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# Evaluate different mulches for management of okra flea beetle (*Podagrica bowringi*) Baly

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**ABSTRACT**

*The research was conducted on evaluate different mulches for management of okra flea beetle (Podagrica bowringi) Baly at Agronomy farm, College of Agriculture, Dapoli during kharif 2017. The observations recorded at 1st week after first soil application indicated that the treatment ($M_3$) black polythene mulch (7.17) was found to be effective treatment. At 2nd week, ($M_3$) black polythene mulch treatment recorded (6.97 shot holes/three leaves/plant). At 3rd week the treatment ($M_3$) black polythene mulch was found to be the effective treatment which recorded 7.17 shot holes/3 leaves/ plant. At 1st week after second soil application indicated that the treatment black polythene mulch ($M_3$) was found to be effective treatment (8.70 shot holes per three leaves per plant). At 2nd week, minimum numbers of shot holes were recorded in the treatment ($M_3$) black polythene mulch (9.50 shot holes/3 leaves/ plant). At 3rd week revealed that ($M_3$) black polythene mulch, ($M_2$) silver polythene mulch and ($M_1$) transparent polythene mulch recorded 8.60, 9.77 and 10.11 shot holes per three leaves per plant, respectively and all these treatments were at par with each other. There was same trends observed during third soil application.*

***Key words:*** *Mulches, Podagrica bowringi, Flea beetle, transparent mulch, Silver mulch, Black mulch etc.*

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## INTRODUCTION

Vegetables form the most important component of our balanced diet. They are also considered as "Protective food" as they contain vitamins, minerals and dietary fibers apart from proteins, lipids, and carbohydrates of biological value. The plant is rich in minerals, carbohydrates, fibers, protein, fat and phenols [7].

In India, okra is grown over an area of 0.529 M ha with a production of 61.51 lakh MT and productivity is 12.1 tonnes/ha [3]. It contributes 5.8 per cent of the total vegetable area and 3.9 per cent of total countries vegetable production. In Maharashtra, area under this crop is 0.011 M ha with a production of 0.84 lakh MT and productivity is 8.01 tonnes/ha [2].

Okra flea beetle, *Podagrica bowringi* Baly has been noticed during *kharif* season on okra causing serious damage to the crop. The adult beetles initially attack tender leaves of okra by making number of shot hole injuries, which later on widen significantly during advanced stage of the crop growth. The activity of pest is also noticed on flowers and flower buds. The grubs are found in soil feeding on root system of crop causing relatively low damage. Due to overall infestation of flea beetle, reduction in vigour of crop, loss of functional leaf area and poor yield of crop have been reported by many farmers and extension agencies working in the area. Defoliation due to infestations has been reported to be up to 80 per cent and severity of damage varies in different places [6, 4]. Among the cultural practices, mulches are used to control pest, diseases, weeds and maintaining soil moisture. The benefits and importance of mulching in modern agriculture respective to the type of material used have been stressed by many authors [1]. The present studies has opened a new way to the farmers to increase the cultivation of okra in the Konkan region with the help of mulches to maximize the production free from flea beetle infestation and at the same time to minimize the residual toxicity of hazardous insecticides.

## MATERIALS AND METHODS

### Experimental Details

| | | |
|---|---|---|
| **Location** | **:** | Department of Agronomy farm, College of Agriculture, Dapoli |
| **Crop** | **:** | Okra |
| **Variety** | **:** | Varsha Uphar |
| **Season** | **:** | *Kharif 2017* |
| **Design** | **:** | Split Plot Design |
| **Replication** | **:** | Three |
| **Main plot size** | **:** | 7.2 m x 4.8 m (34.56 $m^2$) |
| **Sub plot size** | **:** | 2.4 m x 2.4 m (5.76 m2) |
| **Spacing** | **:** | 60 cm X 60 cm |
| **Total experimental area** | **:** | 453.12 $m^2$ |
| **Treatments** | **:** | |
| **A. Main Plots Treatments** | **:** | $M_1$: Transparent polythene mulch |
| | **:** | $M_2$: Silver polythene mulch |
| | **:** | $M_3$: Black polythene mulch |
| | **:** | $M_4$: No mulch (Control) |
| | | |
| **B. Sub plots Treatment** | **:** | $T_1$ : *Verticilium lecanii* 10 g $l^{-1}$ |
| | **:** | $T_2$ : *Beauveria bassiana* 10 g $l^{-1}$ |
| | **:** | $T_3$ : *Metarrhizium anisopliae* 10 g $l^{-1}$ |
| | **:** | $T_4$ : Neem cake 695 Kg/ha (400 g/plot) |
| | **:** | $T_5$ : Cypermethrin dust 35 Kg/ha (20 g/plot) |
| | **:** | $T_6$ : Control |

The first soil application was done after initiation of the pest. Second application was done 21 days after first soil application and third soil application was done 21 days after second soil application.

### Method of recoding observation

Five plants were selected randomly to record the observations on the incidence of okra flea beetle. The shot holes made by flea beetle were counted from top, middle and bottom leaf of the plant. The observations were recorded at weekly interval till the harvesting of crop. The observations on the number of shot holes per three leaves per plant was recorded prior to and 1st, 2nd and 3rd week after soil application. The data on number of shot holes per leaf was converted into square root transformation and analyzed statistically.

## RESULTS AND DISCUSSION

### Effect of mulches on okra flea beetle *Podagrica bowringi* after first soil application

Data on numbers of shot holes of okra flea beetle *P. bowringi* per three leaves per plant at 1st 2nd and 3rd week after first soil application is presented in Table 1.

The numbers of shot holes of okra flea beetle per three leaves per plant prior to soil application as main plot treatments was ranged from 2.61 to 4.18. The difference among the treatments was non-significant, indicating uniform damage.

The observations recorded at 1st week after first soil application indicated that the treatment black polythene mulch ($M_3$) was found to be effective treatment which recorded 7.17 shot holes per three leaves per plant which was at par with the treatment silver polythene mulch ($M_2$) which recorded 8.96 shot holes per three leaves per plant. The next best treatments were ($M_1$) transparent polythene mulch and ($M_4$) no mulch which recorded 12.50 and 12.65 shot holes per three leaves per plant, respectively and were at par with each other.

At 2nd week after first soil application, minimum numbers of shot holes were recorded in the treatment ($M_3$) black polythene mulch (6.97 shot holes/three leaves/plant) which was at par with the treatment ($M_2$) silver polythene mulch (8.39). The remaining treatments transparent polythene mulch ($M_1$) and no mulch ($M_4$) recorded 11.75 and 12.39 shot holes per three leaves per plant, respectively.

The data at 3rd week after first soil application revealed that the treatment ($M_3$) black polythene mulch was found to be the effective treatment which recorded 7.17 shot holes per three leaves per plant and the treatment ($M_2$) silver polythene mulch recorded 8.75 shot holes per three leaves per plant and both these treatments were at par with each other. The next best treatment was ($M_2$) silver polythene mulch which

recorded 9.74 shot holes/three leaves/plant and the treatment was significantly superior over no mulch. The maximum (12.30) shot holes were observed in treatments ($M_4$) no mulch.

**Effect of mulches on okra flea beetle *Podagrica bowringi* after second soil application**

Data on numbers of shot holes of okra flea beetle per three leaves per plant at 1st, 2nd and 3rd week after second soil application is presented in Table 2.

The numbers of shot holes of okra flea beetle per three leaves per plant prior to second soil application as main plot treatments was ranged from 7.41 to 12.79. The treatment black polythene mulch ($M_3$) was found to be effective treatment which recorded 7.41 shot holes per three leaves per plant and was at par with the treatments ($M_2$) silver polythene mulch and ($M_1$) transparent polythene mulch which recorded 8.96 and 9.54 shot holes per three leaves per plant, respectively. The maximum (12.79) shot holes were observed in treatments ($M_4$) no mulch.

The observations recorded at 1st week after second soil application indicated that the treatment black polythene mulch ($M_3$) was found to be effective treatment by recording 8.70 shot holes per three leaves per plant and was at par with the treatment ($M_2$) silver polythene mulch and ($M_1$) transparent polythene mulch which recorded 9.73 and 10.25 shot holes per three leaves per plant, respectively. The maximum (13.77) shot holes were observed in the treatment ($M_4$) no mulch.

At 2nd week after second soil application, minimum numbers of shot holes were recorded in the treatment ($M_3$) black polythene mulch (9.50 shot holes/three leaves/plant) and the treatment was at par with ($M_2$) silver polythene mulch (10.42) and ($M_1$) transparent polythene mulch (10.88). The highest numbers of shot holes (14.44) were observed in the treatment ($M_4$) no mulch.

The data at 3rd week after second soil application revealed that the treatment ($M_3$) black polythene mulch, ($M_2$) silver polythene mulch and treatment ($M_1$) transparent polythene mulch recorded 8.60, 9.77 and 10.11 shot holes per three leaves per plant, respectively and all these treatments were at par with each other. The maximum (13.62) shot holes were observed in treatment ($M_4$) no mulch.

**Effect of mulches on okra flea beetle *Podagrica bowringi* after third soil application**

Data on numbers of shot holes of okra flea beetle per three leaves per plant at 1st, 2nd and 3rd week after third soil application is presented in Table 3.

The numbers of shot holes of okra flea beetle per three leaves per plant prior to third soil application as main plot treatments was ranged from 8.64 to 13.48. The treatment black polythene mulch ($M_3$) was found to be effective treatment by recording 8.64 shot holes per three leaves per plant and was at par with the treatment ($M_2$) silver polythene mulch and ($M_1$) transparent polythene mulch which recorded 9.72 and 9.96 shot holes per three leaves per plant, respectively. The maximum (13.48) shot holes were observed in the treatment ($M_4$) no mulch.

The observations recorded at 1st week after third soil application indicated that the treatment black polythene mulch ($M_3$) was found to be the effective treatment by recording 8.29 shot holes per three leaves per plant and was at par with the treatments ($M_2$) silver polythene mulch and ($M_1$) transparent polythene mulch which recorded 9.39 and 9.63 shot holes per three leaves per plant, respectively. The maximum (13.15) shot holes were observed in the treatment ($M_4$) no mulch.

At 2nd week after third soil application, minimum numbers of shot holes were recorded in the treatment ($M_3$) black polythene mulch (7.62 shot holes/three leaves/plant) which was at par with the treatment ($M_2$) silver polythene mulch (8.70) and treatment ($M_1$) transparent polythene mulch (8.90). The highest numbers of shot holes (12.49) were observed in the treatment ($M_4$) no mulch.

The data at 3rd week after third soil application revealed that the treatment ($M_3$) black polythene mulch, treatment ($M_2$) silver polythene mulch and treatment ($M_1$) transparent polythene mulch recorded 7.17, 8.19 and 8.34 shot holes per three leaves per plant, respectively and all these treatments were at par with each other. The maximum (12.12) shot holes were observed in treatment ($M_4$) no mulch.

The present findings are more or less in conformity with the findings of Necibi *et al*. [8]. They examined the effects of black plastic mulch on the soil and plant distributions of immature and adult cucumber beetles. The black plastic mulch significantly reduced the number of beetle eggs and larvae found within top 5 cm soil around plants.

Demirel and Cranshaw [5] reported that the black mulch had the lowest number of western black flea beetle (WBFB) in 3 years of sampling. The highest number of WBFB were observed in the late day (4 p.m.) counting in 1999, whereas none of the treatments resulted in significant differences among early, mid, and late day counts in 2000 and in 2002.

Ossom and Matsenjwa [9] reported that mulches such as straw and clear plastic showed higher pest infestation than black, yellow, and control in bean.

**Table 1: Effect of mulches on okra flea beetle, *Podagrica bowringi* after first soil application**

| Treatments | No. of shot holes/three leaves/plant | | | |
|---|---|---|---|---|
| | Pre count | 1st WASA | 2nd WASA | 3rd WASA |
| **Main plot: Polythene mulch** | | | | |
| **M1:** Transparent polythene mulch | 2.94 (1.72)* | 12.50 (3.54) | 11.75 (3.43) | 9.74 (3.12) |
| **M2:** Silver polythene mulch | 2.61 (1.62) | 8.96 (2.99) | 8.39 (2.90) | 8.75 (2.96) |
| **M3:** Black polythene mulch | 4.07 (2.02) | 7.17 (2.68) | 6.97 (2.64) | 7.17 (2.68) |
| **M4:** No mulch | 4.18 (2.04) | 12.65 (3.56) | 12.39 (3.52) | 12.30 (3.51) |
| F test | NS | Sig. | Sig. | Sig. |
| S.E. ± | **0.22** | **0.12** | **0.15** | **0.11** |
| C.D. at 5% | **-** | **0.41** | **0.53** | **0.37** |

*Figures in parentheses are $\sqrt{n}$ transformed values.
WASA – Weeks after soil application.

**Table 2: Effect of mulches on okra flea beetle, *Podagrica bowringi* after second soil application**

| Treatments | No. of shot holes/three leaves/plant | | | |
|---|---|---|---|---|
| | Pre count | 1st WASA | 2nd WASA | 3rd WASA |
| **Main plot: Polythene mulch** | | | | |
| **M1:** Transparent polythene mulch | 9.54 (3.09)* | 10.25 (3.20) | 10.88 (3.30) | 10.11 (3.18) |
| **M2:** Silver polythene mulch | 8.96 (2.99) | 9.73 (3.12) | 10.42 (3.23) | 9.77 (3.13) |
| **M3:** Black polythene mulch | 7.41 (2.72) | 8.70 (2.95) | 9.50 (3.08) | 8.60 (2.93) |
| **M4:** No mulch | 12.79 (3.58) | 13.77 (3.71) | 14.44 (3.80) | 13.62 (3.69) |
| F test | Sig. | Sig. | Sig. | Sig. |
| S.E. ± | **0.13** | **0.10** | **0.10** | **0.09** |
| C.D. at 5% | **0.45** | **0.36** | **0.34** | **0.30** |

*Figures in parentheses are $\sqrt{n}$ transformed values.
WASA – Weeks after soil application.

**Table 3: Effect of mulches on okra flea beetle, *Podagrica bowringi* after third soil application**

| Treatments | No. of shot holes/ three leaves/plant | | | |
|---|---|---|---|---|
| | Pre count | 1st WASA | 2nd WASA | 3rd WASA |
| **Main plot: Polythene mulch** | | | | |
| **M1:** Transparent polythene mulch | 9.96 (3.16)* | 9.63 (3.10) | 8.90 (2.98) | 8.34 (2.89) |
| **M2:** Silver polythene mulch | 9.72 (3.12) | 9.39 (3.06) | 8.70 (2.95) | 8.19 (2.86) |
| **M3:** Black polythene mulch | 8.64 (2.94) | 8.29 (2.88) | 7.62 (2.76) | 7.14 (2.67) |
| **M4:** No mulch | 13.48 (3.67) | 13.15 (3.63) | 12.49 (3.53) | 12.12 (3.48) |
| F test | Sig. | Sig. | Sig. | Sig. |
| S.E. ± | **0.10** | **0.10** | **0.11** | **0.12** |
| C.D. at 5% | **0.33** | **0.35** | **0.37** | **0.43** |

*Figures in parentheses are $\sqrt{n}$ transformed values.
WASA – Weeks after soil application.

## CONCLIUSION

From the present investigation it can be concluded that among the main plot treatments black polythene mulch was proved to be best for management of the okra flea beetle. The present studies has opened a new way to the farmers to increase the cultivation of okra in the region with the help of integration of mulches to maximize the production free from flea beetle infestation and at the same time to minimize the residual toxicity of hazardous insecticides.

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