Uttar Pradesh J. Zool. 32(2) : 189-192, 2012 ISSN 0256-971X

EFFECT OF DROPPING OF MATURE SILKWORM AND ITS IMPACT ON COCOON QUALITY AND REELABILITY

G.B. SINGH, SATISH VERMA AND S.M.H. QADRI
CENTRAL SERICULTURAL RESEARCH AND TRAINING INSTITUTE,
SRIRAMPURA, MYSORE-570 008, INDIA
(e-mail : sgbcsrti@rediffmail.com)

Mounting works requires the most intensive labor during a short period. Normal practice is to hand picking the mature worms, however, this practice limits the scale of rearing and great risk is involved due to labour dependency. To overcome this critical situation a worm separator was fabricated. This machine works on vibration and due to vibration mature worms get dislodged from mulberry shoot and collected them for mounting. The ideal height from which mature worms fallen are studied and it was observed that if worm falls from 100 cm height there is no detrimental effect on the mature worms and cocoon & reeling characters. Any height above to this leads to deteriorates the reeling parameters. Improvement in mounting technology has to be done with priority to produce quality cocoons and reduction in labor requirement.

Key words : Mature worms, spinning, dropping, cocoons, reeling

INTRODUCTION

Mounting gives a good effect upon quality of cocoons and any negligence at this stage is bound to cost the rearer heavily (Singh & Kamble 1997). Kim (1988) explained in detail the combined effect of temperature and humidity on cocoon spinning. High temperatures in summer months result in poor reelability and renditta becomes too high and melting percentage increases. This is main reason for occurrence of defective cocoons during summer and rainy seasons.

Singh *et al.* (1994) observed that bottle brush mountages have merits, because of which not only the individual cocoon characters but also all the reeling parameters are improved significantly. Later on Singh *et al.* (2002) revealed that rotary mountage is the best mountages because it produces uniform shape and size, less defective and double cocoons, higher reelability and high grade raw silk compared to other mountages. However, in India most of the farmers are using plastic collapsible mountages or bamboo mountages called Chandrike for mounting of silkworms.

Among the developing countries India ranks second in raw silk production and *sericulture* has become a cash crops in the rural society. Even though with its vast potential in the rural community and semi urban areas still many a constraints are faced by the sericulturists in different mounting methods, which in turn directly linked with their economic loss. Besides, there are various factors, which are influencing the cocoon quality and ultimately reduce the cocoon yield among farmers. In the past, number of researchers conducted studies on constraints existing and what are the factors responsible for low cocoon yield (Farooque *et al.*, 1993; Dhane & Dhane, 2004; Geetha & Geetha Devi, 2006; Singh *et al.*, 1998). Among all silkworm rearing process the separation of spinning worms from the rearing beds under large scale rearing is labour consuming and is a time bound activity. At present the spinning worms are hand picked for mounting. In order to pick spinning worms of 100 dfls (35,000-40,000 worms) 4 workers are required for 8 hours of duration. However, the entire process has to be completed with in

4-5 hours. The delay in picking & mounting of spinning worms results in loss of silk resulting in inferior quality cocoons and more number of cocoons formed inside the rearing bed. Collection of mature worms for mounting is a time bound laborious job. 27 % labour force is required for collection of mature worms. Therefore, several attempts were made to reduce the labour dependency for collection of mature worms. Farmers are placing the plastic collapsible mountages directly over the silkworm rearing bed for mounting of silkworm. This method saves 72 % time compared to pick up method of mounting, but leads to occurrence of 17-25 % defective cocoons. Therefore, it is always recommended to separate out the mature worms and then mount it on any type of mountages. A simple hand operated machine was designed and fabricated to separate out mature worms from the shoot rearing bed (Babu & Dandin, 2008) Motorized worm separator was also designed and fabricated by the Institute (Verma & Dandin, 2006). This machine works as a vibrator and worm fall into collector placed on the on the platform. Since larvae falls from a certain height therefore an attempt was made to know the safe height, from which mature larvae can be dropped.

MATERIALS AND METHODS

Popular Bivoltine (CSR2xCSR4) and multivoltine hybrid (PMxCSR2) were used for this study. Standard silkworm rearing method adopted to rear the worms (Kawakami., 2001). After completion of rearing mature larvae were dropped from three different height *viz*; 0 cm, 100 cm and 200 cm were considered for the experiment. Fallen worms were collected and mounted in plastic collapsible mountages. After complete pupation cocoons were harvested on single day and assessment was conducted. A portion of the harvested cocoons sent for reeling assessment. Experiment was repeated for three times.

RESULTS AND DISCUSSION

Table I shows the cocoon weight, shell weight and shell percentage of Bivoltine cocoons from the batches in which mature worms were dropped from 0, 100 & 200 cm height. The cocoon weight, shell weight and shell percentage deteriorated in the batch where larvae were dropped from 200 cm. The significant reduction in cocoon and shell weight was observed (1.660 g, 0.384 g) in the batch where larvae dropped from 200 cm however these parameters do not shows any significant difference in between the batches where larvae were dropped from 0 and 100 cm height.

Table I : Impact on Cocoon characters after dropping the Bivoltine mature worms from different height (Average of three rearings).

Dropping Height (cm)	Cocoon weight	Shell weight (cg)	Shell %
0	1.780	0.421	23.63
100	1.786	0.414	23.17
200	1.660	0.384	23.11

Table II : Impact on Cocoon characters after dropping the multivoltine mature worms from different height (Average of three rearings).

Dropping Height (cm)	Cocoon weight	Shell weight (cg)	Shell %
0	1.367	0.251	18.38
100	1.387	0.258	18.57
200	1.320	0.240	18.21

Table III : Impact on reeling characters after dropping the Bivoltine mature worms from different height (Average of three rearings).

Dropping Height (cm)	Raw Silk %	Filament length (m)	Reelability (%)
0	18.4±0.35	1096±65	86±0.45
100	18.6±0.27	1015±74	88±0.50
200	17.1±0.43	976±76	78±0.25

Table IV : Impact on reeling characters after dropping the multivoltine mature worms from different height (Average of three rearings).

Dropping Height (cm)	Raw Silk %	Filament length (m)	Reelability (%)
0	12.4±0.25	796±35	76±0.25
100	13.5±0.18	765±27	78±0.35
200	10.1±0.25	576±16	69±0.20

Similarly in multivoltine hybrids (Table II) the cocoon weight ranged between 1.320 to 1.387 g , shell weight 0.240 to 0.258 g and shell percentage from 18.21 to 18.57 %. In this batch the cocoon characters do not show any significant difference in cocoon weight and shell percentage but significant deterioration is observed in shell weight where mature worms dropped from 200 cm.

As it is reflected in cocoon characters the same trend is continued in reeling parameters of Bivoltine cocoon also (Table III). The raw silk %, filament length and reelability significantly deteriorated in the batches dropped from 200 cm (17.1 %, 976 m and 78 %) however this difference is not significant in the batches where larvae were dropped from 0 cm (18.4%, 1096 m & 86 %) and 100 cm (18.6%, 1015 m & 88 %).

Table IV shows the Impact on reeling characters after dropping the multivoltine mature worms from different height (Average of three rearings). In this hybrid also raw silk % was 10.1, filament length 576 m and reelability % 69 in the batch where larvae were dropped from 200 cm and al these parameters are significantly less than the batches where larvae were dropped from 0 cm (12.4 %, 796 m & 76 %) and 100 cm (13.5 %, 765 m & 78 %). However there is no significant difference in the reeling parameters of the baches where larvae were dropped from 0 and 100 cm height.

Building a cocoon is necessary and indispensable activity for metamorphosis of a larvae into moth via a quiescent stage called pupae. Mature silkworm has less appetite and discharge hard dark brown colored faces which are replaced by soft, light brown coloured. Skin becomes gradually transparent due to the growth of silk gland which occupies almost whole body when entire gut remains emptied (Rajan *et al* , 1997).

Spinning speed of fine and longer silk filament is faster compared to that of shorter silk filament. A mature silkworm can spin with silk filament length ranging a range from 500 to 1500 m depending upon the race, out of which 1-2 % is used to make footage. Silkworm discharges a liquid excreta two times in the life cycle the first at the time of cocooning and the second after its emergence as moth (Rajan & Himanthraj, 2005). Therefore special care is must to have good quality cocoon .

The silk is actually hardened silkworm saliva. It comes out of the mouth, not out of the rear end like a spider. When the silkworm ate great quantities of mulberry leaves, they were digested and nutrients were sent into the bloodstream. The silk glands absorbed these nutrients. The larva has a small spinneret on its lip, through which the silk emerges. The single strand of silk that forms the cocoon is about one mile long. Matured silkworm larvae excrete soft faces and have translucent upper portion of the body because the silk glands full of silk substances will occupy almost the complete body cavity of the silkworm (Prasasd *et al* , 2010). Quality of silk depends on the care taken at the time of spinning. Mature worms are sensitive to temperature, humidity, light, etc., at the time of spinning. Therefore much care must be taken while using the worm separator. However, it is evident from above discussion that if mature worms fall from 1 m or less than 1 m height there are no adverse effect on cocoon quality and commercial reeling parameters. However, care must be taken that fallen worms should be collected on cushioned seat not on hard seat. Height of dropping worms should be 1 or < 1 m height.

ACKNOWLEDGEMENT

Grateful thanks are due to the Director, Central Sericultural Research & Training Institute, Mysore for encouragement and interest throughout the progress of the work.

REFERENCES

BABU, G.K.S. & DANDIN, S.B. 2008. Hand operated matured silkworm separator for large scale rearing. *Indian Silk.* **47**(3) : 12-14,.

DHANE V.P. & DHANE A.V. 2004. Constraints faced by the farmers in mulberry cultivation and silkworm rearing. *Indian J. Seric.* **43**(2) : 155-159.

FAROOQUE H.E., KHAN S.M. & MAHAYAN B.S. 1993. Constraints faced by the farmers in adoption of recommended water management practices of wheat and summer ground nut crops. *Maharastra J. Ext. Edu.* **12** : 213

GEETHA, G.S. & GEETHA DEVI, R.G. 2006. Influence of an NGO on socio- economic status of sericulture farmers-A case study. *Indian J. Seric.* **45**(2) : 166-168

KAWAKAMI, K . 2001. Illustrated working process of new bivoltine silkworm rearing Technology. Edited by Kawakami, K, JICA, *Promotion of Popularising the Practical Bivoltine Sericulture Technology Project. JICA, India.*

KIM L.T. 1988. Effect of temperature and humidity on the silkworm at the spinning stage on the reelability of the yarn *International Congress on Tropical Sericulture Practices. Bangalore. India,* 8-23.

PRASAD, G.V. MOGILI, T., RAGHUPATI, M. RAJU, C.S. & QADRI, S.M.H. 2010. *Sericulture field guide.* Central Sericulture Research & Training Institute, Central Silk Board, Mysore.

RAJAN, R.K., MUROGA, A. & DATTA, R.K. 1997. *Manual on mounting and harvesting technology.* Central Sericulture Research & Training Institute, Central Silk Board, Mysore.

RAJAN, R.K. & HIMANTHRAJ, M.T. 2005. *Silkworm rearing technology* Central Silk Board, Bangalore.

SINGH, K.A. JAGADESHWAR, R. & HUSSAIN, S.A. 1998. Constraints in cultivation of mulberry and silkworm rearing. *Maharastra J. Ext. Edu.* **17** : 344-348.

SINGH G.B., RAJAN R.K , INOKUCHI, T., HIMANTHRAJ, M.T & MEENAL A. 1994. Studies on the use of plastic bottle brush mountages for silkworm mounting and its effect on cocoon characters and reelability. *Indian J. Seric.* **33**(1) : 405-408.

SINGH, G.B. & KAMBLE, C.K. 1997. A review of silkworm spinning. *Bull. Sericult. Res.* **8** : 71-75.

VERMA, S. & DANDIN, S.B. 2006. *Mechanization in Sericulture.* CSR&TI, Mysore, India.