



# EFFICACY OF DIFFERENT LURES AGAINST FRUIT FLY (*BACTROCERA CUCURBITAE* COQ.) INFESTING LITTLE GOURD (*COCCINA INDICAL*)

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## Abstract

The experiment was conducted on the management of fruit fly infesting little gourd during August 2015 to February 2016, at College of Agriculture, Dapoli. The methyl eugenol, cue lure and mixture of both the lures were used to trap the fruit flies of little gourd. The weekly catch of the fruit flies was recorded treatment wise for 26 weeks. Analyzed data revealed that the cue lure 3 ml and 2 ml trapped maximum (1440.82 and 1413.62 respectively) number of fruit flies followed by the mixture of both (3 ml methyl eugenol and 3 ml cue lure) and minimum fruit fly trapped in treatment 2ml methyl eugenol (302.98) during the course of investigation. Hence it is recommended to use cue lure 3 ml per trap for mass trapping of fruit flies.

**Key words:** fruit fly, little gourd, methyl eugenol, cue lure and trap, etc.

## Introduction

Cucurbits, little gourd (*Coccina indica* L.), it is grown in most of the parts of India; its cultivation is restricted around cities and coastal area. In our country it is grown in areas viz., Karnataka, Kerala, Tamilnadu, Andhra Pradesh, and Maharashtra. Little gourd is originated from India. It is also known as *Coccinia*, ivy gourd, 'tondali' in Marathi. It is under utilized cucurbitaceous perennial vegetable crop having chromosome number  $2n = 24$ . It is an aggressive climbing vine that spread quickly over trees, shrubs, fences and other supporting structures. Little gourd is dioecious in nature and having parthenocarpic fruit development. The leaves are arranged in alternate fashion. The flower is solitary, large and white contain five long tubular petals. Botanically, the fruit is pepo, which is oval or slender in shape with light or dark green in colour when raw, but attain a red tinge when they ripe (Anon., 2013).

*Coccina* is rich in various nutrients like protein, fat, carbohydrate, fiber vitamin A, thiamin, riboflavin, niacin, ascorbic acid, calcium, and phosphorus (Anon., 2013). Fruits are used in the preparation of salad, pickle etc. Medicinally this vegetable gaining importance among diabetic patients as it contains  $\beta$ -carotene (Anon., 2013).

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Among vegetables grown in the Konkan region, little gourd is considered as one among major economically viable vegetable crops. It is widely cultivated in kitchen garden. Specifically, in Thane, Palghar and Raigad districts, the crop is cultivated on large scale and it has become the main source of income for many families. In Ratnagiri district, the crop is cultivated on small scale and in Sindhudurg district; the crop is cultivated on home scale.

The crop is attacked by number of pests such as fruit fly (*Bactrocera cucurbitae* Coq.), aphid (*Aphis gossypii* Glover), white fly, mealy bug and leaf miners, but among these fruit fly causes serious infestation that leads to reduction in healthy fruits and ultimately decrease in yield of little gourd. A compendium of thirty three insect pests of cucurbitaceous crops in India was given by Lal (1975). Singh (1966) stated that more than 50 per cent of fruits were either partially or fully damaged by fruit fly

## Material and methods

A field experiment was conducted during August 2015 to February 2016 at Hi-tech Farm, Department of Horticulture, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli. to study 'Efficacy of different lures against fruit fly (*Bactrocera cucurbitae* Coq.) infesting little gourd (*Coccina indica* L.)'. Experiment was

conducted with local cultivar of little gourd in randomized block design with nine treatments and three replications.

#### Treatment Details:

| Treatment No.  | Treatments                          |
|----------------|-------------------------------------|
| T <sub>1</sub> | Methyl eugenol 3 ml                 |
| T <sub>2</sub> | Cue lure 3 ml                       |
| T <sub>3</sub> | Methyl eugenol 2 ml + Cue lure 1 ml |
| T <sub>4</sub> | Methyl eugenol 1 ml + Cue lure 2 ml |
| T <sub>5</sub> | Methyl eugenol 2 ml                 |
| T <sub>6</sub> | Cue lure 2 ml                       |
| T <sub>7</sub> | Methyl eugenol 3 ml + Cue lure 3 ml |

#### Methodology

The fruit fly traps developed by Ameya Agency, Pune were used to conduct the experiment. The treatment wise lure/mixture of lures was impregnated to cotton wad. Such lure impregnated cotton wad was kept in the trap. This trap was hanged on trailing system used for growing *Coccina* at 2 m height. The distance of 10 m between two treatments and 50 m between two replications was maintained during experiment. The traps were recharged subsequently at 15 day interval. The experiment on management of fruit fly by using lures was conducted during August 2015 to February 2016.

#### Method of recording observations

From the date of installation of traps, the fruit flies trapped in each trap were collected weekly in small plastic bottles and labeled with treatment and date of collection. The flies specimen collected were firstly dried under the electric bulb treatment wise separately. The efficacy of traps judged on the basis of total number of fruit flies trapped in each trap irrespective of species. Data thus obtained was statistically analyzed and presented.

### Result and discussion

The weekly catch of the fruit flies was recorded and data thus obtained of 26 week was analyzed statistically presented in table-1 and depicted in fig. 1.

The data of first week (table-1) showed that, the maximum fruit flies (478.00 flies) were trapped in the treatment T<sub>6</sub> i.e. cue lure 2 ml and was significantly superior over all other treatments and at par with T<sub>2</sub>-cue lure 3 ml (472.33flies) and maximum number of fruit flies and all these treatments were significantly superior over all other treatments and at par with each other. Data recorded on number of fruit flies trapped in third week revealed that the treatments T<sub>7</sub>, T<sub>6</sub>, T<sub>4</sub> and T<sub>2</sub> trapped maximum number of fruit flies which were (148.00), (105.67), (77.67) and (91.00) respectively and all these

treatments were significantly superior over rest of the other treatments and at par with each other. The treatments T<sub>2</sub>, T<sub>4</sub>, T<sub>6</sub> and T<sub>3</sub> trapped maximum of (112.67), (87.67), (85.33) and (47.33) fruit flies respectively in 4<sup>th</sup> week and found to the best treatments in trapping fruit flies infesting little gourd. All these treatments were significantly superior over rest of the treatments but at par with each other. The data of fruit flies trapped in fifth week revealed that the treatment T<sub>2</sub>-cue lure 3ml (39.00) trapped maximum number of fruit flies and found to be best treatments and was at par with T<sub>6</sub>-cue lure 2ml (41.00), In sixth week it was noticed that the maximum fruit flies were trapped in the traps charged with T<sub>2</sub>-cue lure 3ml alone (89.00 flies). The fruit flies captured in traps in seventh week revealed that the significantly maximum fruit flies captured in traps charged with the treatment T<sub>7</sub>-methyl eugenol 3 ml + cue lure 3 ml (84.00) which was at par with T<sub>2</sub>-cue lure 3ml (94.67). The observations recorded in eighth week indicated that the treatment T<sub>1</sub> methyl eugenol 3 ml (53.33 flies) showed significantly superior treatment by capturing maximum number of fruit flies followed by T<sub>7</sub>-methyl eugenol 3ml + cue lure 3ml (39.00 flies,) and tother treatments were at par with each other. The data presented in table 1 of ninth week clearly indicated that the significantly maximum fruit flies were trapped in treatment T<sub>7</sub>-methyl eugenol 3 ml + cue lure 3 ml (63.33 flies) followed T<sub>6</sub>-cue lure 2 ml (56.00), T<sub>2</sub>-cue lure 3 ml (33.33) and T<sub>4</sub>-methyl eugenol 1ml + cue lure 2 ml (32.67) and all these treatments were at par with each other.

The results of the fruit flies trapped in 10<sup>th</sup> week indicated that significantly highest number were in the treatment T<sub>7</sub>-methyl eugenol 3ml + cue lure 3ml (60.00) followed by T<sub>2</sub>-cue lure 3ml (40.33) and both the treatments were at par with each other. In eleventh week the maximum of 41.00 fruit flies were trapped in the treatment T<sub>7</sub>-methyl eugenol 3ml + cue lure 3ml and the treatment was significantly superior over rest of the

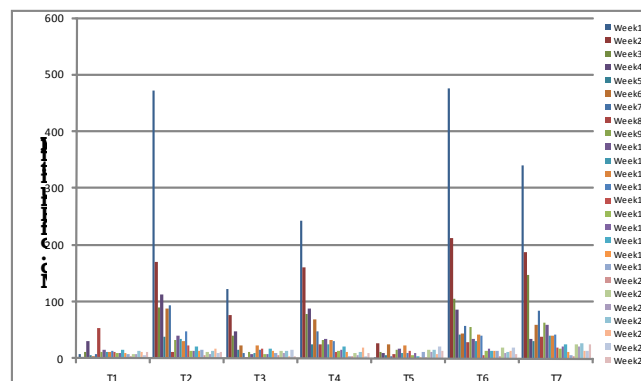


Fig. 1: Effect of methyl eugenol and cue lure in trapping fruit fly

**Table 1.1:** Effect of Average population of fruit fly per week methyl eugenol and cue lure in trapping fruit fly.

| Tr. No.        | Treatment combination (ml) |          | Average population of fruit fly per week |                   |                   |                   |                 |                 |                 |                 |                 |                 |
|----------------|----------------------------|----------|--|-------------------|-------------------|-------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                | Methyl eugenol             | Cue-lure | 1 Week                                   | 2 Week            | 3 Week            | 4 Week            | 5 Week          | 6 Week          | 7 Week          | 8 Week          | 9 Week          | 10 Week         |
| T <sub>1</sub> | 3                          | 0        | 6.67<br>(2.63)                           | 2.00<br>(1.66)    | 12.33<br>(3.28)   | 31.33<br>(5.15)   | 5.33<br>(2.32)  | 3.33<br>(2.04)  | 8.00<br>(2.56)  | 53.33<br>(7.35) | 12.00<br>(3.21) | 16.00<br>(4.10) |
| T <sub>2</sub> | 0                          | 3        | 472.33<br>(21.75)                        | 169.67<br>(12.60) | 91.00<br>(7.67)   | 112.67<br>(10.11) | 39.00<br>(5.71) | 89.00<br>(9.31) | 94.67<br>(8.60) | 11.00<br>(3.39) | 33.33<br>(5.82) | 40.33<br>(6.40) |
| T <sub>3</sub> | 2                          | 1        | 121.33<br>(10.39)                        | 76.33<br>(8.64)   | 39.67<br>(5.49)   | 47.33<br>(6.46)   | 16.00<br>(3.79) | 22.33<br>(4.82) | 8.67<br>(2.80)  | 2.67<br>(1.91)  | 12.00<br>(3.21) | 7.67<br>(2.69)  |
| T <sub>4</sub> | 1                          | 2        | 243.33<br>(15.57)                        | 161.67<br>(12.48) | 77.67<br>(8.84)   | 87.67<br>(9.08)   | 24.33<br>(4.42) | 69.33<br>(8.26) | 48.33<br>(5.85) | 25.33<br>(4.78) | 32.67<br>(5.67) | 35.33<br>(6.01) |
| T <sub>5</sub> | 2                          | 0        | 1.00<br>(1.38)                           | 26.67<br>(5.23)   | 10.67<br>(3.05)   | 9.33<br>(3.18)    | 6.33<br>(2.56)  | 24.67<br>(4.32) | 4.00<br>(2.19)  | 7.67<br>(2.94)  | 16.00<br>(4.00) | 17.67<br>(4.23) |
| T <sub>6</sub> | 0                          | 2        | 478.00<br>(21.88)                        | 212.33<br>(14.57) | 105.67<br>(10.06) | 85.33<br>(8.90)   | 41.33<br>(5.54) | 44.67<br>(6.60) | 57.00<br>(7.21) | 28.00<br>(5.32) | 56.00<br>(7.51) | 33.67<br>(5.86) |
| T <sub>7</sub> | 3                          | 3        | 341.67<br>(18.50)                        | 188.33<br>(13.71) | 148.00<br>(12.11) | 35.00<br>(5.79)   | 30.00<br>(5.05) | 59.67<br>(7.77) | 84.00<br>(9.17) | 39.00<br>(6.28) | 63.33<br>(8.00) | 60.00<br>(7.80) |
| S.Em.±         |                            |          | 1.10                                     | 1.38              | 1.88              | 1.24              | 0.87            | 1.11            | 1.08            | 0.67            | 0.81            | 0.53            |
| CD (p=0.05)    |                            |          | 3.40                                     | 4.24              | 5.78              | 3.81              | 2.68            | 3.41            | 3.34            | 2.08            | 2.50            | 1.64            |

(Figures in the parenthesis are transformed  $\sqrt{x+1}$ )**Table 1.2:** Effect of Average population of fruit fly per week methyl eugenol and cue lure in trapping fruit fly.

| Tr. No.        | Treatment combination (ml) |          | Average population of fruit fly per week |                 |                 |                 |                 |                 |                 |                 |                 |                |
|----------------|----------------------------|----------|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|
|                | Methyl eugenol             | Cue-lure | 11 Week                                  | 12 Week         | 13 Week         | 14 Week         | 15 Week         | 16 Week         | 17 Week         | 18 Week         | 19 Week         | 20 Week        |
| T <sub>1</sub> | 3                          | 0        | 11.00<br>(3.45)                          | 11.33<br>(3.49) | 14.00<br>(3.85) | 11.33<br>(3.49) | 8.67<br>(3.09)  | 9.00<br>(3.13)  | 16.00<br>(7.06) | 9.33<br>(3.18)  | 7.00<br>(2.58)  | 2.24<br>(2.49) |
| T <sub>2</sub> | 0                          | 3        | 34.00<br>(5.90)                          | 31.00<br>(5.61) | 48.67<br>(6.96) | 22.67<br>(4.75) | 13.33<br>(3.68) | 13.33<br>(3.76) | 21.67<br>(8.90) | 14.33<br>(3.87) | 14.67<br>(3.82) | 4.47<br>(3.60) |
| T <sub>3</sub> | 2                          | 1        | 10.00<br>(2.99)                          | 22.33<br>(4.82) | 15.67<br>(3.63) | 17.67<br>(4.14) | 7.67<br>(2.90)  | 8.00<br>(2.95)  | 16.33<br>(7.15) | 13.00<br>(3.39) | 8.67<br>(3.02)  | 4.00<br>(3.74) |
| T <sub>4</sub> | 1                          | 2        | 24.67<br>(4.83)                          | 33.33<br>(5.74) | 31.00<br>(5.58) | 11.00<br>(3.12) | 14.00<br>(3.68) | 15.00<br>(3.97) | 21.33<br>(8.86) | 12.33<br>(3.31) | 4.33<br>(2.13)  | 2.83<br>(3.01) |
| T <sub>5</sub> | 2                          | 0        | 9.67<br>(3.20)                           | 23.33<br>(4.90) | 10.33<br>(3.36) | 13.00<br>(3.50) | 6.33<br>(2.46)  | 9.33<br>(3.20)  | 4.33<br>(2.52)  | 2.33<br>(1.73)  | 12.33<br>(3.61) | 1.00<br>(2.05) |
| T <sub>6</sub> | 0                          | 2        | 30.67<br>(5.45)                          | 41.33<br>(6.46) | 41.00<br>(6.38) | 5.33<br>(2.40)  | 13.00<br>(3.19) | 17.67<br>(4.30) | 13.67<br>(5.98) | 13.67<br>(3.63) | 13.33<br>(3.43) | 3.61<br>(4.00) |
| T <sub>7</sub> | 3                          | 3        | 41.00<br>(6.44)                          | 40.33<br>(5.56) | 43.00<br>(6.59) | 19.33<br>(4.50) | 17.33<br>(3.09) | 21.33<br>(4.71) | 24.00<br>(9.68) | 10.67<br>(3.28) | 5.00<br>(2.23)  | 3.16<br>(3.17) |
| S.Em.±         |                            |          | 0.75                                     | 0.51            | 0.76            | 0.42            | 0.48            | 0.32            | 0.53            | 0.35            | 0.45            | 0.51           |
| CD (p=0.05)    |                            |          | 2.32                                     | 1.59            | 2.35            | 1.29            | NS              | 1.00            | NS              | 1.09            | NS              | NS             |

(Figures in the parenthesis are transformed  $\sqrt{x+1}$ )

treatments except the treatments T<sub>2</sub>, T<sub>6</sub>, and T<sub>4</sub>, which recorded an average of 34.00, 30.67 and 24.67 fruit flies respectively and all these treatments were at par with each other. The observations on trapping fruit flies in twelfth week revealed that the maximum fruit flies (41.33

flies) were trapped in T<sub>6</sub>- cue lure 2ml and minimum T<sub>1</sub> methyl eugenol 3ml. The observations recorded in thirteenth week clearly indicated that the treatment T<sub>2</sub>- cue lure 3ml (48.67 flies) was observed to be the most effective and recorded significantly more fruit flies than

**Table 1.3:** Effect of Average population of fruit fly per week methyl eugenol and cue lure in trapping fruit fly.

| Tr. No.        | Treatment combination (ml) |          | Average population of fruit fly per week |                 |                 |                 |                 |                 |
|----------------|----------------------------|----------|--|-----------------|-----------------|-----------------|-----------------|-----------------|
|                | Methyl eugenol             | Cue-lure | 21 Week                                  | 22 Week         | 23 Week         | 24 Week         | 25 Week         | 26 Week         |
| T <sub>1</sub> | 3                          | 0        | 8.33<br>(3.02)                           | 8.00<br>(3.22)  | 12.67<br>(3.31) | 10.67<br>(3.37) | 6.33<br>2.48    | 11.33<br>(3.32) |
| T <sub>2</sub> | 0                          | 3        | 11.00<br>(3.12)                          | 7.67<br>(2.86)  | 13.67<br>(3.63) | 17.67<br>(4.31) | 9.00<br>(3.05)  | 10.67<br>(3.07) |
| T <sub>3</sub> | 2                          | 1        | 13.00<br>3.67                            | 9.67<br>(2.67)  | 12.67<br>(3.31) | 4.00<br>(2.05)  | 15.67<br>(3.86) | 3.67<br>(2.03)  |
| T <sub>4</sub> | 1                          | 2        | 10.00<br>(2.99)                          | 6.67<br>(3.26)  | 12.33<br>(3.27) | 19.67<br>(4.20) | 4.67<br>(2.20)  | 10.33<br>(3.14) |
| T <sub>5</sub> | 2                          | 0        | 15.67<br>(4.06)                          | 12.33<br>(2.61) | 15.00<br>(3.93) | 8.33<br>(2.37)  | 21.33<br>(4.69) | 14.33<br>(3.42) |
| T <sub>6</sub> | 0                          | 2        | 19.33<br>(4.48)                          | 9.67<br>(3.43)  | 10.67<br>(3.09) | 12.67<br>(3.58) | 18.67<br>(4.31) | 7.33<br>(2.71)  |
| T <sub>7</sub> | 3                          | 3        | 24.00<br>(4.96)                          | 22.00<br>(4.76) | 26.00<br>(5.17) | 14.33<br>(3.83) | 12.67<br>(3.41) | 24.67<br>(5.06) |
| S.Em.±         |                            |          | 0.70                                     | 0.65            | 0.99            | 0.54            | 0.81            | 0.91            |
| CD (p=0.05)    |                            |          | NS                                       | NS              | NS              | NS              | NS              | NS              |

(Figures in the parenthesis are transformed  $\sqrt{x+1}$ )

all other treatments.

### Treatments

The significantly maximum fruit flies were trapped in the treatment T<sub>2</sub> - cue lure 3ml (22.67 flies) all these treatments were significantly superior over rest of the treatments but at par with each other. In fifteenth week the numbers of fruit flies trapped in different treatments were in the range of 6.33 to 17.33 and the results are non-significant. The results of the sixteenth week revealed that the maximum of 21.33 fruit flies were trapped in the treatment T<sub>7</sub> -methyl eugenol 3ml + cue lure 3ml followed by T<sub>7</sub> -methyl eugenol 3ml + cue lure 3ml (17.67), T<sub>4</sub> - cue lure 3ml (15.00) and T<sub>2</sub> - cue lure 3ml (13.33) and all these treatments were significantly superior over rest of the treatments and at par with each other. The numbers of fruit flies trapped in different treatments during seventeenth week were in the range of 4.33 to 24.00 but the results are non-significant. The observation recorded in eighteen week observed that the treatment T<sub>2</sub>- cue lure 3ml (14.33) was found to be significantly superior treatment followed by T<sub>6</sub>-cue lure 2ml (13.67) and other treatments were at par with each other. The fruit fly catch in different treatments during 19<sup>th</sup> to 26<sup>th</sup> week showed non-significant results. In 19<sup>th</sup> week catch was in the range of 4.33 to 14.67, in 20<sup>th</sup> week it was between 1.00 to 4.00, during 21<sup>st</sup> week it was 8.33 to 24.00, during 22<sup>nd</sup> week it was 6.67 to 22.00, in 23<sup>rd</sup> week it was 10.67

to 26.00, in 24<sup>th</sup> week it was 4.00 to 14.33, in 25<sup>th</sup> week it was 6.33 to 21.33 and in 26<sup>th</sup> week it was in the range of 3.67 to 24.67. During these weeks the catch was low because of the continuous catching of the fruit flies in the previous period. The continuous catching of fruit flies in the orchard reduced the fruit fly infestation and it can be concluded that for the eco-friendly management of fruit fly, the installation of the pheromone traps in the orchard is recommended. The treatment wise total number of fruit flies trapped in 26 weeks is given in table 2. From the table it can be seen that the cue lure 3 ml and 2 ml trapped maximum (1440.82 and 1413.62 respectively) number of fruit flies followed by the mixture of both (3 ml methyl eugenol and 3 ml cue lure) during the course of investigation. It is

therefore concluded that the cue lure is the best lure for trapping fruit flies infesting little gourd.

**Table 2:** Total number of fruit flies trapped in different treatments

| Tr. No.        | Lure quantity (ml)/trap |          | Total fruit flies trapped in 26 weeks |
|----------------|-------------------------|----------|---------------------------------------|
|                | Methyl eugenol          | Cue-lure |                                       |
| T <sub>1</sub> | 3                       | 0        | 307.55                                |
| T <sub>2</sub> | 0                       | 3        | 1440.82                               |
| T <sub>3</sub> | 2                       | 1        | 536.02                                |
| T <sub>4</sub> | 1                       | 2        | 1039.15                               |
| T <sub>5</sub> | 2                       | 0        | 302.98                                |
| T <sub>6</sub> | 0                       | 2        | 1413.62                               |
| T <sub>7</sub> | 3                       | 3        | 1397.82                               |

The results of the earlier workers confirm the results of the present investigation. Verghese *et al.* (2005) reported that *B. dorsalis*, *B. correcta*, *B. zonata*, *B. verbascifoliae* were attracted to 1 per cent methyl eugenol whereas *B. cucurbitae* attracted to 1 per cent cue lure. Sawai (2013) observed that *B. tau* was the predominant and contributed 34.68 per cent flies trapped followed by *B. cucurbitae* (32.19), *B. caryae* (27.06%), *B. caudata* (2.02%), *B. gavisia* (0.31%) and non tephritids contributed 3.73 per cent in Sindhudurg district when the traps were baited with cue lure.

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