

EVALUATION OF DIFFERENT SYNTHETIC AND BOTANICAL INSECTICIDE AGAINST APHID, *APHIS GOSSYPYII* GLOVER INFESTING ISABGOL CROP

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ABSTRACT

An investigation was carried out during 2008-09 to evaluate the different insecticides against aphid, *Aphis gossypii* Glover infesting isabgol (*Plantago ovata*) crop under field condition at Sardarkrushinagar, S. D. A. U., Dantiwada. The result of the field study revealed that, among all the chemical and botanical insecticides used, carbosulfan @ 0.05 per cent was found to be most effective by recording lowest population of aphid as per aphid indexing method (0.99 A. I.) with the highest seed yield, 11.24 q/ha and neem oil @ 0.5 per cent was superior than other botanical recording (1.83 A. I.) with a maximum 7.21 q/ha seed yield. Thus, from the overall results it can be concluded that the carbosulfan @ 0.05 and neem oil 0.5 per cent proved most effective for the management of aphid *A. gossypii* in isabgol crop.

INTRODUCTION

Isabgol (*Plantago ovata* Forsk.) is one of the most important medicinal plants in the Unani and Ayurvedic system of medicine. It belongs to order Plantaginates which consist of only a single family Plantaginaceae. These species either are annual or perennial herbs. About 10 species of *Plantago* are recorded in India. *P. ovata* is only the cultivated species of the country because of its bold seed. Indian *P. ovata* is preferred over European *Plantago psyllium* and *Plantago indica* (Trease and Evans, 1978). *P. ovata* is known to be grown as wild in warmer and drier part of the Mediterranean region of India. It is one of the important medicinal crops traditionally cultivated in North, Saurashtra and Kachchh region of Gujarat. South western Rajasthan, Haryana, Madhya Pradesh and Punjab are also produced small quantity of isabgol.

As the whole, India holds monopoly in the production and export of isabgol to the world market and about 80 to 90 per cent produce is mainly exported to U.S.A., West Germany, United Kingdom and France. Isabgol is commercially grown as a winter crop, which remain in the field for about four to five months.

The most important component of isabgol is husk obtained from its seed. Isabgol husk is popularly known as "Sat isabgol" in Indian market. It is an important medicine for intestinal and stomach disorders.

Isabgol crop is attacked by number of insect pest, out of which aphid, *Aphis gossypii* Glover (Homoptera: Aphididae) has been reported as major pest of isabgol (Sagar and Jindla, 1984). Aphid, *A. gossypii* is a polyphagous pest which infesting

number of field crops. The work on *A. gossypii* was carried out by various workers on different hosts in India as well as in abroad. *A. gossypii*, which has been observed to attack 220 host plant belonging to 46 families throughout the world (Roy and Behura, 1983). Lonely dependence on synthetic chemical for the control of aphid is very well known. Besides the fact that these chemicals create problem of resistance, resurgence, environmental pollution, health hazards, harmful residues on food crop and adverse effect on activity of parasites and predator of crop pests.

In spite of regular occurrence of *A. gossypii* on isabgol crop in North Gujarat and South Rajasthan regions causing economic losses, no any systemic work has been done on various aspects of such an important pest of isabgol in Gujarat State. Keeping this in view, to overcome lacunae and to develop an eco-friendly and effective pest management strategy, the present study was carried out with the following objectives.

MATERIALS AND METHODS

A field experiment was carried out during *rabi* season, 2008-09 at farmers' fields near university campus in Dantiwada to find out the most effective insecticide against isabgol aphids. The isabgol variety Gujarat Isabgol-2 was sown by broadcasting method with a gross plot size of 4.0 m x 3.0 m. The trials were laid out in Randomized Block Design (RBD) with nine treatments and three replications. All the pre and post-sowing agronomical practices were adopted to raise the healthy crop. Considering the pest pressure the spray was given at 75 days after germination. The spray fluid was applied with the help of Knapsack sprayer.

Table 1: Efficacy of different insecticides against *A. gossypii* in isabgol crop in field condition (2008-09)

Sr.No.	Treatments	A. I. / plant at different intervals of spray Conc. (%)	Isabgol					Mean	Yield q/ha
			Before spray	1 DAS	3 DAS	7 DAS	10 DAS		
1.	Carbosulfan	0.05	1.72*(2.45)	1.08 (0.66)	1.05 (0.60)	1.01 (0.52)	1.12 (0.76)	1.18 (0.99)	11.24
2.	Imidacloprid	0.006	1.65 (2.23)	1.30 (1.20)	1.28 (1.13)	1.26 (1.08)	1.34 (1.30)	1.37 (1.38)	9.62
3.	Acetamiprid	0.004	1.76 (2.60)	1.39 (1.42)	1.35 (1.32)	1.32 (1.24)	1.42 (1.52)	1.46 (1.62)	9.30
4.	Thiomethoxam	0.035	1.75 (2.58)	1.51 (1.79)	1.45 (1.61)	1.41 (1.49)	1.54 (1.88)	1.54 (1.87)	6.38
5.	Fenvalerate	0.02	1.73 (2.50)	1.73 (2.48)	1.71 (2.43)	1.52 (1.81)	1.75 (2.57)	1.69 (2.35)	6.79
6.	NSKS	5.0	1.77 (2.64)	1.56 (1.93)	1.47 (1.67)	1.42 (1.52)	1.57 (1.98)	1.56 (1.94)	5.42
7.	Godrej Achook	0.5	1.79 (2.72)	1.59 (2.03)	1.56 (1.94)	1.46 (1.62)	1.61 (2.10)	1.61 (2.08)	6.04
8.	Neem Oil	0.5	1.82 (2.82)	1.47 (1.65)	1.42 (1.51)	1.37 (1.39)	1.51 (1.78)	1.53 (1.83)	7.21
9.	Control (Water Spray)	-	1.86 (2.96)	1.83 (2.85)	1.82 (2.82)	1.79 (2.70)	1.89 (3.06)	1.84 (2.87)	5.16
S. Em. ±			0.090	0.053	0.061	0.056	0.070	-	0.528
C.D. at 5 %			NS	0.158	0.182	0.167	0.211	-	1.481
C.V. %			10.34	8.86	10.89	10.48	11.21	-	8.862

* Outside the parentheses are "x + 0.5 transformed values while, values in parentheses are retransformed value; DAS = Days after Spray

For recording the observation, five plants were selected randomly from net plot area of each plot and tagged. The plants were observed critically for aphid infestation and on the basis of aphid infestation the aphid index was recorded. The aphid index was fixed as described later. The observations on aphid population were recorded before and after 1, 3, 7 and 10 days after application of different insecticidal spray. The seed yield of isabgol was also recorded from the net plot area of the each plot. The data thus, obtained were statistically analyzed after suitable transformation.

Following aphid index given by the Bank (1954) were fixed for estimating the population of aphid and the average aphid index was worked out by adopting following formula.

The average of aphid index was worked out by adopting following formula.

$$\text{Average aphid Index per plant} = \frac{0N + 1N + 2N + 3N + 4N}{\text{Total number of plant observed}}$$

Where,

0, 1, 2, 3, 4 are aphid index

N = Number of plant showing respective aphid index

Aphid Index	Degree of infestation
0	Plant free from aphid
1	Aphid present, but colonies did not build up. No injury due to pest apparent on the plant
2	Small colonies of aphid were present
3	Large colonies of aphid were present on tender parts. Counts of aphids in colonies were possible and tender plant part show damage symptom due to aphids
4	Entire plant was covered by aphids. Counts of aphids in colonies were impossible and plant show damage symptom due to aphids

@ 0.02 per cent recorded higher aphid population (2.48 A.I.) and was proved least effective.

The aphid index recorded at 3 days after spraying indicated that carbosulfan @ 0.05 per cent again found highly effective insecticidal treatment as it recorded minimum aphid index (0.60). The second effective insecticide was imidacloprid @ 0.006 per cent (1.13 A.I.) and it was at par with acetamiprid @ 0.004 (1.32 A.I.) but significantly superior than the remaining treatments. Among the botanicals, neem oil @ 0.5 per cent was recorded lower aphid index of 1.51 and it was at par with

RESULTS AND DISCUSSION

The results of field experiments conducted at farmers field, revealed that the population of aphids was non significant before application of the insecticidal treatments Table 1.

At one day after spraying, all the synthetic and botanical insecticides were recorded significantly lower aphid populations over the control (2.85 A.I.). The treatment carbosulfan @ 0.05 per cent were recorded significantly the lowest aphid population (0.66 A.I.) among the different insecticidal treatments and proved most effective against isabgol aphid. Next to this, imidacloprid @ 0.006 per cent and acetamiprid @ 0.004 per cent recorded the average aphid index of 1.20 and 1.42, respectively and these treatments were differing significantly with each other. Both these treatments were recorded significantly lower aphid population than the remaining insecticidal treatments. Among the different botanicals the treatment neem oil @ 0.5 per cent was recorded the lowest aphid index of 1.65 and it was at par with thiomethoxam @ 0.035 per cent (1.79 A.I.). The treatment NSKS @ 5.0 per cent was also found moderately effective which was at par with Godrej achook 0.5 per cent recorded 1.93 and 2.03 average aphid index, respectively. Fenvalerate

treatments thiomethoxam @ 0.035 per cent, NSKS @ 5.0 per cent and Godrej achook 0.5 per cent which recorded 1.61, 1.67 and 1.94 A.I., respectively. Fenvalerate @ 0.02 per cent was found least effective as it recorded the highest aphid index (2.43) among the insecticidal treatments.

Result on average aphid index recorded at 7 days after spraying, indicated that carbosulfan @ 0.05 per cent was again recorded the lowest aphid index (0.52) and proved the most effective treatment. Next to this, imidacloprid @ 0.006 per cent was also found effective against the aphid as it recorded

1.08 A.I. and it was at par with acetamiprid @ 0.004 per cent (1.24 A.I.). Among the plant materials, neem oil @ 0.5 per cent was recorded 1.39 A.I. and found effective among the botanicals and it was statistically at par with thiomethoxam @ 0.035 per cent (1.49 A.I.) NSKS @ 5.0 per cent (1.52 A.I.) and Godrej Achook @ 0.5 per cent (1.62 A.I.). Fenvalerate @ 0.02 per cent was found least effective insecticide as it recorded higher aphid index (1.81 A.I.). The aphid index in untreated control was 2.70 at 7 days of spraying.

At 10 days after spraying, all the insecticidal treatments were recorded significantly lower aphid index than the untreated control and proved effective against the isabgol aphid. The treatment carbosulfan @ 0.05 per cent ranked first in reducing the aphid incidence in isabgol crop as it recorded significantly lower aphid index (0.76). The treatment imidacloprid @ 0.006 per cent recorded the lower aphid index of 1.30 and found effective next to carbosulfan @ 0.05 per cent. The treatment imidacloprid was at par with acetamiprid @ 0.004 per cent, neem oil 0.5 per cent and thiomethoxam @ 0.035 per cent which recorded 1.52, 1.78 and 1.88 A.I., respectively. The treatment NSKS @ 5.0 per cent was recorded 1.98 A.I. and it was at par with Godrej ahook @ 0.5 per cent (2.10 A.I.) and fenvalerate @ 0.02 per cent (2.57 A.I.).

The highest yield (11.24q/ha) was obtained in the treatment carbosulfan @ 0.05 per cent. The treatment imidacloprid 0.006 percent and acetamiprid 0.004 percent were recorded 9.62 and 9.30 q/ha seed yield and both were at par with each other.

Thus, the treatment carbosulfan @ 0.05 per cent proved most effective against aphids in isabgol followed by imidacloprid @ 0.006 per cent and acetamiprid @ 0.004 per cent.

Similar observations were also reported by Calafori *et al.* (1999), carbosulfan (Marshal at 0.6L/ha) gave greater than 80 per cent control of aphid with residual effect for up to 20 days. Patel *et al.* (2002) also reported that carbosulfan (Marshal 25 EC) @ 2500 mL/ha found most effective in reducing aphid infestation in cumin. Imidacloprid was tested in laboratory test on cotton variety (MC 4-5) as seed treatment (Gaucho 7 WS) at 7 g/kg or as foliar spray (Confidor 200 SL) at 100 ml/ha against *Aphis gossypii* resulted in cent per cent mortality for up to 10 to 26 days after sowing and 7 days after treatment, respectively, Kumar *et al.* (1999).

According to Khalequzzaman and Nahar (2008), azadirachtin as a natural plant origin insecticide proved to be the most toxic having LC50 as 0.41 μ g cm⁻² for *A. craccivora*, 0.34 μ g cm⁻² for *A. gossypii* and 0.44 μ g cm⁻² for both *M. persicae* and *L. erysimi*.

Khan *et al.* (2012) evaluated different insecticides used alone and in combination by making carbosulfan as standard and

combined with other insecticides in 1:1 ratio against *Lipaphis erysimi* (kalt.) (homoptera: aphididae) and found that, the carbosulfan + profenofos combination as the best insecticidal combination for the control of mustard aphid followed by carbosulfan + imidacloprid.

Rouhani *et al.* (2013) studied the evaluation of imidacloprid, thiamethoxam, thiacloprid and flonicamid on mortality against pomegranate aphid, *A. punicae* under controlled conditions and reported that as the dose increases the mortality was also increases and recorded highest (73.33%) in the treatment imidacloprid at the highest concentration *i.e.* 1 μ L/mL than the other insecticides.

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REFERENCES

- Bank, C. J. 1954.** A method for estimating population and counting large number of *Aphis fabae* Scop. *Bull. Ent. Res.* **45(4)**: 751-756.
- Calafori, M. H., Barbhri, A. A. and Salvo, S. 1999.** Efficacy of insecticides for the control of *Thrips tabaci* (Linderman, 1876) and aphid *Aphis gossypii* Glover 1888, on cotton, *Gossypium hirsutum* L. Campina Grande, Brazil; Empresa Brasileira de Pesquisa Agropecuaria, Embrapa Algodao. pp. 208-211.
- Khalequzzaman, M. and Nahar, J. 2008.** Relative toxicity of some insecticides and azadirachtin against four crop infesting aphid species *Univ. J. zool. Rajshahi Univ.* **27**: 31-34.
- Khan, R. R., Irfan, R., Ahmed, S., Oviedo, A., Arshad, M. and Zia, K. 2012.** *Pakistan Entomologist.* **34(2)**: 157-160.
- Kumar, K. and Santharam, G. 1999.** Effect of imidacloprid against aphids and leaf hoppers on cotton. *Annals of Plant Protection Sciences.* **7(2)**: 248-250.
- Patel, G. M., Patel, B. R., Patel, I. S., Patel, R. K. and Patel, S. R. 2002.** Testing of Marshal 25 EC for the control of sucking pest like aphids in cumin crop. *Report of Ad-hoc Research Project.*
- Rouhani M., Samih, M. A., Izadi, H. and Mohammadi, E. (2013).** Toxicity of new insecticides against pomegranate aphid, *Aphis punicae*. *Intl. Res. J. Appl. Basic. Sci.* **4(3)**: 496-501.
- Roy, D. K. and Behura, B. K. 1983.** Notes on host plants, feeding behavior, infestation and ant attendance of cotton aphids, *Aphis gossypii* Glover. *J. Bombay Natural Hist. Soc.* **80(3)**: 654-656.
- Sagar, P. and Jindla, L. N. 1984.** An outbreak of aphid, *Aphis gossypii* Glover on Isabgol, *Plantago ovata* (L.) and its chemical control. *Intl. Pest Control.* **26(3)**: 76-77.
- Trease, G. E. and Evans, W. C. 1978.** Pharmacognosy 11th Ed. Cassell and Collier Mac Millan Publishers, London.

