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# MASS CULTURING OF CIGARETTE BEETLE, *Lasioderma serricorne*

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## ABSTRACT

The cigarette beetle, *Lasioderma serricorne* (Fabricius) is an omnivorous insect pest that feeds and breeds successfully on a variety of processed food commodities in storage. Development of the cigarette beetle is influenced greatly by the diet and the ability of the insect to utilize the diet. An experiment was conducted at Post Harvest Technology Centre, Bapatla to identify an effective and cheaper culture medium for rearing of cigarette beetle to ensure regular supply of different stages of test insect for conducting various experiments in the laboratory. Wheat and maize were used as base food material in combination with yeast and/or vitamin supplements. Both maize and wheat in combination with yeast + B- complex, resulted in higher number of adult emergence (1076.3 and 1026.3 respectively) when compared to wheat alone or maize alone as culture media indicating that maize or wheat in combination with yeast and vitamin mix can be used as food source for getting good supply of different stages of cigarette beetle.

**KEYWORDS:** Cigarette beetle, culture media, wheat, maize

## INTRODUCTION

The cigarette beetle, *Lasioderma serricorne* (Fabricius) (Coleoptera: Anobiidae) is ubiquitous of all stored-product insect pests as it occurs throughout the tropical and subtropical regions and in warm storage godowns of the temperate regions. It is known to feed and breed successfully on a variety of commodities during storage, processing and at the retail level. In addition to tobacco, these beetles infest various products such as castor beans (Chatterjii, 1963), coconut meal, mushrooms, pet feed (Gahukar, 1975), ginger, dried yeast, chilli powder, red pepper, paprika, turmeric (Ashworth, 1993), herbarium, insect museum, book binding (Kawamura, 2000), chocolates (Begum *et al.,* 2007), dried bee pollen (Julio *et al.,* 2013), cayenne pepper, opium and even pyrethrum powder (Mahroof and Phillips, 2015). Larval feeding causes most of the damage to stored commodities, while adults are known to cause damage by making holes to packages (Highland, 1991). Development of the cigarette beetle is influenced greatly by the diet and the ability of the insect to utilize the diet. Completion of the life cycle of *L. serricorne* required typically 18–20 d longer in tobacco (55 d) than in yeast (36 d) under similar conditions (Powell, 1931). Based on the time required for development and fresh body weights of cigarette beetles, Lecato, (1978) reported that cayenne pepper and paprika were the most favorable diets among the different spices tested.

For conducting various experiments on such an important omnivorous insect pest in laboratory, ensuring regular supply of different stages of test insect is very important. Imai and Harada (2009) maintained the cigarette beetle culture on yeast (10%) added corn flour while, Krishna and Bhargava (2009) mass cultured *L. serricorne* on a mixture of wheat flour and turmeric powder (4:1) to get a regular supply of different developmental stages of test insect for experiments. Chun (2008) reared cigarette beetle on the poultry diet composed ground corn and soybean meal. Thus, several researchers cultured cigarette beetles on various food sources. In view of this, an experiment was conducted at Post Harvest Technology Centre, Bapatla to identify an effective and cheaper culture medium for rearing of cigarette beetle.

## MATERIALS AND METHODS

Wheat and maize were used as base food material in this experiment in combination with yeast and/or vitamin supplements. Wheat and maize grains were obtained from the market and disinfested by fumigation with Aluminium phosphide (celphos 3 g) tablets @ 1 per half quintal for seven days to eliminate existing infestation, if any. Later, the grains were milled to make suji and their moisture content before the experiment was determined by gravimetric method. The sample was prepared in triplicate portions of 30 g and was oven-dried at 70°C. After

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achieving constant weight *i.e.*, ensuring that there is no moisture retained in the sample, the moisture content (w/w) was determined and found to be 14.23 per cent in wheat and 14.16 per cent in maize. Yeast was procured from the commercial bakery while B-complex vitamin capsules (Becosules[R]) were obtained from local pharmacy. Different compositions of media *viz;* wheat alone, wheat + yeast (5%), wheat + B-complex vitamin powder (60 µg/kg), wheat + yeast (5%) + B-complex vitamin powder (60 µg/kg), maize alone, maize + yeast (5%), maize + B-complex vitamin powder (60 µg/kg) and maize + yeast (5%) + B-complex vitamin powder (60 µg/kg) were tested for rearing cigarette beetles for two successive generations. Thus, seven different media were prepared by thoroughly mixing the ingredients and 100 g of each medium was taken separately in plastic jars of 250 ml capacity. Insect culture required for the experiment was obtained from infested turmeric rhizomes collected at store houses of Agricultural Market Committee yard, Duggirala, Guntur district, Andhra Pradesh. Sex of the pupae were determined based on the morphological differences of the genital papillae *i.e.,* globular in male and protuberant, three segmented and distinctly divergent in female (Halstead, 1963). Ample numbers of male and female pupae were kept in separate containers to obtain sufficient number of adults of both sexes required for the experiment. Five pairs of freshly emerged adult beetles were introduced into the culture medium and the jars were secured with perforated lids. These jars were maintained in the laboratory at 28 ± 2 °C and 70 per cent RH. The experiment was replicated thrice. Data on adult emergence was recorded at 40 and 100 days after release (DAR) of the insects and analysed statistically.

## RESULTS AND DISCUSSION

The highest number of adult emergence was recorded in maize + yeast + B- complex treatment (175.7) at 40 DAR followed by wheat + yeast + B- complex (156.3) which was significantly different from other treatments (Table 1). A progeny of 138.0 adults were recorded in maize + B- complex treatment which was on par with wheat + B- complex (137.3), maize + yeast (136.3) and wheat + yeast (132.0). The numbers of adults emerged from the culture media of wheat alone and maize alone were only 118.3 and 117.3, respectively. At 100 DAR, also similar trend was observed in emergence of cigarette beetle adults from different culture media. The highest number of adult emergence was observed in maize + yeast + B- complex treatment (900.7) which was on par with wheat + yeast + B- complex (847.0). A progeny of 608.7 adults was recorded in maize + B- complex treatment followed by maize + yeast (546.3), wheat + B- complex (518.7) which was on par with wheat + yeast (499.7). Wheat alone and maize alone as culture media resulted only in less number of adults (411.7 and 426.3 respectively). Overall, both wheat and maize in combination with yeast + B- complex resulted in higher number of adult emergence (1026.3 and 1076.3 respectively) when compared to wheat alone or maize alone as culture media which resulted in less number of adults (537.7 and 579.3 respectively).

The results are in conformity with Mahroof and Phillips (2015) who observed the highest fecundity (52.4 ± 4.8 eggs/female) and adult survival rate (91.0 ± 2.7%) of cigarette beetles on wheat flour at 28°C compared to tobacco and processed almonds. Ali *et al.* (1972) also reported that the development of the cigarette beetle varies greatly on its natural diets, as the insect requires certain balance between the main classes of nutrients, proteins, carbohydrates and fats, which differ widely in various diets. The pupal period, longevity and egg production are influenced by the ability of the insect to utilize protein. The ability of *L. serricorne* to utilize toxin-rich hosts as food may be correlated to its association with a yeast-like symbiont, *Symbiotaphrina kochii* which is transmitted to the next generation superficially on the eggs and carried internally in larvae and adults in the mycetome of the gut (Patric and Samuel, 1990). Broad spectrum detoxification abilities of these symbionts help the insect to utilize host materials which are rich in plant allelochemicals and convert these to nutrients and carbon sources (Shen and Dowd, 1991).

However, variation in the total number of adults emerged from different culture media tested show that larval and pupal development is influenced by the specific food source. Cornell and Hoveling, (1998) indicated that wheat flour is nutritionally rich in valuable proteins, complex carbohydrates, vitamins and minerals necessary for growth and development of *L. serricorne*, and wheat flour also lack the defensive chemicals present in other hosts. Apart from the anobiid specific symbionts, addition of yeast and vitamin mix also supplemented to the nutrition of the beetles and resulted in more number of insects in this experiment. Hence, maize or wheat in combination of yeast and vitamin mix can be used as food source for getting good supply of different stages of cigarette beetle.

**Table.1.** Adult emergence of cigarette beetle, ***L. serricorne*** **from different media**

| Treatment | Number of adults emerged | | |
|---|---|---|---|
| | **at 40 DAR** | **at 100 DAR** | **Total** |
| Wheat | 118.3 (10.87)$^{c}$ | 411.67 (20.26)$^{d}$ | 537.67 (22.99)$^{d}$ |
| Wheat + yeast @ 5% | 132.0 (11.48)$^{bc}$ | 499.67 (22.27)$^{bcd}$ | 614.33 (25.07)$^{bcd}$ |
| Wheat + B- complex @ 60 µg kg$^{-1}$ | 137.7 (11.71)$^{bc}$ | 518.67 (22.62)$^{bcd}$ | 646.33 (25.54)$^{bc}$ |
| Wheat + yeast @ 5% + B- complex @ 60 µg kg$^{-1}$ | 156.3 (12.50)$^{ab}$ | 847.00 (29.09)$^{a}$ | 1026.33 (31.67)$^{a}$ |
| Maize | 117.3 (10.83)$^{c}$ | 426.33 (20.62)$^{cd}$ | 579.33 (23.30)$^{cd}$ |
| Maize + Yeast @ 5% | 136.3 (11.65)$^{bc}$ | 546.33 (23.34)$^{bc}$ | 647.00 (26.11)$^{b}$ |
| Maize + B-complex @ 60 µg kg$^{-1}$ | 138.0 (11.73) $^{bc}$ | 608.67 (24.66)$^{b}$ | 725.00 (27.32)$^{b}$ |
| Maize+ Yeast @ 5%+ B- complex @ 60 µg kg$^{-1}$ | 175.7 (13.22)$^{a}$ | 900.67 (30.00)$^{a}$ | 1076.33 (32.79)$^{a}$ |
| **SEm ±** | **0.38** | **0.92** | **0.84** |
| **CD** | **1.13** | **2.77** | **2.51** |
| **CV %** | **5.54** | **6.63** | **5.41** |

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