (Tiwari, 2003).Cultivation of soybean on large scale was started in selected states during the year 1971-72 (Wasnik, 1986). In India, around 20 insect pests species have been recorded infesting soybean crop (Singh and Singh, 1990). Leaf feeding, or defoliation, is the most common type of insect injury that growers will often observe. Defoliation will usually be seen twice during the growing season; first during the early vegetative stages soon after plant emergence, and then during soybean reproductive stages in July and August (Ohio State University) Defoliation during this time can be from either a single insect species acting alone, or more commonly, from a complex of insect pests all contributing to the overall level of leaf feeding. Singh and Singh, 1987 observed the higher population of (14.67 larvae/10plants) semilooper on 1st September. Conventional chemical insecticides have generally provided effective suppression of soybean insect pests. Number of insecticidal have been recommended against insect pests of soybean. Singh *et al*. (1998) who tested efficacy of 11 insecticides (triazophos, orthene, chlorpyriphos, methomyl, ethion, profenofos, monocrotophos, endosulfan, quinalphos and deltamethrin) and reported that all the

insecticides except phosphamidon and profenofos were highly toxic. Leaf damage due to defoliators was worked out in terms of per cent defoliation. Decisions to apply an insecticide rescue treatment are based primarily on the observed defoliation caused by the total pest complex and continuing insect activity. Objective of experiment was to study the efficacy of different IGRs, biorationals and insecticide against defoliators of soybean.

RESOURCES AND METHODS

The variety MAUS 71 with good germination percentage was procured from department of Agricultural Entomology, MKV, Parbhani. The line sowing of seed was done by maintaining 45cm distance between two rows and 5cm between two plants on 17.06.2010 and 11.07.2011. The field experiment was laid out in a RBD and the treatments were replicated two times with a plot size 4.5×3m in which 5 rows were planted in *Kharif*-2010 and 2011. The spraying was done in morning hours between 9.0 to 11.0 a.m. totally two sprayings were made 30 and 55 days after sowing, respectively. The pretreatment count of insect pests was made one day before and post treatment population count was taken on 3,7 and 14 day after the spraying. The number of larvae/meter row length (mrl) was recorded at three places on weekly basis. Leaf damage due to defoliators was worked out in terms of per cent defoliation.As per Gomez and Gomez (1984), the data obtained on live population *i.e.* observations on larval population were subjected to $\sqrt{x+0.5}$ transformation *i.e.* Poisson formula. Whereas data on per cent infestation were transformed into arc sin transformation values before statistical analysis (X=average number of pest population).

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

First spraying (2010-11):

The data presented in Table 1 showed that per cent defoliation due to defoliators a day before the first spray ranged from 11.51 to 14.40 per cent. At 3DAS, it was observed that the lowest per cent defoliation due to defoliators was observed in Rynaxypyr 20 SC (10.00 %) followed by Emamectin benzoate 5SG (10.50 %) and Chlorpyriphos 20 EC (10.52%).At 7 DAS, significantly lowest per cent defoliation was observed in Rynaxypyr 20 SC (8.49%) followed by Indoxacarb 14.5 % (8.52 %) and Chlorpyriphos 20 EC (9.33%). At 14 DAS, the defoliation was lowest in NSKE 5% (9.37%) followed by Indoxacarb 14.5 % (9.45 %) and Chlorpyriphos 20

Table 1 : Effect of insecticides and biorationals on per cent defoliation due to defoliators, after first spraying(2010-11)

Sr. No.	Treatments	Dose / lit.	Concentration (%)	First spraying, 2010-11			
				% defoliation due to defoliators			
				1 DBS	3 DAS	7 DAS	14 DAS
1.	Buprofezin 25 SC	2 ml	0.05	14.40 (8.24)	12.33 (7.08)	9.57 (5.48)	10.04 (5.76)
2.	Diflubenzuron 25 WP	0.8 g	0.02	12.03 (6.82)	11.55 (6.24)	9.55 (5.60)	9.67 (5.54)
3.	Azadirachtin 1500 ppm	2 ml	-	12.35 (7.09)	11.58 (6.12)	9.78 (5.60)	10.00 (10.17)
4.	NSKE 5%	1 ml	-	13.00 (7.46)	11.59 (6.65)	9.41 (3.96)	9.37 (5.16)
5.	*Nomuraea rileyi*	4 g	-	12.48 (7.17)	11.18 (10.54)	9.98 (4.00)	9.67 (5.37)
6.	*Beauveria bassiana*	4 g	-	12.29 (7.05)	10.54 (6.04)	10.03 (2.29)	9.63 (5.55)
7.	Bt 5%	100 g/ ha.	-	11.51 (6.61)	11.52 (6.04)	9.82 (5.46)	9.63 (5.37)
8.	Emamectin benzoate 5 SG	0.4 g	0.002	11.92 (6.84)	10.50 (6.02)	9.44 (2.10)	9.89 (5.45)
9.	Spinosad 45%	0.4 ml	0.018	12.67 (7.27)	10.55 (6.03)	10.00 (5.35)	9.78 (5.60)
10.	Indoxacarb 14.5%	1 ml	0.0145	13.44 (7.74)	11.17 (6.41)	8.52 (5.41)	9.45 (5.48)
11.	Rynaxypyr 20 SC	0.3 ml	0.006	12.33 (7.08)	10.00 (5.73)	8.49 (3.36)	9.56 (5.48)
12.	Chlorpyriphos 20 EC	2 ml	0.04	12.44 (7.14)	10.52 (6.04)	9.33 (5.63)	9.49 (5.56)
13.	Quinalphos 25 EC	2 ml	0.05	13.04 (5.57)	11.11 (6.37)	9.70 (5.76)	9.70 (5.44)
14.	Untreated control	-	-	14.00 (8.07)	14.13 (8.12)	14.38 (6.36)	12.86 (6.31)
	S.E.±	-	-	0.55	0.51	1.17	1.25
	C.D. (P=0.05)	-	-	1.62	1.49	3.41	3.64

* Figures in parentheses are Arc sin transformed values

EC (9.49%) were significantly superior over rest of all the treatments and found at par with each other .

Second spraying (2010-2011):

The data presented in Table 2 showed that per cent defoliation due to defoliators a day before the second spray ranged from 8.68 to 11.13 per cent. At 3DAS, it was observed that the lowest per cent defoliation due to defoliators was observed in Emamectin benzoate 5SG@ (7.91%) followed by Rynaxypyr 20 SC (8.01 %), Chlorpyriphos 20 EC (8.12%) and Quinalphos 20EC (8.57%) were significantly superior and at par with each

Table 2 : Effect of insecticides and biorationals on per cent defoliation due to defoliators, second spraying, 2010-11

Sr. No.	Treatments	Dose / lit.	Concentration (%)	Second spraying, 2010-11			
				% defoliation due to defoliators			
				1 DBS	3 DAS	7 DAS	14 DAS
1.	Buprofezin 25 SC	2 ml	0.05	10.14 (5.81)	8.88 (4.92)	9.42 (5.40)	6.81 (3.90)
2.	Diflubenzuron 25 WP	0.8 g	0.02	10.56 (5.99)	8.81 (5.41)	10.74 (4.43)	6.66 (3.82)
3.	Azadirachtin 1500 ppm	2 ml	-	11.04 (6.33)	9.89 (5.61)	10.89 (4.12)	7.12 (4.08)
4.	NSKE 5%	1 ml	-	10.77 (6.12)	9.13 (5.17)	10.10 (4.07)	6.86 (3.93)
5.	*Nomuraea rileyi*	4 g	-	10.69 (6.13)	9.67 (5.67)	10.70 (4.41)	7.71 (4.41)
6.	*Beauveria bassiana*	4 g	-	11.00 (6.31)	9.71 (5.37)	8.87 (5.03)	7.82 (4.48)
7.	Bt 5%	100 g/ ha.	-	9.63 (5.52)	8.75 (4.85)	8.78 (5.15)	8.22 (4.71)
8.	Emamectin benzoate 5 SG	0.4 g	0.002	10.00 (5.74)	7.91 (5.32)	8.99 (5.12)	6.79 (3.81)
9.	Spinosad 45%	0.4 ml	0.018	9.62 (5.52)	9.03 (4.82)	8.93 (4.43)	8.05 (4.61)
10.	Indoxacarb 14.5%	1 ml	0.0145	9.56 (5.50)	8.66 (4.69)	8.08 (4.15)	6.78 (4.61)
11.	Rynaxypyr 20 SC	0.3 ml	0.006	8.68 (4.98)	8.01 (4.33)	7.49 (4.03)	6.63 (3.88)
12.	Chlorpyriphos 20 EC	2 ml	0.04	9.29 (5.33)	8.12 (4.61)	7.00 (4.03)	6.81 (3.80)
13.	Quinalphos 25 EC	2 ml	0.05	9.76 (5.59)	8.57 (5.02)	7.63 (4.48)	7.38 (4.23)
14.	Untreated control	-	-	11.13 (6.38)	12.00 (6.89)	11.43 (6.56)	10.87 (6.23)
	S.E.±	-	-	0.17	0.20	0.17	0.15
	C.D. (P=0.05)	-	-	0.49	0.58	0.51	0.07

* Figures in parentheses are Arc sin transformed values

Table 3 : Effect of insecticides and biorationals on per cent defoliation due to defoliators after first spraying, 2011-12

Sr. No.	Treatments	Dose / lit.	Conce-ntration (%)	First spraying, 2011-12			
				% defoliation due to defoliators			
				1 DBS	3 DAS	7 DAS	14 DAS
1.	Buprofezin 25 SC	2 ml	0.05	20.59 (26.97)	13.73 (21.91)	11.80 (20.15)	12.20 (20.43)
2.	Diflubenzuron 25 WP	0.8 g	0.02	21.00 (27.26)	13.46 (21.52)	11.35 (19.64)	12.70 (20.86)
3.	Azadirachtin 1500 ppm	2 ml	-	20.10 (26.63)	13.38 (21.45)	10.91 (19.28)	11.81 (20.09)
4.	NSKE 5%	1 ml	-	21.72 (27.77)	14.76 (22.58)	11.64 (19.93)	12.28 (20.50)
5.	*Nomuraea rileyi*	4 g	-	21.56 (27.65)	13.34 (21.42)	10.24 (18.66)	11.23 (19.57)
6.	*Beauveria bassiana*	4 g	-	19.54 (26.49)	12.04 (20.27)	9.89 (18.32)	10.8 (19.18)
7.	Bt 5%	100 g/ ha.	-	20.96 (27.24)	12.25 (20.47)	9.96 (18.39)	10.93 (19.30)
8.	Emamectin benzoate 5 SG	0.4 g	0.002	20.25 (26.73)	9.72 (18.14)	8.62 (17.03)	10.09 (18.51)
9.	Spinosad 45%	0.4 ml	0.018	23.45 (28.96)	12.19 (20.42)	12.84 (21.00)	13.66 (21.96)
10.	Indoxacarb 14.5%	1 ml	0.0145	20.96 (27.23)	11.04 (19.39)	10.05 (18.47)	11.01 (19.37)
11.	Rynaxypyr 20 SC	0.3 ml	0.006	21.24 (27.43)	10.10 (18.51)	9.73 (18.17)	11.50 (19.80)
12.	Chlorpyriphos 20 EC	2 ml	0.04	21.85 (27.86)	11.39 (19.63)	9.63 (18.07)	10.91 (19.29)
13.	Quinalphos 25 EC	2 ml	0.05	20.21 (26.71)	11.23 (19.55)	9.47 (17.90)	11.10 (19.45)
14.	Untreated control	-	-	22.40 (28.24)	21.68 (27.73)	20.99 (27.26)	21.78 (27.81)
	S.E.±	-	-	0.44	0.51	0.45	0.36
	C.D. (P=0.05)	-	-	1.28	1.48	1.32	1.05

* Figures in parentheses are Arc sin transformed values

other. At 7DAS, significantly lowest per cent defoliation was observed in Chlorpyriphos 20 EC (7.00%) followed by Quinalphos 20EC (7.63%) ,Rynaxypyr 20 SC (7.49%) and Indoxacarb 14.5 % (8.08 %) were significantly superior over rest of all the treatments and at par with each other. At 14 DAS, the defoliation was lowest in Rynaxypyr 20 SC (6.63 %) followed by Indoxacarb 14.5 % (6.78 %) and Diflubenzuron 25WP (6.66 %) were significantly superior over rest of all the treatments .

First spraying (2011-12) :

The data presented in Table 3 showed that per cent defoliation due to defolitors a day before the first spray ranged from 19.54 to 23.45 per cent. At 3DAS, it was observes that the lowest per cent defoliation due to defolitors was observed in Emamectin benzoate 5SG@ (9.72 %) followed by Rynaxypyr 20 SC (10.10 %) and Indoxacarb 14.5 % (11.04 %) were significantly superior over rest of all the treatments and at par with each other. At 7DAS, significantly lowest per cent defoliation was observed in Emamectin benzoate 5SG@ (8.62 %) followed by Quinalphos 20EC (9.47%) , Chlorpyriphos 20 EC (9.63 %) and Rynaxypyr 20 SC (9.73 %). At 14 DAS, the defoliation was lowest in Emamectin benzoate 5SG@ (10.09 %) followed by Chlorpyriphos 20 EC (10.91 %) and Indoxacarb 14.5 % (10.93 %) were significantly superior over rest of all the treatments and at par with each other.

Second spraying (2011-12) :

The data presented in Table 4 showed that per cent defoliation due to defoliators a day before the second spray ranged from 10.63 to 24.74. At 3DAS, it was observed that the lowest per cent defoliation due to defolitors was observed in Rynaxypyr 20 SC (9.07%) followed by Indoxacarb 14.5 % (9.96 %) and *Bacillus thuringensis* (9.96 %) were significantly superior over rest of all the treatments and at par with each other. At 7 DAS, significantly lowest per cent defoliation was observed in Rynaxypyr 20 SC (7.66 %) followed by Bt 5% (8.18 %) and NSKE (8.44%). At 14 DAS, the defoliation was lowest in Rynaxypyr 20 SC (9.41 %) followed by Spinosad 45% (9.75 %) and Bt 5% (9.80 %) were significantly superior over rest of all the treatments and at par with each other.

First spraying (Pooled) :

The data presented in Table 5 showed that per cent defoliation due to defolitors a day before the first spray ranged from 16.08 to 18.22 per cent. At 3DAS, it was obesrved that the lowest per cent defoliation due to defoliators was observed in Emamectin benzoate 5SG@

Table 4 : Effect of insecticides and biorationals on per cent defoliation due to defoliators after second spraying, 2011-12

Sr. No.	Treatments	Dose / lit.	Concentration (%)	Second spraying, 2011-12 % defoliation due to defoliators			
				1 DBS	3 DAS	7 DAS	14 DAS
1.	Buprofezin 25 SC	2 ml	0.05	12.57 (20.75)	10.24 (18.66)	9.57 (18.02)	11.69 (19.99)
2.	Diflubenzuron 25 WP	0.8 g	0.02	11.03 (19.38)	10.05 (18.48)	9.72 (18.17)	11.72 (20.02)
3.	Azadirachtin 1500 ppm	2 ml	-	11.92 (20.18)	11.26 (19.58)	10.21 (18.62)	12.03 (20.29)
4.	NSKE 5%	1 ml	-	12.58 (20.76)	10.33 (18.74)	8.44 (16.89)	10.91 (19.28)
5.	*Nomuraea rileyi*	4 g	-	12.31 (20.53)	11.67 (19.94)	9.65 (18.07)	11.87 (20.14)
6.	*Beauveria bassiana*	4 g	-	11.61 (19.91)	10.57 (18.97)	9.84 (18.07)	11.65 (19.93)
7.	Bt 5%	100 g/ ha.	-	10.63 (19.02)	9.96 (18.38)	8.18 (18.25)	9.80 (18.56)
8.	Emamectin benzoate 5 SG	0.4 g	0.002	12.76 (20.91)	11.16 (19.48)	9.06 (16.60)	10.37 (17.89)
9.	Spinosad 45%	0.4 ml	0.018	13.16 (21.27)	10.46 (18.83)	8.73 (17.50)	9.75 (18.41)
10.	Indoxacarb 14.5%	1 ml	0.0145	12.18 (20.42)	9.96 (18.39)	8.67 (17.15)	10.11 (18.59)
11.	Rynaxypyr 20 SC	0.3 ml	0.006	11.24 (19.57)	9.07 (17.52)	7.66 (17.11)	9.41 (17.87)
12.	Chlorpyriphos 20 EC	2 ml	0.04	12.70 (20.86)	10.71 (19.09)	8.76 (16.07)	12.04 (19.62)
13.	Quinalphos 25 EC	2 ml	0.05	12.15 (20.39)	10.3 (18.70)	9.08 (17.22)	11.06 (19.41)
14.	Untreated control	-	-	24.74 (29.82)	25.9 (30.59)	26.99 (31.30)	28.06 (31.98)
	S.E.+	-	-	0.43	0.55	0.37	0.59
	C.D. (P=0.05)	-	-	1.26	1.58	1.66	1.71

* Figures in parentheses are Arc sin transformed values

(10.11 %) followed by Spinosad 45% (10.37%), Rynaxypyr 20 SC (10.50 %),Chlorpyriphos 20 EC (10.95 %) and Indoxacarb 14.5 % (11.10 %) were significantly superior over rest of all the treatments . Next minimum population was in treatment *Beauveria bassiana* followed by Bt 5%, *Nomuraea rileyi*, Azadirachtin 1500 ppm and Diflubenzuron 25WP. At 7 DAS, significantly lowest per cent defoliation was observed in Spinosad 45% (7.42 %) followed by Emamectin benzoate 5SG@ (9.03%) ,Rynaxypyr 20 SC (9.11%) and Indoxacarb 14.5 % (9.28%) were significantly superior and at par with each other. At 14 DAS, the defoliation was lowest in

Table 5 : Effect of insecticides and biorationals on per cent defoliation due to defoliators after first spraying, pooled

Sr. No.	Treatments	Dose / lit.	Concentration (%)	First spraying, pooled (*Kharif* 2010 & 2011) % defoliation due to defoliators			
				1 DBS	3 DAS	7 DAS	14 DAS
1.	Buprofezin 25 SC	2 ml	0.05	17.49 (17.60)	13.03 (14.49)	10.68 (12.81)	11.12 (13.09)
2.	Diflubenzuron 25 WP	0.8 g	0.02	16.51 (17.04)	12.50 (13.88)	10.45 (12.62)	11.18 (13.20)
3.	Azadirachtin 1500 ppm	2 ml	-	16.22 (16.86)	12.48 (13.78)	10.34 (12.44)	10.90 (15.13)
4.	NSKE 5%	1 ml	-	17.36 (17.61)	13.17 (14.61)	10.77 (19.45)	10.82 (12.83)
5.	*Nomuraea rileyi*	4 g	-	17.02 (17.41)	12.26 (15.98)	10.11 (11.33)	10.95 (12.47)
6.	*Beauveria bassiana*	4 g	-	15.91 (16.77)	11.29 (13.15)	9.96 (10.30)	10.21 (12.36)
7.	Bt 5%	100 g/ ha.	-	16.23 (16.92)	11.88 (13.25)	9.89 (11.92)	10.20 (12.33)
8.	Emamectin benzoate 5 SG	0.4 g	0.002	16.08 (16.78)	10.11 (12.08)	9.03 (9.56)	9.99 (11.98)
9.	Spinosad 45%	0.4 ml	0.018	18.06 (18.11)	10.37 (13.22)	7.42 (13.17)	11.72 (13.78)
10.	Indoxacarb 14.5%	1 ml	0.0145	17.20 (17.48)	11.10 (12.90)	9.28 (11.94)	10.23 (12.42)
11.	Rynaxypyr 20 SC	0.3 ml	0.006	16.78 (17.25)	10.50 (12.12)	9.11 (10.76)	10.53 (12.64)
12.	Chlorpyriphos 20 EC	2 ml	0.04	17.14 (17.00)	10.95 (12.83)	9.48 (11.85)	10.20 (12.42)
13.	Quinalphos 25 EC	2 ml	0.05	16.62 (16.14)	11.17 (12.96)	9.58 (11.83)	10.40 (12.44)
14.	Untreated control	-	-	18.22 (18.15)	17.90 (17.92)	17.68 (16.81)	17.32 (17.06)
	S.E.±	-	-	0.01	0.42	0.34	0.15
	C.D. (P=0.05)	-	-	0.03	1.16	0.94	0.41

* Figures in parentheses are Arc sin transformed values

Table 6 : Effect of insecticides and biorationals on per cent defoliation due to defoliators after second spraying, pooled

Sr. No	Treatments	Dose / lit.	Concentration (%)	Second spraying, pooled (*Kharif* 2010 and 2011) % defoliation due to defoliators			
				1 DBS	3 DAS	7 DAS	14 DAS
1.	Buprofezin 25 SC	2 ml	0.05	11.35 (13.28)	9.56 (11.79)	9.49 (11.71)	9.25 (11.94)
2.	Diflubenzuron 25 WP	0.8 g	0.02	10.79 (1.68)	9.43 (11.94)	10.23 (11.30)	9.19 (11.92)
3.	Azadirachtin 1500 ppm	2 ml	-	11.48 (13.25)	10.57 (12.59)	10.55 (11.37)	9.57 (12.18)
4.	NSKE 5%	1 ml	-	11.67 (13.44)	9.73 (11.95)	9.27 (10.48)	8.88 (11.60)
5.	*Nomuraea rileyi*	4 g	-	10.50 (13.33)	10.67 (12.80)	10.17 (11.24)	9.79 (12.27)
6.	*Beauveria bassiana*	4 g	-	11.30 (13.11)	10.14 (12.17)	9.35 (11.55)	9.73 (12.20)
7.	Bt 5%	100 g/ ha.	-	10.13 (12.27)	9.35 (11.61)	8.48 (11.70)	9.01 (11.63)
8.	Emamectin benzoate 5 SG	0.4 g	0.002	11.38 (13.32)	9.53 (12.40)	9.02 (10.86)	10.66 (11.30)
9.	Spinosad 45%	0.4 ml	0.018	11.39 (13.39)	9.74 (11.82)	8.83 (10.96)	8.90 (11.51)
10.	Indoxacarb 14.5%	1 ml	0.0145	10.88 (12.96)	8.93 (11.54)	8.37 (10.65)	8.44 (11.60)
11.	Rynaxypyr 20 SC	0.3 ml	0.006	9.96 (12.27)	9.59 (10.92)	7.57 (10.57)	8.02 (10.87)
12.	Chlorpyriphos 20 EC	2 ml	0.04	10.99 (13.09)	9.36 (11.85)	7.87 (10.05)	9.42 (11.71)
13.	Quinalphos 25 EC	2 ml	0.05	10.95 (12.99)	9.43 (11.86)	8.35 (10.85)	9.22 (11.82)
14.	Untreated control	-	-	17.93 (18.10)	17.45 (18.74)	18.71 (18.93)	18.46 (19.90)
	S.E.±	-	-	0.18	0.16	0.15	0.56
	C.D. (P=0.05)	-	-	0.49	0.44	0.44	1.55

* Figures in parentheses are Arc sin transformed values

Emamectin benzoate 5SG@ (9.99 %) followed by Chlorpyriphos 20 EC (10.20 %), *Beauveria bassiana* (10.21 %) and Indoxacarb 14.5 % (10.23 %) were significantly superior over rest of all the treatments and at par with each other.

Second spraying (Pooled):

The data presented in Table 6 showed that per cent defoliation due to defolitors a day before the second spray ranged from 9.69 to 17.93 per cent.At 3DAS, it was observed that the lowest per cent defoliation due to defolitors was observed in Indoxacarb 14.5 % (8.93 %) followed by Bt 5 % (9.35%) and Chlorpyriphos 20 EC (9.36%) were significantly superior and at par with each other. Next minimum population was in treatment Emamectin benzoate 5SG followed by Rynaxypyr 20 SC, Diflubenzuron 25WP Buprofezin 25 SC, NSKE 5%, Spinosad 45%, *Beauveria bassiana*, Azadirachtin 1500 ppm and *Nomuraea rileyi*. At 7DAS, significantly lowest per cent defoliation was observed in Rynaxypyr 20 SC (7.57 %) followed by Chlorpyriphos 20 EC (7.87%), Quinalphos 20EC (8.35%) and Indoxacarb 14.5 % (8.37%). At 14 DAS, the defoliation was lowest in Rynaxypyr 20 SC (8.02 %) followed by Indoxacarb 14.5 % (8.44%), NSKE (8.88%) and Spinosad 45% (8.90%) were significantly superior over rest of all the treatments. As recommended in Integrated pest management package for soybean use Chlorantraniliprole 85% SC @ 150 ml/ha, Indoxocarb 15.8% EC @ 333ml/ha, Quinalphos25EC @1000 ml/ha etc. against defoliators in soybean. Result of present investigations are in conformity with those of Patil *et al.* (2008) who also reported minimum per cent defoliation was observed in the plot treated with rynaxypyr 20 SC (9.83%) and spinosad 45SC (21.22%). Rajkumar and Shriram (2002) recorded highest cost benefit ratio in treatment triazophos which were found effective against defoliators on soybean.

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