

Original Research Article

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Field Evaluation of Different Locally Available Mounting Materials for Their Suitability under Hilly Areas of Kashmir

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ABSTRACT

The most important device that helps or supports the silkworm larvae for comfortable spinning of cocoons is called mountage or cocoonage and the process of transferring the mature larvae on mountage is called mounting. Even if the silkworm crop is healthy, wrong mounting methods, spinning conditions and bad type of mounting material can result in inferior or poor quality cocoons and silk yarn leading to lower income to farmers. Under temperate conditions of Kashmir due to its salubrious climate, congenial or conducive for silkworm rearing still farmers lose about 20% of their cocoon crop during mounting due to use of unsuitable or faulty mounting materials. The reliability of cocoons also gets badly affected. For identification of feasible or suitable locally available mounting material for quality cocoon production at farmers level, a comprehensive study was carried out at Lolab area of district Kupwara lying in north of Kashmir through REC Sub Unit Bandipora during the year 2015-2016, 2016-2017. During seriposition silkworms were mounted in five different types of locally available materials viz Indigofera heterantha shoots, Pinus excelsa shoot lets, Mustard hay (*Brassica compestris*), Mulberry shoots and Paddy grass (*Oryza sativa*). The results revealed qualitative improvement in cocoon as well as reeling features when Indigofera heterantha shoots followed by Pinus excelsa shoot lets were used for seriposition or mounting purposes for Silkworm, *Bombyx mori* L. Thus suggesting their feasibility for the farmers of hilly areas of Kashmir region for better economic returns and sustenance of Sericulture industry in Kashmir.

Keywords

Silkworm, *Bombyx mori* L, Evaluation, Mounting materials, cocoon quality, Kashmir

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Introduction

At the end of fifth age silkworm larvae shrink in size, discharge soft light brown colored feces and slowly stop feeding. Silk worms at this stage are called ripe worms or mature larvae and are ready to exude silk in the form of long thread for spinning of cocoons with the support of any hard object or hold fast called mountage. Thus the mountage or mounting material is the most important

device that supports the silk worm larvae for spinning of cocoons comfortably (Singh, 1995, Mathur and Qadri 2010., Singh *et al.*, 2012) and the process of transferring the mature larvae is called mounting (Rajan *et al.*, 1996., Shinde *et al.*, 2012). It has been observed that if the silk worm crop is healthy, wrong mounting methods, spinning conditions and bad type of mounting material can result in inferior or poor quality cocoons and silk yarn leading to lower income to farmers

(Rajan *et al.*, 1996, Singh and Kambli 1997, Singh *et al.*, 2011). It has also been observed when material and structure of the mountage are not proper, the reelibility of the cocoons is reduced and other features like double cocoons, deformed cocoons and soiled cocoons get increased (Mathur and Qadri, 2010)

Various types of mountages have been used in different countries and areas like rotary mountage in Japan (Kutsumata, 1975., Rajan *et al.*, 1996, 2000) bottle brush mountage in Brazil (Singh *et al.*, 1994). In China many types of mountages Viz, Umbrella type, centipede type, checkerboard type are being used at farmers level. All of them are fabricated from rice straw, Wheat/paddy stray and card board material which are economical and easily available (Sugun *et al.*, 2000)

The most common mountages used in India particularly in southern parts and West Bengal are bamboo chandrika, screen type bamboo mountage, collapsible plastic mountage and bamboo strip mountage (Singh, 1995; Rajan *et al.*, 1996 and Haroon *et al.*, 2001). CSR & TIMysore have developed different types of improved mountages to replace the traditional ones and the cocoons produced out of these have improved the reeling parameters (Sangappa *et al.*, 2010)

Under North India or North West Indian states in general and temperate climatic conditions of Kashmir in particular due to lack of adequate rearing space and rearing equipment at farmers places (Khan *et al.*, 2010; Wani and Jaiswal 2012) farmers conduct floor rearing and shelf rearing to accommodate the huge number of silkworm larvae. On maturity they do not pick the worms, but simply keep/spread the locally available material like paddy straw, or any type of plant material over the rearing bed so as to allow the worms to crawl over the mounting material for spinning of cocoons.

But it has been seen that inspite of salubrious climatic conditions congenial for bivoltine silkworm rearing, farmers of Kashmir are loosing large quantity of cocoon crop during spinning stage due to production of defected or deformed cocoons by using unsuitable or improper mounting materials (Khan, etal2010., Malik and Khan, 2010). Thus in the present study emphasis was laid to evaluate other locally available materials in addition to those in use for their suitability at field conditions particularly for hilly areas of Kashmir valley.

Materials and Methods

The present study was carried out during the year 2015-2016 and 2016-2017 spring season at field conditions of Lolab area of Kupwara district lying in the north of Kashmir at latitude of 34⁰27'19.50 N-longitude of 74⁰26'59.53E at the altitude of 1746M above sea level. On the seventh day of fifth age, silkworm larvae stop feeding, shrank in size, became translucent and changed their color to light yellow. Their feaces became soft which could easily be crushed with fingers. Silkworm larvae at this stage were called mature larvae. They started crawling in the rearing bed in search of suitable place to spin cocoons. For seriposition five different types of locally available plant materials Viz Indigofera heterantha shoots, Pinus excelsa shoot lets, Mustard hay (*Brassica compestris*), Mulberry twigs (*Morus spp.*) and Paddy grass (*Oryza sativa*) were separately arranged around the sides of rearing bed without picking the ripe larvae, by the process known as self-picking method. Small quantity of mulberry leaves was provided in the centre of the rearing bed for unripe worms (Pandey *et al.*, 2006, 2007). The optimal temperature and relative humidity of the mounting rooms was maintained at 25⁰C and 65 to 70% throughout the period of mounting or seriposition (Jolly, 1987, Mathur and Qadri, 2010). Thus in total

50 farmers were taken for this study, with ten farmers each with separate mounting materials. Bivoltine double hybrid FC1*FC2 procured from SDD Srinagar was used as test animal. Harvesting of cocoons was done on sixth day from mounting, only after complete pupation by testing the hardening of the pupal skin (Rajan *et al.*, 1996, Rahmathulla *et al.*, 2007). Before harvesting of cocoons all the diseased, unspunlarvae, flimsy, Melted, thin shelled and double cocoons were removed from the mounting materials manually to prevent staining/soiling of good cocoons and counted for calculation of double and deformed cocoon %age separately for each mounting material (Rajan *et al.*, 1996). After harvesting of cocoons, floss covering the cocoons was removed manually. Cocoon parameters like single cocoon wt (g), single shell wt (g) and SR% was calculated as per the procedure given by Datta in (1996). Post cocoon parameters got analyzed from SETH Srinagar. Data on all the parameters were subjected to statistical analysis to draw logical conclusion.

Results and Discussion

Assessment of cocoons harvested on different mountages or mounting materials

From the data (table-1, fig. A) it could be seen that cocooning percentage was maximum (94.30%) in *Indigofera heterantha* shoot mountages followed by *Pinus excelsa* shoot lets (93.50%). It was found minimum in case of Paddy grass mounting material (91.00%) however, statistically no significant difference was recorded among the treatments with respect to total cocooning percentage. Deformed cocoon percentage was also maximum (10.00%) in paddy grass mounting material, followed by Mulberry shoots (9.26%) and Mustard hay (7.30%). Minimum deformed cocoon percentage (5.10%) was recorded in *Indigofera heterantha* shoot

mountage. Double cocoon percentage was recorded minimum (4.79%) when *Indigofera heterantha* shoots were used as mounting material. This was followed by *Pinus excelsa* shoot let mounting material with 4.98% double cocoons. Maximum double cocoon percentage (11.85%) was recorded in Paddy grass mounting material. Statistically non-significant difference was observed among the different mounting materials tested as Single cocoon weight was concerned. Single shell weight and shell ratio was registered maximum (0.365g & 20.88%) in *Indigofera heterantha* shoots followed by *Pinus excelsa* shoot let mounting material with 0.355g and 20.06% respectively, whereas paddy grass mounting material recorded the minimum (0.338g & 19.01%) single shell weight and shell ratio respectively.

Test reeling results

The reeling characters such as filament length, non-breakable filament length and reelability percentage was analyzed and presented in table (2, fig. B). It could be observed that the cocoons harvested from *Indigofera heterantha* shoots and *Pinus excelsa* shootlet mounting materials have shown better reeling results as compared to other tested materials as they were statistically different from each other.

Maximum filament length and non-breakable filament length (915m & 850m) was recorded in *Indigofera heterantha* shoots and minimum (805m & 700m) in Paddy grass mounting material. The respective filament length and non-breakable filament length were in order of 895m & 820m in *Pinus* shoot lets, 837m & 715m in Mustard hay and 814m & 702m in Mulberry shoot mounting material respectively. Reelability% age (88.00%) was recorded highest in *Indigofera heterantha* shoot mountage, followed by *Pinus excelsa* shootlet mountage (86.30%). Least reelability (80.00%) was recorded in Paddy grass mountage.

Table.1 Effect of different mounting materials on economic characters of Silkworm *Bombyx mori* L.

Serial no.	Treatments/ Mounting materials	Parameters					
		Total Cocooning % age	Deformed cocoon % age	Double cocoon % age	Single cocoon wt (G)	Single shell wt (G)	Shell ratio (%)
01	Indigofera heterantha Shoots	94.30	5.10	4.79	1.748	0.365	20.88
02	Pinus excelsa Shoot lets	93.50	6.20	4.98	1.770	0.355	20.06
03	Mustard hay (Brassica compestris)	93.00	7.30	6.83	1.760	0.344	19.54
04	Mulberry Shoots	92.61	9.26	7.84	1.756	0.341	19.42
05	Paddy grass (<i>Oryza sativa</i>)	91.00	10.00	11.85	1.778	0.338	19.01
06	SE	3.991	0.179	0.118	0.012	0.002	0.173
07	CV	13.849	7.458	5.231	2.230	2.193	2.773
08	CDat5% level	NS	0.514	0.338	NS	0.007	0.499

Table.2 Effect of different mounting materials on post cocoon parameters of Silkworm, *Bombyx mori* L.

Serial no.	Treatments/ Mounting materials	Parameters		
		Filament Length (MT)	Non Breakable Filament Length (MT)	Reeli-bility (%)
01	Indigofera heterantha Shoots	915	850	88.00
02	Pinus excelsa Shoot lets	895	820	86.30
03	Mustard hay (Brassica (compestris)	837	715	85.85
04	Mulberry Shoots	814	702	82.50
05	Paddygrass (<i>Oryza sativa</i>)	805	700	80.00
06	SE	13.999	10.500	0.471
07	CV	5.288	3.200	1.763
08	CD at 5% level	40.314	35.010	1.358

Fig. A

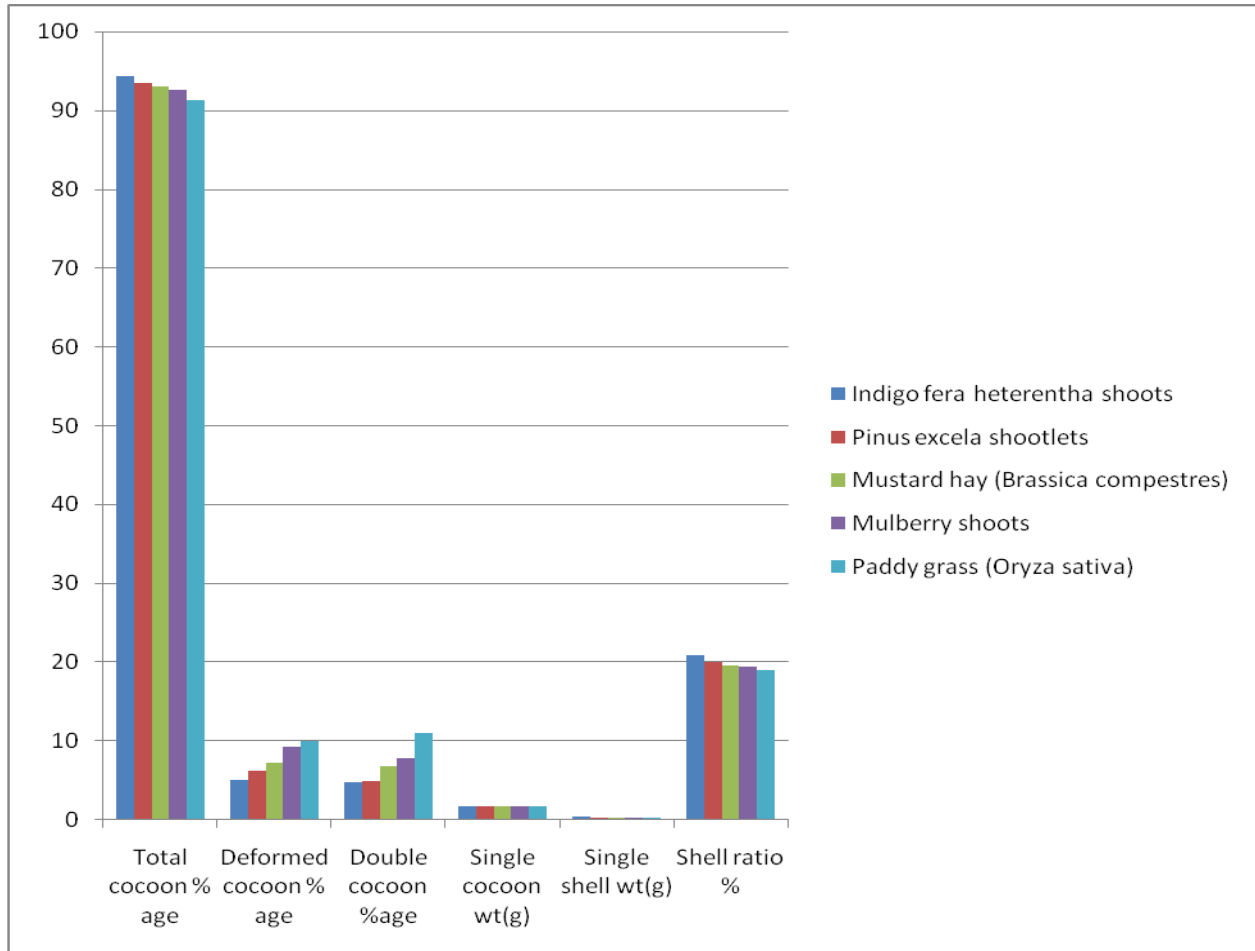
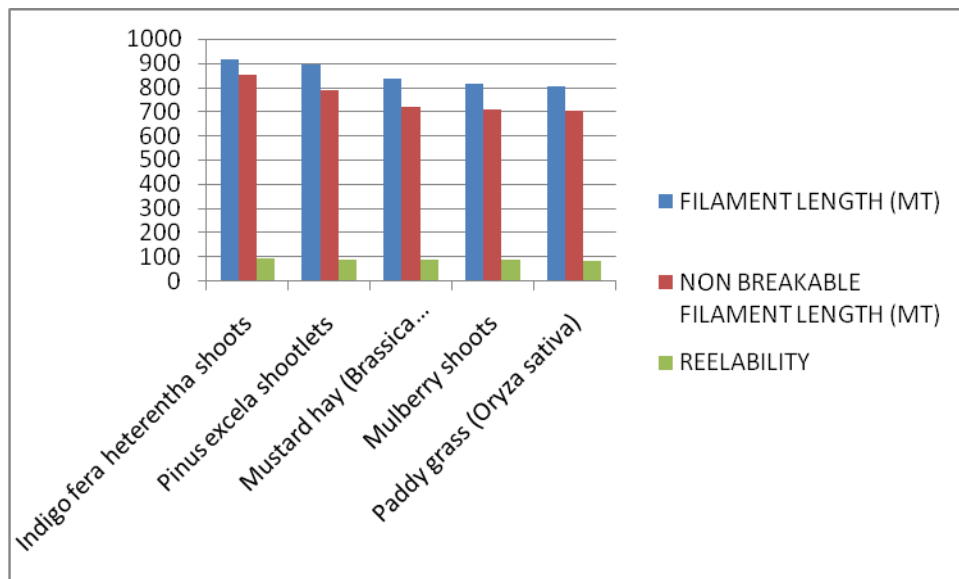


Fig. B



Shelf silkworm rearing at farmers place



Paddy grass used as moutage/mounting material for spinning of silkworm cocoons



Pinus excelsa used as mounting material / moutage for spinning of silkworm cocoons at farmers place



The results of the above study revealed that most of the cocoon and post cocoon parameters (reeling parameters) viz deformed cocoon percentage, double cocoon percentage, single shell weight, shell ratio, filament length, non-breakable filament length and reelability were significantly superior when *Indigofera heterantha* shoots were used as mounting material for silkworm larvae followed by *Pinus excelsa* shootlet. The reasons for the superiority of these materials in improving the cocoon quality is due to the fact that these materials provide enough and suitable space for silk worms to spin cocoons comfortably. Also better passage of air current through the materials decreased the humidity of rearing bed there by improved the reeling parameters of the cocoons produced. The poor performance shown by Paddy grass and Mustard hay when used for mounting purposes is because matured larvae crawl on top or upper layer of these material for spinning of cocoons. But the upper layers did not bear the weight of huge quantity of matured larvae with the result these layers fall flat on the lower layers resulting in dumping off the material and creation of insufficient space for cocoon formation, besides increase in humidity in the bed. This has resulted in the formation of more double and deformed cocoons, besides affected post cocoon parameters. Naik and Somashekhar (2004) also observed that environmental conditions of silkworms during spinning stage had direct bearing on the post cocoon parameters.

The present findings are also in agreement with the work conducted by Tazima (1972), Periasamy and Radhakrishnan (1987), Geetha Devi *et al.*, (1990), Rajan *et al.*, (1996), Singh and Kamble (1997), Haroon *et al.*, (2001), Mathur and Qadri (2010) who reported that for quality cocoon production besides other factors type of mountage, methods of mounting and mounting material used plays a

paramount role. Pandey *et al.*, (2006) advocated that in place of paddy straw which produced lot of deformed and double cocoons, semidried Eucalyptus leaves could be used successfully for mounting purposes in absence of plastic or rotary mountages. Naphade *et al.*, (2010) also reported that Mango twigs performed better as compared to plastic mountages when used for mounting purposes.

From the studies conducted, it is inferred that *Indigofera heterantha* shoots followed by *Pinus excelsa* shoot lets can successfully be used as mounting materials or mountages for spinning of cocoons by silk worm larvae in hilly areas of Kashmir as they will certainly improve the cocoon production in terms of quantity and quality so that silk worm farmer can get good remuneration for their produce. These materials are also economical as both are locally available.

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