WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 5.990
Volume 4, Issue 7, 876-882. Research Article ISSN 2277– 7105

STUDIES ON MOISTURE RETENTION CAPACITY OF SOM AND SOALU GENOTYPES AND ITS IMPACT ON SURVIVAL OF EARLY INSTAR MUGA SILKWORM *ANTHERAEA ASSAMENSIS* HELFER UNDER INDOOR CONDITIONS

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Article Received on
22 April 2015,

Revised on 16 May 2015,
Accepted on 07 June 2015

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ABSTRACT

Moisture retention capacity (MRC) of two som genotypes (S_3 and S_6) and that of soalu obtained 2, 3 and 4 months after pruning was determined at an interval of 4, 8, 12 and 24 hours after harvesting during the month of August and October. The study revealed no significant difference in the mean MRC in relation to age of leaf. Mean MRC recorded highest in soalu during both the months compared to som genotypes. MRC decreased significantly in relation to hour of harvest of leaves in both the months. Survival of worms up to 2nd instar under indoor rearing condition exhibited significant positive correlation with genotypes (r= 0.607*) and recorded highest in four months old twigs of soalu followed by 2 months old twigs of som of both the genotypes in both the months.

KEYWORDS: Moisture retention capacity (MRC), som, soalu, muga silkworm, indoor rearing.

INTRODUCTION

The state of Assam in the North Eastern Region of India is renowned for the production of fabulous golden yellow silk which is produced by the lepidopteran insect, *Antheraea assamensis* Helfer. The silkworm feeds exclusively on two evergreen food plants namely Som (*Persea bombycina*) and soalu (*Litsaea polyantha*) which grow abundantly throughout the region. The muga silk production during 2013-2014 was 146 MT (Giridhar & Neog, 2014). The muga silk industry in Assam is a sustainable farm based economic enterprise

positively favouring the rural people in the unorganized sector because of its relatively low requirement of fixed capital and higher returns of investment.

Muga silkworm being reared outdoor, suffers heavy loss due to adverse environment as well as incidence of pest and diseases. Mortality of worms during early instars goes to the tune of 35% (Kakati, 2002). The damage intensity is more during seed crops particularly during summer and winter affecting the production of commercial crops. In the early stages (I-III) the damage is mainly caused by natural hazards/ adverse environment, pests and predators while in the later stages (IV-V) by pests and diseases. To minimize early instar loss of silkworms, efforts have been made to evolve/standardize suitable indoor rearing technology by several scientists with varying degrees of success (Rao *et al*., 1976; Thangavelu and Sahu, 1983; Goswami and Samson, 1987, Singh and Barah, 1994; Teotia and Bhattacharya, 1997; Hazarika *et al*., 2004; Khonikor (2004). But, till now not a single concrete technique of indoor rearing is available for rearing of muga silkworm with high degree of success over out door rearing. It has been widely accepted that, a number of factors are responsible for successful indoor rearing of silkworm such as, physiological parameters of leaf like moisture, structure, *etc*., biochemical like nutritional status, production of repellents after plucking of leaves, environmental conditions like temperature, humidity inside the room, feeding behaviour of the worm under indoor conditions *etc*. But, the most desirable factor for feeding of leaves under indoor conditions is that the leaves should remain fresh and succulent for a maximum period of time, *i.e.* the moisture retention capacity of the genotypes. Importance of moisture content and moisture retention capacity in relation to performance of mulberry silkworm was reported by Narayanaprakash *et al.* (1985) and Paul *et al*., (1992). This character again varies among genotypes of different plants as well as environment (Clarke & Townby, 1986; Roarke & Quisenberry, 1977). But such studies in the case of muga silkworm have not been reported so far. The present study was undertaken to determine the role of moisture retention capacity of two som genotypes and that of soalu for early stages (1^{st} and 2^{nd}) indoor rearing of muga silkworm.

MATERIALS AND METHODS

The present experiment was divided into two sets. In the first set of experiment, leaves of som (*Persea bombycina* King) and soalu (*Litsea polyantha*) were collected in polythene bags from branches developed 2, 3 and 4 months after pruning of the plants. The initial weight of leaves was first recorded and then leaves of each genotype were kept on perforated polythene

sheet inside wooden trays of size 3ft x 2 ft x 0.5ft. having wire mesh at the top and bottom parts. Wet foam pads inside and perforated polythene sheets on the top of trays were placed to check quick driage of leaves. Weight of the leaves was recorded at every 4, 8, 12 and 24 hours after harvesting, oven dried at 60º C for 3 days and moisture retention capacity (MRC) of each sample was calculated by using the following formula.

$$\text{Moisture retention capacity} = \frac{\text{4/8/12/24 hours weight – oven dry weight x 100}}{\text{Fresh weight – dry weight}}$$

In the second set, rearing of muga silkworms was conducted up to 2nd instar on the twigs of above genotypes in the experimental indoor rearing room of Central Muga Eri Research & Training Institute, Jorhat, Assam, under indoor environmental conditions in trays as described above, to ascertain suitable age of leaves and genotypes in terms of survival of worms. Bed was cleaned once and feeding was given twice a day, first at 9.0 AM and second at 4.0 PM. During moult, wet foam pads and polythene cover were removed to minimize the moisture in the rearing bed. Survival of the worms was recorded after the 2nd moult out.

The above two sets of experiments were carried out simultaneously during the months of August and October, 2011. Data thus obtained were statistically analyzed to determine the level of significance of moisture retention capacity of som and soalu genotypes in relation to age of leaves, hour of harvest and survival of worms under indoor rearing conditions.

RESULTS AND DISCUSSIONS

Moisture retention capacity (MRC) of som and soalu leaves in relation to age and hour of harvesting is presented in Tables 1 and 2. No significant difference in the mean MRC was observed in relation to age of leaves. Mean MRC was higher in soalu during August and October (79.98% and 72.72%, respectively) compared to som genotypes while som genotype S-3 retained higher moisture in its leaves in August and October (75.55 % and 69.63%, respectively) compared to S-6 (73.51% and 66.98%, respectively).

Mean MRC values in respect of hours of harvesting were found to be significant in both the months and genotypes of host plants. There was gradual and significant reduction in MRC and this was more during October than during August. Similar pattern of mean MRC was observed in relation to genotypes used, being higher in soalu during August and October (79.98% and 72.72%, respectively) compared to som genotypes while som genotype S-3

retained higher moisture in its leaves in August and October (75.55 % and 69.63%, respectively) compared to S-6 (73.51% and 66.98%, respectively).

Survival percent of worms up to 2nd instar in relation to age of leaf is presented in Table 3. It clearly indicates superiority of soalu leaves over som leaves in both the months of rearing. Mean survival percent was higher in soalu fed worms compared to som and higher number of worms survived during October (69.55.0%) compared to that during August (43.67%).

Higher leaf moisture is known to increase the amount of leaf ingestion and digestion capacity of mulberry silkworm through its olfactory and gustatory stimulative effect (Ito, 1963). Hazarika *et al*., (1994) reported that dietary water plays a very important role in silkworm metabolism as it regulates the rate of ingestion in muga silkworm. It acts as diluents of nutrients, but not as a phagostimulant. They found that, higher the moisture content of leaves, higher the blood volume in different instars of muga silkworm body, but lower the total haemocyte count and vice versa. Vijayan *et al.* (1997) found only one mulberry variety with higher leaf moisture content in all seasons out of 152 varieties studied by them. In our present study, survival of worms in both the months were significantly higher in soalu over som genotypes due to its higher moisture retention capacity in relation to age of leaves as well as hours of harvest. Narayanaprakash *et al.* (1985) found that assimilated food converted into body tissue and conversion efficiency decreases with decreasing dietary moisture content in mulberry leaves. Basu *et al*. (1992) reported that the development time and weight gain was significantly higher for larvae fed on tender rather than on older leaves. In our present study, it was observed that, survival of muga silkworm was maximum in 2 months old leaves of som genotypes while it was maximum in 4 months old leaves of soalu in both the months under study. Similar study in respect of influence of genotypes and environmental factors was reported by Clarke & Townby (1986); Roarke & Quisenberry, (1977); Vijayan *et al*. (1997). Chakravorty *et al*. (2004) recorded 66.89% moisture content in the leaves of som and 74.73% in soalu, and higher in spring (78.83%) compared to autumn (61.71%) season. Moisture retention capacity in the present finding was also higher during August compared to October.

Table 4 depicts the correlation among genotype, age of leaves, MRC and survival percent of 2nd instar worms. It was observed that, there was positive non-significant correlation between MRC and the genotypes; while negative but non-significant correlation between MRC and age of leaves. In respect of survival percent of worms up to 2nd instar, it exhibited significant positive correlation with genotypes (r=0.607*), but negative non-significant correlation with

age of leaves (r= - 0.051). Between MRC and survival of worms, there was positive but non-significant correlation (r=0.256).

Thus, from the experiment it can be inferred that, 3-4 months old soalu leaves are more suitable for early stage rearing of muga silkworm during August and October, as the leaves retain higher moisture for a longer period which may have direct relation with higher survivability of worms compared to som genotypes under indoor environmental conditions.

Table 1. Moisture retention capacity of som and soalu genotypes in relation to age of leaf

Month	Host plant / genotype	Age of leaf			Total mean	CD at 5%
		2 months	3 months	4 months		
August	Som (S-3)	75.05	75.09	76.52	75.55	NS
	Som (S-6)	73.38	76.08	71.08	73.51	NS
	Soalu	78.19	80.91	80.84	79.98	NS
October	Som (S-3)	69.310	69.87	69.93	69.63	NS
	Som (S-6)	68.26	69.12	63.55	66.98	NS
	Soalu	73.80	71.77	72.59	72.72	NS

NS=Non significant

Table 2. Moisture retention capacity of som and soalu genotypes in relation to hours of harvesting

Month	Host plant / genotype	MRC after harvest				Total mean	CD at 5%
		4 hour	8 hour	12 hour	24 hour		
August	Som (S-3)	93.07	83.44	73.01	52.69	75.55	3.36
	Som (S-6)	92.16	78.95	69.76	53.19	73.51	5.14
	Soalu	94.64	85.39	76.96	62.94	79.98	3.08
October	Som (S-3)	86.54	77.58	67.88	46.52	69.63	2.67
	Som (S-6)	86.25	74.14	65.32	42.20	66.98	3.23
	Soalu	87.98	79.38	71.53	51.99	72.72	2.67

Table 3. Indoor survival up to 2nd instar in relation to age of leaf of som and soalu genotypes

Month	Host plant / genotype	MRC after harvest			Total mean	CD at 5%
		2 months	3 months	4 months		
August	Som (S-3)	49.67	38.00	36.67	41.45	5.37
	Som (S-6)	45.33	39.33	40.33	41.66	NS
	Soalu	38.00	39.00	54.00	43.67	5.53
October	Som (S-3)	38.00	26.33	25.00	29.78	6.35
	Som (S-6)	41.33	29.33	29.00	33.22	5.84
	Soalu	59.33	73.33	76.00	69.55	5.24

Table 4. Correlation coefficients among survival of worms with genotypes, moisture retention capacity and, age of leaves

Particulars	Survival %	Genotype	MRC	Age of leaves
Survival %	-	0.607**	0.256	-0.051
Genotype		-	0.348	0.00
MRC			-	-0.051
Age of leaves				-

**** Significant at 1% level**

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