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Original Research Article

Efficacy of Neonicotinoids against Aphids Infesting Brinjal

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A B S T R A C T

The study on efficacy of newer neonicotinoids on aphid carried out under field condition in Department of Agricultural Entomology, VNMKV, Parbhani during the year 2015-16 and 2016-17. Pooled data regarding efficacy of neonicotinoids against aphids infesting brinjal crop revealed that the treatment with dinotefuran 20 SG @ 30 g a.i./ha was most superior. The average number of aphids per three leaves in dinotefuran treated plots was 1.13, 1.68, 3.02 and 5.30 aphids per three leaves at 1, 3, 7 and 14 DAS, respectively. The next superior treatment was clothianidin 50 WDG @ 20 g a.i./ha recording 1.52, 1.92, 3.87 and 5.97 aphids per three leaves at 1, 3, 7 and 14 DAS, respectively. It was followed by flonicamid 50 WG @ 75 g a.i./ha. The plots treated with this new molecule harboured 1.68, 2.23, 4.34 and 6.83 aphids per three leaves at 1, 3, 7 and 14 DAS, respectively. However, there was no statistical difference among these treatments in respect of their efficacy against brinjal aphids. Hence we can say that these newer molecules are equally effective against this pest.

Keywords

Brinjal, Aphids, neonicotinoids, efficacy

Introduction

Brinjal or eggplant (*Solanum melongena* L.) is an important Solanaceous crop of subtropics and tropics. Brinjal has been cultivated in India for the last 4,000 years and is often thought of as a Mediterranean or Mid-Eastern vegetable. The brinjal is of much importance in the warm areas of Far East, being grown extensively in India, Bangladesh, Pakistan, China and the Philippines. It is also popular in Egypt, France, Italy and United States. It is known as a "King of vegetables" originated from India where a wide range of wild types and land races occurs (Thompson and Kelly, 1957).

It is the third most important vegetable crop grown throughout the year in all parts of India and contributes 17.8 per cent of the total production of vegetables in the country. Further, it is a popular vegetable in China, Turkey, Syria, Egypt, Indonesia, Philippines, Thailand, France, Taiwan, Italy and USA. In India, brinjal is cultivated on an area of 664 thousand ha with an annual production of 12552 thousand million tonnes with productivity of 18.9 tonnes ha^{-1} during 2015-16. The total area under brinjal cultivation is 26.7 thousand ha in Maharashtra producing 543.9 thousand million tonnes annually with productivity of 20.4 tonnes fruits ha^{-1}. The west Bengal is a leading state in brinjal production (2,985.4 thousand MT) and area (161.9 thousand ha) in India. The major brinjal producing states are Orissa, Bihar, Karnataka, West Bengal, Andhra Pradesh, Karnataka and Uttar Pradesh (Anon., 2017).

In India, brinjal is widely cultivated in 8 states, practically on all soils from light sand to heavy clay and in almost all eight vegetable growing zones including Maharashtra- Madhya Pradesh. Although several varieties of brinjal are cultivated, the expected yield of the crop is not achieved so far because of the crop damage caused by the insect pests. Insect pests are most limiting factor for accelerating crop yield. Brinjal is attacked by more than 70 insect pests (Subbaratnam and Butani, 1982), of which the major important ones are the shoot and fruit borer (*Leucinodes orbonalis* Guen :pyralidae), stem borer (*Euzophera perticella* Ragonot : Phycitidae), leaf hopper (*Amrasca biguttula biguttula* Ishida: Cicadellidae), aphid (*Aphis gossypii* Glover: Aphididae), Leaf roller (*Antoba olivacea* Walker: Noctuidae), leaf beetle (*Henosepilachna vigintiopunctata* Fab: Coccinellidae), whitefly (*Bemisia tabaci* Gennadius: Aleyrodidae), lace wing bugs (*Urentius echinus* Distant and *U. sentis* Distant: Tingidae), mealy bug (*Coccidohystrix insolitus* Green: Pseudococcidae) and non-insect pest, red spider mite (*Tetranychus macfurlanei* Baker and Pritchard) which cause about 70-92 per cent loss in the fruit yields (Vevai, 1970).

Both nymphs and adults of sucking pests *viz., A. gossypii* occur regularly on the crop from the early stage and remain till harvest of the crop causing enormous damage by sucking cell sap from the leaves and tender plant parts. Due to aphid infestation under surface of the leaves get crinkled and slightly curled backwards. The vitality of the plant is diminished and the plants turn yellow, get deformed and dry away.

Pest management is an important aspect of brinjal production. Several chemical insecticides have been experimented, recommended and are being used extensively by farmers to control pests. However, considering economics and efficacy of pesticidal treatments, satisfactory control could not be obtained in many instances due to misuse of insecticides, resistance developed by pests and faulty application techniques. With this view the present experiment was conducted for studying the efficacy of newer neonicotinoids on aphids infesting brinjal.

Materials and Methods

Five observation plants were selected randomly from the net plot of each treatment in each replication and properly labeled. The observations on total number of aphids were recorded on the leaf each from top, middle and bottom canopy of the observation plants at one day before and 1, 3, 7 and 14 days after application of insecticides. The observations on number of aphids were recorded at different intervals and transformed into square root transformation before statistical analysis.

The data obtained in number was subjected to transformation using Poisson formula $\sqrt{x + 0.5}$ and per cent data was transformed using arc sine transformation before further statistical analysis. The mean data on efficacy and yield were statistically analyzed and subjected to the analysis of variance by adopting the appropriate methods as outlined by Panse and Sukhatme (1978) and Gomez and Gomez (1984) by adopting "Fishers analysis of variance technique".

Results and Discussion

Overall efficacy of newer neonicotinoids against aphids infesting brinjal based on pooled data *Kharif* 2015-16 and 2016-17

Pooled data on incidence of aphids (average number/three leaves) of two seasons *viz.,*

Kharif 2015-16 and 2016-17 are presented in Table 1 and fig.1.The pre-treatment count of aphids before initiation of the spray treatments was in the range of 16.00 to 17.77 aphids/three leaves.

Based on the mean of two sprays of both the years, the post-treatment counts of aphid population on untreated control plants were 18.97, 19.67, 21.03 and 22.15 aphids/three leaves on 1, 3, 7, and 14 days after spray (DAS), respectively.

The aphid incidence in all insecticidal treatments was significantly low indicating that all the insecticides were significantly effective against aphids.

Pooled data regarding efficacy of neonicotinoids against aphids infesting brinjal crop revealed that the treatment with dinotefuran 20 SG @ 30 g a.i./ha was most superior.

The average number of aphids per three leaves in dinotefuran treated plots was 1.13, 1.68, 3.02 and 5.30 aphids per three leaves at 1, 3, 7 and 14 DAS, respectively. The next superior treatment was clothianidin 50 WDG @ 20 g a.i./ha recording 1.52, 1.92, 3.87 and 5.97 aphids per three leaves at 1, 3, 7 and 14 DAS, respectively.

It was followed by flonicamid 50 WG @ 75 g a.i./ha.

The plots treated with this new molecule harboured 1.68, 2.23, 4.34 and 6.83 aphids per three leaves at 1, 3, 7 and 14 DAS, respectively.

However, there was no statistical difference among these treatments in respect of their efficacy against brinjal aphids. Hence we can say that these newer molecules are equally effective against this pest.

Other test products also proved their effectiveness against this pest and their order of efficacy was imidacloprid > thiamethoxam > acetamiprid > dimethoate.

Most preferably these products should be rotated against brinjal aphids at 10 days interval since average count of aphids at 14 DAS in the treatments was more.

Considering the typical damage caused by aphids on brinjal responsible for loss in the economic yield of the crop, spraying of these molecules *viz.,* dinotefuran 20 SG, clothianidin 50 WDG, flonicamid 50 WG, imidacloprid 17.8 SL, thiamethoxam 25 WG, acetamiprid 20 SP and dimethoate 30 EC can be effectively advocated in its spray schedules.

However, the interval between two sprays should be 15 days for dinotefuran, clothianidin and flonicamid rest of the molecules should be applied at 10 days interval.

The present results are in conformity with the findings of Sreenivas *et al.,* (2015) who reported that dinotefuran 20 SG @ 30 g $a.i.ha^{-1}$ performed significantly better by recording lowest population of 9.10 aphids /leaf at 3 DAS.

Ghelani (2014) stated that flonicamid 0.02 per cent was found more effective against aphids on *Bt* cotton followed by thiamethoxam 0.01 per cent and dinotefuran 0.008 per cent.

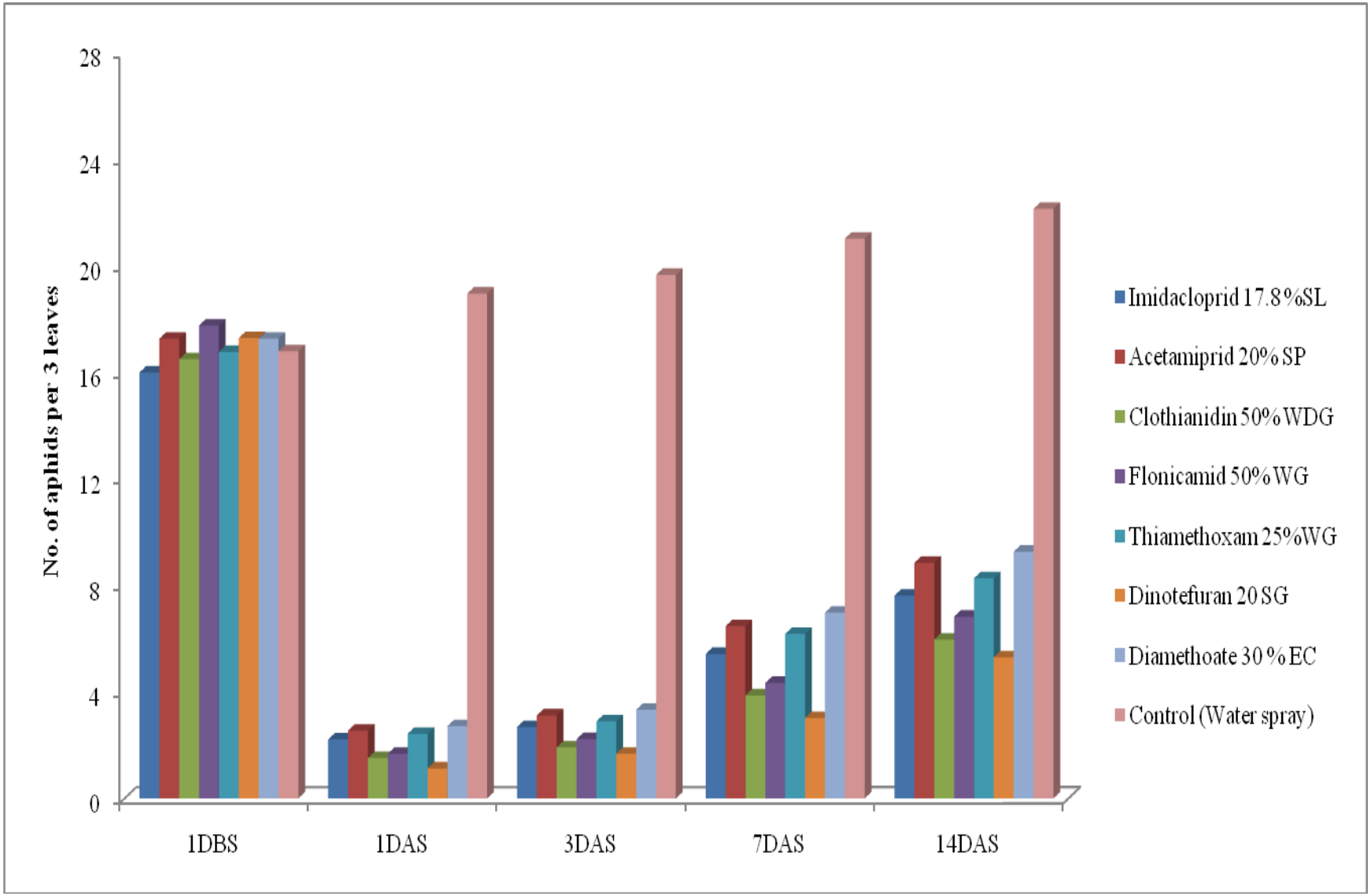
Both thiamethoxam and dinotefuran exhibited efficiency against cabbage aphid infesting canola plants after one, three, seven, fifteen and twenty-one days of treatments as observed under field condition by Mohamed *et al.,* (2015).

Table.1 Overall efficacy of newer neonicotinoids against aphids infesting brinjal based on pooled data (*Kharif* 2015-16 and 2016-17)

Sr.No	Treatments	Dose g.a.i/ha	Average number of aphids/3 leaves				
			1DBS	1DAS	3DAS	7DAS	14DAS
1	Imidacloprid 17.8 SL	20	16.00 (4.06)	2.22 (1.65)	2.68 (1.78)	5.43 (2.43)	7.62 (2.85)
2	Acetamiprid 20 SP	10	17.27 (4.21)	2.55 (1.74)	3.12 (1.90)	6.47 (2.64)	8.85 (3.06)
3	Clothianidin 50 WDG	20	16.50 (4.12)	1.52 (1.42)	1.92 (1.55)	3.87 (2.09)	5.97 (2.54)
4	Flonicamid 50 WG	75	17.77 (4.27)	1.68 (1.48)	2.23 (1.65)	4.34 (2.20)	6.83 (2.71)
5	Thiamethoxam 25 WG	50	16.77 (4.15)	2.43 (1.71)	2.90 (1.84)	6.18 (2.58)	8.27 (2.94)
6	Dinotefuran 20 SG	30	17.30 (4.22)	1.13 (1.28)	1.68 (1.48)	3.02 (1.87)	5.30 (2.41)
7	Diamethoate 30 EC	200	17.27 (4.21)	2.72 (1.79)	3.33 (1.96)	6.98 (2.73)	9.27 (3.12)
8	Control (Water spray)	-	16.80 (4.16)	18.97 (4.40)	19.67 (4.48)	21.03 (4.63)	22.15 (4.75)
	S.E ±	**-**	**0.11**	**0.10**	**0.09**	**0.11**	**0.12**
	CD at 5 %	**-**	**NS**	**0.31**	**0.27**	**0.34**	**0.37**

DAS-Days after spray DBS- Day before spray Figures in parenthesis are $\sqrt{x + 0.5}$ transformed values

Fig.1 Overall efficacy of newer neonicotinoids against aphids infesting brinjal based on pooled data (*Kharif* 2015-16 and 2016-17)



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