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Acceleration of natural mounting process in the silkworm, *Bombyx mori* L by applying dust formulation of dried eucalyptus leaves

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Abstract

The results of the present study revealed the dust formulation prepared and tested to accelerate the mounting efficiency on two silkworm breeds viz., CSR₂×CSR₄ and PM×CSR₂ with three different base (carrier) materials viz., lime, saw dust and Kaolin did not showed much difference when compared to control. The findings of the study showed that percentage of larvae spun the cocoons on the mountages and percentage of good cocoons was improved but it was not found significant. Further, there was no negative effect on single cocoon weight, shell weight and shell percentage.

Keywords: *Bombyx mori* L, cocoon characters, dust formulations, hybrids, natural mounting

Introduction

Silkworm mounting process is a very short duration activity and maximum number of mandays to be engaged during this specific period and is realized to be bottleneck for expansion of the scale of the silkworm rearing. Thus, improvement in mounting process is indispensable for decreasing the labour requirement and reduction in input while improving the mounting efficiency. To save the time and labour different mounting methods are adopted by the farmers in India viz., Jobarai (Shoot shaking), self or natural mounting, pick up method of mounting. It is estimated that, by adopting Jobarai method 30-40% and by employing self-mounting method, 80-90% labour can be saved [1]. But, two methods of silkworm mounting viz., pick up method and self or natural mounting is very much popular among sericulture farmers [1]. For a long time it has been practice to pick mature larvae one by one and transfer them to the cocooning frames. This method is more effective because it is possible to select only the mature larvae for mounting. However, it needs a large labour force to carry out the work in a longer period. Sometimes it takes even 4-5 days depending on the scale of silkworm rearing. To get good quality cocoon, early and late mounting should be avoided and the mature silkworms should be mounted at appropriate time. Natural or self mounting is the most rational method of utilizing the negative geotaxis of the silkworm at the wandering stage, but the mounting rate is generally low, few larvae make the cocoons in the rearing bed itself, if mounting is delayed and high humidity and poor ventilation in the rearing bed affects the cocoon quality and reelability [5]. Such cocoons are of inferior in quality therefore fetch low price in the cocoon market leading to considerable economic loss to the farmers. To improve the efficiency of self mounting various insect repellents viz., cresol and saw dust of Hinoki cypress tried in Japan [2, 8] and lime, saw dust, kaolin and phytoecdysteroid [4] in India. Hence, the present experiment was undertaken with the objective to acceleration of natural mounting process in the silkworm, *Bombyx mori* L by applying dust formulations of dried eucalyptus leaves.

Materials and methods

Eucalyptus dried leaves in the form of dust formulation was prepared with three different base (carrier) materials viz., lime, saw dust and Kaolin. 450g eucalyptus leaves dried in hot air oven at 100 °C for 3 hours until all the moisture content were evaporated and grinded into fine powder with the help of mixer. 50g grinded powder was mixed with three different media of 50g each and were tested on bivoltine hybrid (CSR₂ × CSR₄) and 70g grinded powder was mixed with three different base material of 30g each tested on multi x bi hybrid (PM × CSR₂). For each treatment, three replications were maintained and for each replication 100 larvae were kept. When 4-5% larvae were ready for spinning, formulation was dust on rearing bed. The details of different treatments tested on CSR₂ x CSR₄ and PM x CSR₂ silkworm breeds are given below.

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CSR₂ × CSR₄

- T1-50g eucalyptus powder + 50g Kaolin @40g/100 larvae
 T2- 50g eucalyptus powder + 50g lime @40g/100 larvae
 T3- 50g eucalyptus powder + 50g saw dust @40g/100 larvae
 T4- Lime @50g/100 larvae (Media control)
 T5- Sawdust @50g/100 larvae (Media control)
 T6- Kaolin @50g/100 larvae (Media control)
 Control-(without dusting)

PM × CSR₂

- T1-70g eucalyptus powder + 30g Kaolin @40g/100 larvae
 T2-70g eucalyptus powder + 30g lime @40g/100 larvae
 T3- 70g eucalyptus powder + 30g saw dust @40g/100 larvae
 T4- Lime @30g/100 larvae (Media control)
 T5- Sawdust @30g/100 larvae (Media control)
 T6- Kaolin @30g/100 larvae (Media control)
 Control-(without dusting)

The data for different traits studied in the present investigation were collected and finally pooled in the form of overall mean values and the significance of variation between them was calculated by employing ANOVA using SPSS package (7.5) for Windows^[3] to ascertain the significance.

Results**CSR₂ × CSR₄ Silkworm breed****Percentage of larvae climbed on the mountages****0-18 h & 18-30 h**

On the percentage of larvae climbed on the mountages at 0-18h duration after applying dust formulations revealed improvement in the treated batches, but improvement was not reached significant level. However, highest value was recorded in T4 batches (29%), whereas, lowest value (25%) was observed in T2 & T5 and in control (Fig- 1). The date percentage of larvae climbed on the mountages after 18-30 h showed slight improvement in T2 batch (51%). However, the difference among the treatments and the control was not significant (Fig-1).

Percentage of larvae spun the cocoons in the rearing bed

Dusting of plant based repellent on percentage of larvae spun the cocoons in the rearing bed showed marginal reduction in T6 batch (10.2%) but the difference among the treatments and the controls was not reached significant level.

Percentage of larvae spun the cocoons on the mountages

Similar trend was observed for this trait also. The maximum improvement was recorded in T5 (89.5%) and minimum was observed in T1 (88.5%) (Fig- 1).

PM × CSR₂ Silkworm breed**Percentage of larvae climbed on the mountages****0-18 h & 18-30 h**

The data regarding 0-18h interval, in respect of percentage of larvae climbed on the mountages after the treatment of dust formulation exhibited non-significant change among the treatments. However, marginal improvement was recorded in T3 (28%) treated batches over the control (26%) (Fig-2). Dust formulation treatment on the percentage of larvae climbed over the mountage after 18-30 h elicited no significant change. However, highest value (55%) was recorded in T1 and lowest was observed in T5 (51%) (Fig-2).

Percentage of larvae spun the cocoons in the rearing bed

Larvae spun the cocoons in the rearing bed showed non-significance difference among the treatments and the control. However, minimum was recorded in T2 (10%), whereas maximum was observed in T1 (11.5%) (Fig-2).

Percentage of larvae spun the cocoons on the mountages

The data with regard to larvae spun the cocoons on the mountages showed maximum in T5 batch (89.5%) larvae spun the cocoons on the mounatges and minimum was found in T4 batch (88.2%) (Fig-2).

Percentage of defective & good cocoons in CSR₂ × CSR₄ & PM × CSR₂ Silkworm breed

The dust formulation showed that maximum defective cocoons percentage was recorded in T4 (12.4%) and minimum was found in T1 (10.2%) in CSR₂ × CSR₄ breed (Fig-3), whereas similar trend was trend in the case of PM × CSR₂ breed also (Fig-3).

The data with respect to good cocoon percentage more or less depicted almost similar trend in both the breeds when treated with the dust formulations (Fig-3)

Effect of dust formulation on single cocoon weight (g), single shell weight (g) and shell 5% in CSR₂ × CSR₄ & PM × CSR₂ Silkworm breed

The data showed that maximum single cocoon weight (g) was recorded in T3 (1.87g) and minimum was found in T5 (1.79%) (Fig-4). No significant change was observed in respect of single shell weight (g). However, maximum shell % was recorded in T5 (21.96%) and lowest was reported in T6 (21.20%) (Fig-4). In case of Pm x CSR2 silkworm breed results showed that highest single cocoon weight (g) was found in T2 (1.60g) and lowest was recorded in T5 & T 6 (1.57g) (Fig-5). The other two traits viz., single shell weight (g) and shell % depicted similar trends and there was no significant difference was observed among the treatments (Fig-5).

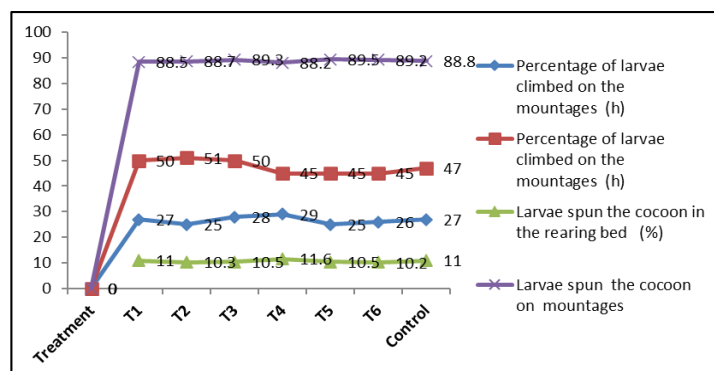


Fig 1: Effect of dust formulations on percentage of larvae climbed on mountages (0-18 h & 18-30 h), larvae spun the cocoons in the rearing bed and on mountages (CSR₂ × CSR₄).

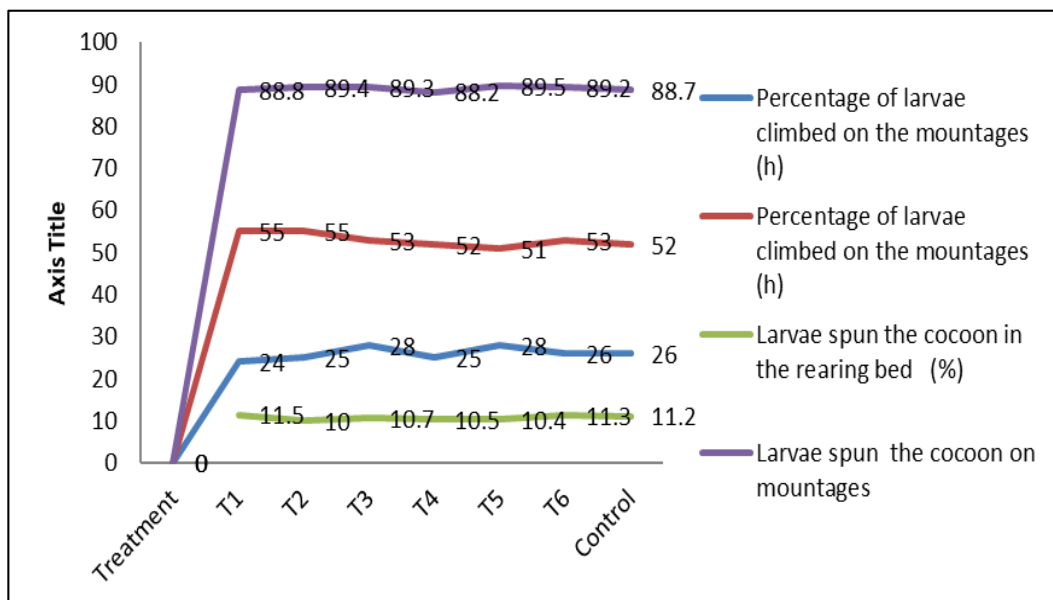


Fig 2: Effect of dust formulations on percentage of larvae climbed on mountages (0-18 h & 18-30 h), larvae spun the cocoons in the rearing bed and on mountages (PM × CSR₂).

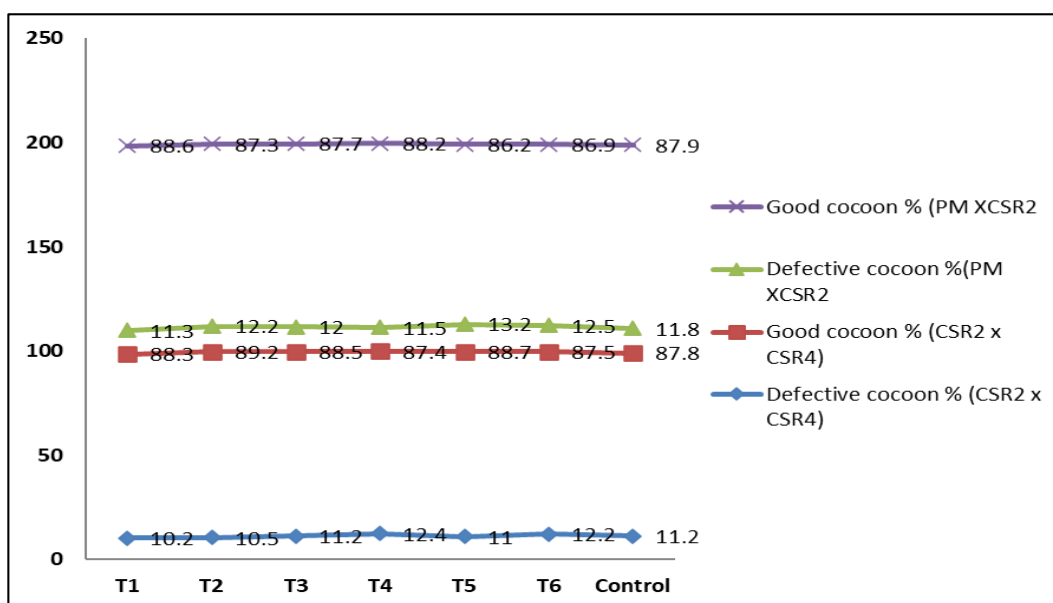


Fig 3: Effect of dust formulations on percentage of good and defective cocoons percentage (CSR₂ × CSR₄) & (PM × CSR₂).

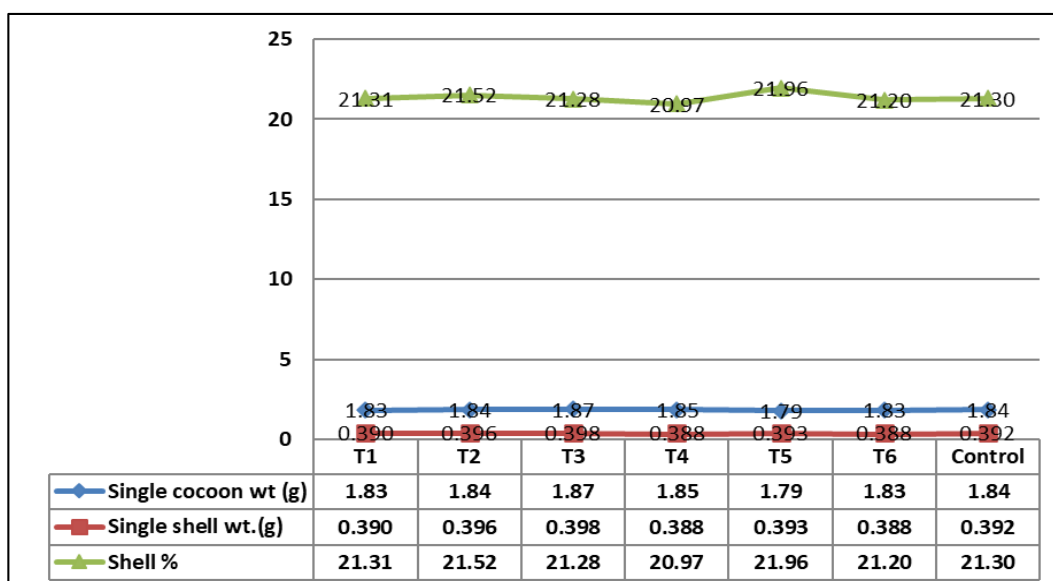


Fig 4: Effect of dust formulations on cocoons characters (CSR₂×CSR₄).

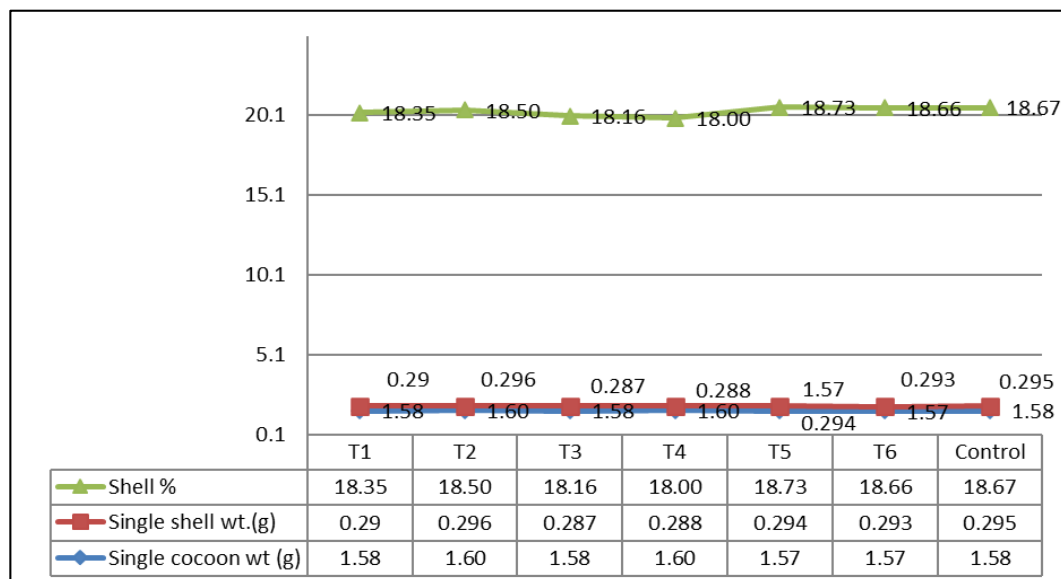


Fig 5: Effect of dust formulations on cocoons characters (PM ×CSR₂).

Discussion

Self or natural mounting in silkworm rearing are widely adopted by the farmers in India due to its merits to save labour and time while mounting the matured silkworms. But it has been seen that while mounting the matured silkworms by adopting the self-mounting method, mounting rate is generally low. To overcome this issue, various repellents were tested to accelerate the mounting process viz., lime, sawdust, kaolin in the past with marginal improvement. In mounting process, the requirement of workforce for picking the matured silkworms is around 10% of the total labour requirement during entire silkworm rearing but it is very important to mount the mature silkworms at right time and it is realized to be a skilled and labour demanding operation which last for a period of 2-3 days depending on the scale of silkworm rearing. Owing to labour intensive nature works for a short period of time, majority of the farmers adopt natural mounting method to save labour as well as time and this method is the most rational method by utilizing the negative geotaxis of the silkworms at the wandering stage, but the mounting rate is around 50-60%^[1]. In the past, to repel the insects various methods were adopted viz., by burning aromatic woods containing resins, covering the skin with mud or by applying a variety of animal fats and grease^[10]. Similarly, the sericulture scientist were also made an attempts of using repellents for improving the efficiency of mounting in Japan^[2, 6, 9] and also in India^[11]. The present findings of the study showed that the traits studied under the experiment showed marginal reduction in percentage of larvae spun the cocoon in the rearing bed as well as percentage of cocoons spun on the mountages in improved in both silkworm breeds (CRS₂ × CSR₄ & PM X CSR₂). Despite, others parameter studied in the present investigation also showed marginal reduction and good cocoons percentage was slightly improved in some of the treatments but was not significant. The present findings of the study showed that the traits studied under the experiment showed marginal reduction in percentage of larvae spun the cocoon in the rearing bed as well as percentage of cocoons spun on the mountages in improved in both silkworm breeds (CR_{S2} × CSR₄ & PM × CSR₂). Despite, others parameter studied in the present investigation also showed marginal reduction and good cocoons percentage was slightly improved in some of the treatments but was not significant.

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