Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

**E-ISSN:** 2278-4136
**P-ISSN:** 2349-8234
JPP 2019; 8(4): 1764-1766
Received: 18-05-2019
Accepted: 23-06-2019

**Shobharani M**
Agricultural Research Station, Bidar, University of Agricultural Sciences, Raichur, Karnataka, India

**Sunilkumar NM**
Agricultural Research Station, Bidar, University of Agricultural Sciences, Raichur, Karnataka, India

**Sidramappa**
Agricultural Research Station, Bidar, University of Agricultural Sciences, Raichur, Karnataka, India

**Amitabegaum Biradar**
Agricultural Research Station, Bidar, University of Agricultural Sciences, Raichur, Karnataka, India

**Correspondence**
**Shobharani M**
Agricultural Research Station, Bidar, University of Agricultural Sciences, Raichur, Karnataka, India

# Field evaluation of imidacloprid and thiamethoxam against sucking insect pests of blackgram

**Shobharani M, Sunilkumar NM, Sidramappa and Amitabegaum Biradar**

**Abstract**
Field experiment was conducted for two consecutive seasons 2016-17 and 2017-18 to test the efficacy of Imidacloprid 60 FS and Thiamethoxam 30 FS against sucking Pests *viz.*, aphids and jassids infesting blackgram at Agricultural Research Station, Bidar, Karnataka. Among them, the Seed treatments with Imidacloprid 60 FS @ 10 ml/ Kg, 7 ml/ Kg seeds and Thiamethoxam 30 FS @ 5.7 ml/kg of seeds were proved superior in protecting the crop from the early season sucking pests and recorded highest grain yield of blackgram.

**Keywords:** Sucking pests, blackgram, imidacloprid 60 FS, thiamethoxam 30 FS

## Introduction
Pulses have been considered as poor man's meat because these are rich in proteins and it is the second important constituent of Indian diet after cereals. Among the different pulses, blackgram is a rich source of protein which is one of the essential nutrients of human diet. It is also rich in phosphoric acid and established itself as a highly valuable with ability to improve the soil by fixing atmospheric nitrogen. Blackgram, *Phaseolus mungo* (L.), commonly known as Urdbean, mash, mashkalai black mapte etc., belongs to the family Leguminosae; sub family Papilionaceae. This crop contributes 10% to the national pulse production from an area of 13%. The area under blackgram in India is about 3.25 million ha with production of 1.81 million tones and productivity of 463 kg/ha. This crop is severely damaged by many insect pests that cause serious damage and reduction in yield. Farmers rely on foliar application of insecticides for the management of insect pests in blackgram. This crop is attacked by different species of insect pests, among them sucking insect pests (aphid, jassids, white leaf hopper and whitefly) are of the major importance. These insect pests not only reduce the vigour of the plant by sucking the sap but transmit diseases and affect photosynthesis as well [11]. The annual yield loss due to the insect pests has been estimated at about 30 per cent in urd bean and mung bean. In order to manage these sucking pests, Farmers rely on foliar application of insecticides after their occurrence or pest population crossing Economic Threshold Level in black gram. Under such situation, seed treatment with systemic insecticide is an integral part of pest management tactics, which is comparatively less pollutant to the environment, cost effective, selective and reported to maintain natural equilibrium [9, 16] can be practiced. Hence, the present study was undertaken to identify an effective seed treatment insecticide for the management of sucking pests on blackgram.

## 2. Materials and Methods
A field experiment was conducted to test the efficacy of Imidacloprid 60 FS and Thiamethoxam 30 FS against sucking pests, aphids and jassids infesting Blackgram. The experiment was carried out at Agricultural Research Station Bidar during the *Kharif* seasons of year 2016-17 and 2017-18. The experiment was laid out in Randomized block design with five treatments replicated five times [as detailed in Table No.1]. The plot size was 3m x 4m.
The seeds of the blackgram var. DU-1 were taken in a polythene bag and required quantity of the seed dressing chemicals (Imidacloprid 60 FS @ 5, 7 and 10ml/kg of seeds and thiamethoxam 30 FS @ 5.7 ml/kg of seeds was added to this and stirred carefully. If necessary few ml of water can be added to get uniform coating of the chemical on the seeds and dried in shade before sowing. Before sowing the treated seeds, there should be sufficient moisture in the soil.
Treated Blackgram Var, DU-1 was sown at 45cm × 10cm spacing and all the recommended package of practices were followed to raise the crop, except plants protection measures for sucking pests. Where ever necessary a spray was given to control leaf eating caterpillar and pod borers.

Observations on incidence of sucking pests were recorded by counting the number of aphids and jassids present at top three leaves at 10, 20, 30 and 40 days after sowing on randomly selected 5 plants/plot. The data was subjected for square root transformation and statistical analysis. The seed yield was recorded plot wise at the time of harvest and converted to hectare basis and subjected for statistical analysis.

## 3. Results and Discussion

The data on the effectiveness of different doses of imidacloprid 60 FS and thiamethoxam 30 FS seed treatment for the management of sucking pests of blackgram under field condition during 2016-17 and 2017-18 was pooled and presented in the Table 1.

**Table 1:** Bio-efficacy of seed dressing chemicals against sucking insect pests of blackgram during 2016-17 and 2017-18 Kharif at ARS, Bidar (Pooled data)

| Treatments | Dose (ml/Kg of seeds) | No. of aphids/ top three leaves | | | | No. of jassids/ top three leaves | | | | Yield (Qtl. /ha) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 10 DAS | 20 DAS | 30 DAS | 40 DAS | 10 DAS | 20 DAS | 30 DAS | 40 DAS | |
| 1. Untreated control | - | 9.28 (3.21) | 16.70 (4.21) | 21.02 (4.69) | 26.20 (5.22) | 5.74 (2.59) | 7.92 (2.98) | 10.64 (3.41) | 10.38 (3.37) | 3.27 |
| 2. Imidacloprid 60 FS | 5 | 3.02 (2.00) | 8.22 (3.03) | 11.50 (3.53) | 14.74 (3.96) | 2.90 (1.97) | 4.48 (2.33) | 6.18 (2.67) | 6.13 (2.66) | 5.84 |
| 3. Imidacloprid 60 FS | 7 | 1.26 (1.50) | 3.36 (2.07) | 5.30 (2.49) | 8.92 (3.13) | 1.38 (1.55) | 2.68 (1.92) | 4.12 (2.26) | 4.14 (2.27) | 8.87 |
| 4. Imidacloprid 60 FS | 10 | 0.84 (1.35) | 2.16 (1.78) | 4.45 (2.33) | 6.67 (2.77) | 0.80 (1.21) | 1.89 (1.69) | 3.28 (2.07) | 3.98 (2.23) | 10.59 |
| 5. Thiamethoxam 30 FS | 5.7 | 2.30 (1.81) | 7.14 (2.84) | 8.86 (3.13) | 12.66 (3.69) | 2.54 (1.88) | 3.74 (2.16) | 6.46 (2.72) | 6.15 (2.67) | 7.63 |
| S.Em± | | 0.09 | 0.15 | 0.14 | 0.15 | 0.09 | 0.09 | 0.10 | 0.10 | 0.35 |
| CD(0.05) | | 0.28 | 0.44 | 0.41 | 0.44 | 0.26 | 0.26 | 0.29 | 0.31 | 1.09 |

DAS: Days After Spray; DBS: Days Before Spray. Figures in the parentheses are square root transformed values $\sqrt{(x+1)}$

Among the different treatments, imidacloprid seed treatment @ 10 ml/ kg of seeds and 7 ml/kg of seeds showed significantly lowest number of aphids 0.84 and 1.26 aphids/ top three leaves and these two treatments were followed by thiamethoxam 30 FS @ 5.7 ml/kg of seeds with 2.30 aphids/ top three leaves at 10 days after sowing. However, untreated control recorded highest aphid population of 9.28 aphids/ top three leaves.

At 20 days after sowing lowest aphid population of 2.16 and 3.36 aphids / top three leaves was recorded in the plots treated with imidacloprid 60 FS @ 10 ml/ Kg of seeds and 7 ml/kg of seeds respectively. These two treatments were followed by thiamethoxam 30 FS @ 5.7 ml/kg of seeds with 7.14 aphids/ top three leaves. However, untreated control recorded highest aphid population of 16.70 aphids/ top three leaves.

At 30 and 40 days after sowing aphid population started to build up in all the treatments which ranged from 4.45 to 21.02 aphids/ top three leaves. However, lowest aphid population was recorded in the plots treated with imidacloprid 60 FS @ 10 ml/ Kg of seeds (4.45 aphids/top three leaves) and was followed by imidacloprid 60 FS @ 7 ml/ Kg of seeds and thiamethoxam 30 FS @ 5.7 ml/ Kg of seeds with 5.30 and 8.86 aphids/top three leaves respectively. Further, the highest aphid population was noticed in untreated control with 21.02 aphids/top three leaves (Table 1).

During 40 DAS same trend was followed as that of 30 DAS with respect to the aphid population.

During the present study, the jassids population ranged from 0.80 to 2.90 jassids per top three leaves in all the seed treated plots at 10 days after sowing. However, the untreated control recorded highest population of 5.74 jassids/ top three leaves.

At 20 days after sowing lowest jassids population of 1.89 was recorded in the plots treated with Imidacloprid 60 FS @ 10 ml/ Kg of seeds and was followed by imidacloprid 60 FS @ 7 ml/ Kg of seeds and thiamethoxam 30 FS @ 5.7 ml/ Kg of seeds with 2.68 and 3.74 jassids / top three leaves. The highest jassid population was noticed in untreated control with 7.92 jassids/top three leaves (Table 1).

At 30 days after sowing jassids population started to build up in all the treatment which ranged from 1.89 to 7.92 jassids / top three leaves. However, lowest jassids population was recorded in the plots treated with Imidacloprid 60 FS @ 10 ml/ Kg of seeds (1.89 jassids /top three leaves) and was followed by imidacloprid 60 FS @ 7 ml/ Kg of seeds and thiamethoxam 30 FS @ 5.7 ml/ Kg of seeds with 2.68 jassids /top three leaves and 3.74 jassids /top three leaves respectively. Further, the highest jassids population was noticed in untreated control with 10.64 jassids /top three leaves (Table 1).

During 40 DAS same trend was followed as that of 30 DAS with respect to the jassids population.

### 3.1 Yield

The highest grain yield was recorded in imidacloprid 60 FS @ 10 ml/ Kg of seeds with 10.59 q/ha (Table 1). This treatment was followed by imidacloprid 60 FS @ 7 ml/ Kg of seeds and thiamethoxam 30 FS @ 5.7 ml/ Kg of seeds with 8.87 q/ha and 7.63 q/ha grain yield of blackgram respectively. Further, imidacloprid 60 FS @ 5 ml/ Kg of seeds recorded 5.84 q/ha. However, Untreated control recorded lowest grain yield of 3.27 q /ha (Table 1).

The results of the present study revealed that, seed treatment with imidacloprid 60 FS @ 10 ml/ Kg seeds or thiamethoxam 30 FS @ 5.7 ml/ kg of seeds can be used in Blackgram for the management of the sucking pests up to 30-35 days after sowing.

The present results are in accordance with the results where, seed treatment with imidacloprid 60 FS @ 10 ml/kg seeds sown when there is sufficient moisture soil was most effective in controlling the sucking pests of blackgram starting from sowing/ germination up to 40-45 days old crop with highest grain yield and proved cost effective [12]. Further, seed treatment by imidacloprid recorded the lowest incidence of the sucking pests in blackgram [13]. Cotton seeds treated with imidacloprid reduced sucking pest population below the economic threshold level up to 40 days after sowing in cotton [6, 10] and 61 days after germination in cotton [1, 7]. Imidacloprid 600FS when applied as seed treatment was most effective in controlling the sucking pests up to four week of seed germination in soybean [2].

Further, efficacy of thiamethoxam 30 FS @ 5.7 ml/ kg of seeds proved to be effective in managing the sucking pests of blackgram. These findings are in accordance with the results, where imidacloprid 60 FS @ 10ml/kg seeds and thiamethoxam 35 FS @ 15ml/kg seeds were found effective in managing the thrips and leafhopper population in okra up

to 40 days after germination and also recorded higher fruit yield[14]. In okra, thiamethoxam and imidacloprid 70 WS seed dressing chemical protect the crop up to 55 days after sowing from sucking pests [15].

### 3.2 Phytotoxicity

There was no Phytotoxicity symptoms were noticed in the plots where seeds treated with imidacloprid 60 FS. Whereas, the plots where thiamethoxam 30 FS seed treatment was done, there was a tip burning and slight crinkling of the leaves was noticed initially. Further, the plants were recovered from this damage after getting enough rainfall. So, it should be kept in the mind that, we need to sow the seeds treated with imidacloprid 60 FS or thiamethoxam 30 FS when there is optimum moisture/ enough moisture in the soil.

### 3.3 B:C ratio

Imidacloprid 60 FS @ 10 ml/ Kg of seeds and Imidacloprid 60 FS @7 ml/kg of seeds (Table 2) recorded highest B:C ratio of 3.33 and 2.83. These two treatments followed by thiamethoxam 30 FS @ 5.7 ml/ Kg of seeds with 2.49 B:C ratio. Untreated control recorded lowest B: C ratio of 1.08.

**Table 2:** Cost economics of different seed treatment chemicals tested against sucking pests of Blackgram

| Treatments | Dose (ml/ Kg of seeds) | Yield (q/ha) | Cost of production (Rs/ha) | Cost of treatment (Rs/ha) | Total cost of cultivation (Rs/ha) | Gross returns (Rs/ha) | Net Returns (Rs/ha) | B:C ratio |
|---|---|---|---|---|---|---|---|---|
| 1. Untreated control | - | 3.27 | 19,658 | 0 | 19,658 | 21255 | 1,597 | 1.08 |
| 2. Imidacloprid 60 FS | 5 | 5.84 | 19,658 | 550 | 20,208 | 37960 | 17,752 | 1.88 |
| 3. Imidacloprid 60 FS | 7 | 8.87 | 19,658 | 750 | 20,408 | 57655 | 37,247 | 2.83 |
| 4. Imidacloprid 60 FS | 10 | 10.59 | 19,658 | 1000 | 20,658 | 68835 | 48,177 | 3.33 |
| 5. Thiamethoxam 30 FS | 5.7 | 7.63 | 19,658 | 285 | 19,943 | 49595 | 29,652 | 2.49 |

Imidacloprid 60 FS @ Rs. 250/50ml Seed rate: 7.5 kg/hectare: Thiamethoxam 30 FS @ Rs.45/25ml: Blackgram Rs. 6500/qtl

## 4. Conclusion

Seeds treated with imidacloprid 60 FS @ 10 ml/kg seeds or thiamethoxam 30 FS @ 5.7 ml/ Kg of seeds sown when there is sufficient moisture in the soil was found most effective in managing the early season sucking pests of black gram up to 30-35 DAS.

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