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LOW COST INCUBATION POT FOR BETTER HATCHING OF SILKWORM EGGS IN DRY SUMMER

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Proper incubation of silkworm eggs play a vital role in silkworm rearing. 25^{0}C temperature and 75-80% R.H. is ideal for incubation of silkworm eggs. The farmers do not have suitable devise for maintaining optimum temperature and humidity during incubation for obtaining uniform hatching and subsequently improvement in yield. The low cost incubation device developed is suitable for dry summer can reduce the temperature by 6-7^{0}C and increase the humidity by 40% and thereby maintaining suitable environment for incubation of silkworm eggs. Hence, the method can be adopted at farmers' level.

INTRODUCTION

Incubation is an acclaimed important step to obtain uniform hatching, normal growth of larvae and subsequently improvement in yield and quality of cocoon (Tazima, 1972). It is also known as 'seed warming' by which the activated silkworm eggs are protected in proper temperature and other environmental conditions so that the embryo can develop normally and the eggs hatch uniformly. Activated silkworm eggs mean non hibernating eggs or hibernating eggs that have undergone an artificial hatching treatment or over wintering (Pang-Chaun *et al.*, 1988). Proper incubation of silkworm eggs is one of the most vital aspects in sericulture. The laying collected from the grainages, if not incubated at optimum condition of temperature (25^{0}C) and humidity (75-80%) (Ullal & Narasimhanna, 1978), the growth and development of embryo in eggs is adversely affected and may result in uneven/poor hatching and weak larvae, which ultimately affect the cocoon crop. Proper incubation of eggs, thus always has been a cause of concern for chawki rearing centre as well as farmers.

In organizational level incubation is carried out by using costly as well as sophisticated instruments such as incubators, humidifier, air cooler etc. But the farmers do not have any provision for incubation of eggs, under fluctuating conditions of environment. In eastern region the temperature and humidity fluctuate to a large extent during different seasons in the year. It is thus felt necessary to develop a suitable low cost incubation chamber by using locally available material which is within the reach of the poor marginal farmers.

Though several methods have been advocated for incubation of silkworm eggs like, incubation of eggs in wooden tray with wet foam pad and wax paper (Krishnaswami, 1986), low cost incubation chamber (Muralikrishna & Pavan Kumar, 1988), double brick wall chamber (Himanthraj *et al.*, 1990), controlled incubation chamber (Sen *et al.*, 1993) and use of mud pot buried in wet sand bed (Muniraju *et al.*, 2001), the present innovation has the advantages as under:

1. It is made up of locally available low cost material.
2. Operation of unit is easy and involves no skill.
3. Keep the internal climate static inspite of fluctuation of temperature and humidity outside.
4. Electricity is not required for its operation and can be used anywhere.
5. Both loose eggs and sheet eggs can be incubated properly.
6. As the size of the unit is small, problems of housing the unit do not arise and can be used by the farmers for preserving vegetable etc when it is of no use.

METHODS OF OPERATION

Description : The incubation unit consists of two bucket shaped earthen pots the bigger one is outer chamber and the smaller one is the inner chamber. The size of the outer chamber is 40 cm (16□) in height, opening diameter 33 cm (13□),bottom diameter 27 cm (11□)and that of inner one is 32 cm (13□) in height, opening diameter 28 cm (11□)and bottom diameter 23 cm (9□). The inner chamber hangs inside the outer chamber from its rim. In between two chambers there is a space or gap of about 2.5 cm (1□) In both the chambers there are two holes of 1cm diameter just below the upper rim in opposite direction. The holes are for inserting the bamboo or wooden stick for hanging the egg sheets during incubation (Figs. 1 & 2).

Methodology : Prior to incubation about 7-8 litres of water is poured inside the outer chamber and the inner chamber is placed within the outer one. The bottom of the inner chamber should touch the water level. After keeping the egg sheets vertically (in hanging position) for incubation the opening of the inner chamber is covered with the lid (Fig. 3). The whole incubation unit is placed on an earthen plate partly filled with water. It serves the purpose of an ant well.

About 1½ litres of water should be poured daily inside the outer chamber to compensate the loss of water by evaporation during incubation.

400 dfls in sheet can be accomodated in the pot. In case of loose eggs the quantity will be more. For incubation of loose eggs a suitable alignment unit with shelf arrangement should be prepared from locally available materials like bamboo strips or dry mulberry cuttings and the packets are placed over the shelves and evenly spread taking utmost care so that the loose eggs are not heaped (Fig. 4).

The above incubation unit is most suitable for incubation of dfls during dry summer. It has been observed that during summer (May) when the room temperature and relative humidity are 35-37^{0}C and 45-60% respectively the incubation pot maintains more or less uniform temperature of 29^{0}C and 95% humidity. It prevents the fluctuations of temperature and humidity during different hours of a day and this ensures proper incubation.

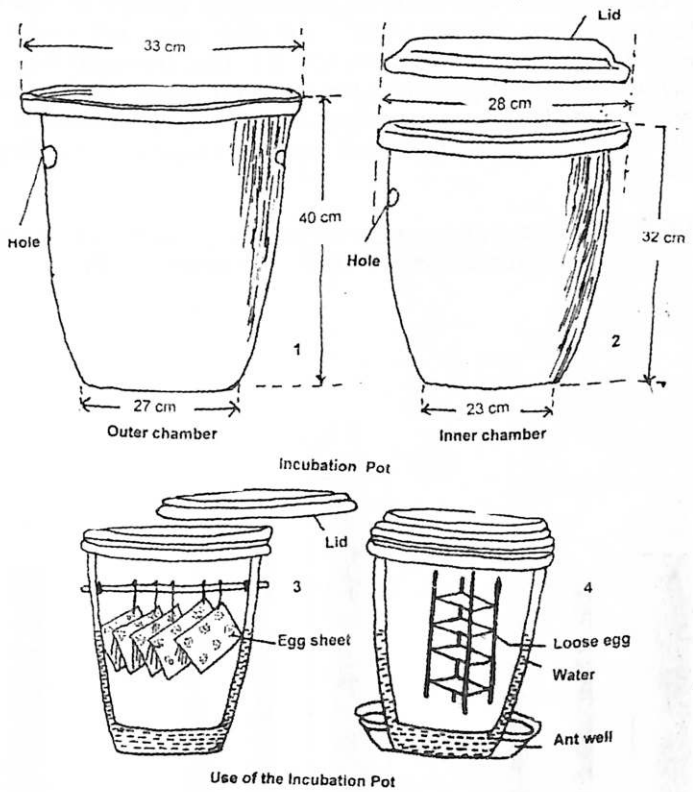
Costing : Cost of one unit of incubation pot is Rs. 150.00

RESULTS AND DISCUSSION

The efficacy of the incubation pot was tested at the laboratory level during dry summer of consecutive two years (1995 & 1996). It has been found that the device is able to lower the temperature by 6-7^{0}C and simultaneously increasing the humidity by 40% from ambient which are near to the optimum (Table I).

Table I : Average of temperature and humidity of incubation pot and room recorded during dry summer of 1995 & 1996.

Year	Temperature (^{0}C)			Relative Humidity (%)		
	Inc. Pot	Room	Difference	Inc. Pot	Room	Difference
1995	30.05	35.87	5.82	94.89	51.56	43.34
1996	27.65	34.87	7.21	93.63	57.46	36.17
Average	28.85	35.37	6.51	94.26	54.51	39.75



Figs. 1 - 4 : 1, 2. Incubation pot; **3, 4.** Use of the incubation pot.

Statistical analysis of rearing data obtained by using the incubation pot also proves its superiority over the traditional method of incubation i.e. use of paraffin paper and wet foam pad as hatching %, yield per 40,000 larvae and ERR% were significantly increased in lots incubated in the incubation pot without affecting single cocoon weight (SCW), single shell weight (SSW) and silk ratio (SR%) (Table II).

Table II : Comparative hatching and rearing performance of lots incubated in incubation pot and by conventional method (Race : Multi x Bi).

Parameter	May 1995			May 1996		
	Inc. Pot	Traditional	t-value	Inc. Pot	Traditional	t-value
Hatching %	92.39	80.64	10.41**	93.17	81.88	8.32**
L. Period (days)	22.95	22.90	00.53	23.05	22.95	0.784
ERR %	84.94	80.74	02.19*	85.02	79.02	6.11**
Yield/40,000 Larvae (kg)	48.57	44.77	08.83**	48.50	43.84	2.83*
SCW (g)	1.437	1.426	01.21	01.42	01.39	0.507
SSW (g)	0.251	0.252	0.294	0.248	0.245	0.401
SR %	17.43	17.66	0.540	17.49	17.59	0.405

*=Significant at 5% level; **=Significant at 1% level.

Field study : The efficacy of incubation pot was tested at farmers' level in different zone of West Bengal, Bihar and North Eastern States. The study was carried out through Research Extension Centre (REC) Shaktipur and Mothabari (W.B.) : REC (Sub unit) Rajmahal, Saharsa and Lohardaga (Bihar) and REC, Dimpur and Agartala (N.E.) during 1997-1998, 1998-1999 and 1999-2000. In all the cases hatching percentage was significantly increased in lots incubated in incubation pot in comparison to the traditional method of incubation by using foam pad and paraffin paper (Table III).

COMPARATIVE REARING PERFORMANCE OF DFLS INCUBATED IN INCUBATION POT & TRADITIONAL METHODS AT FARMERS' LEVEL

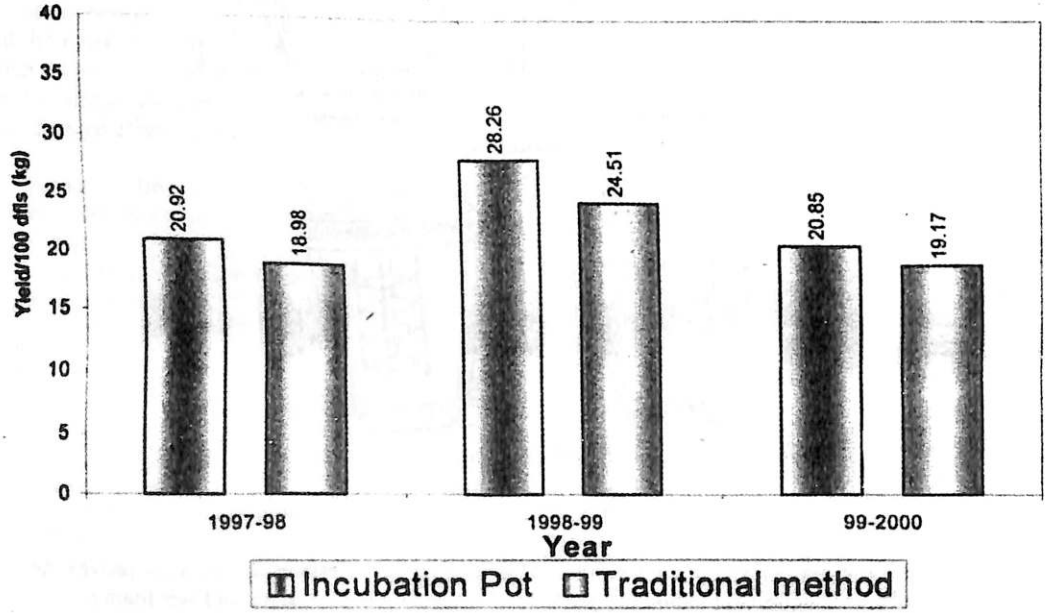
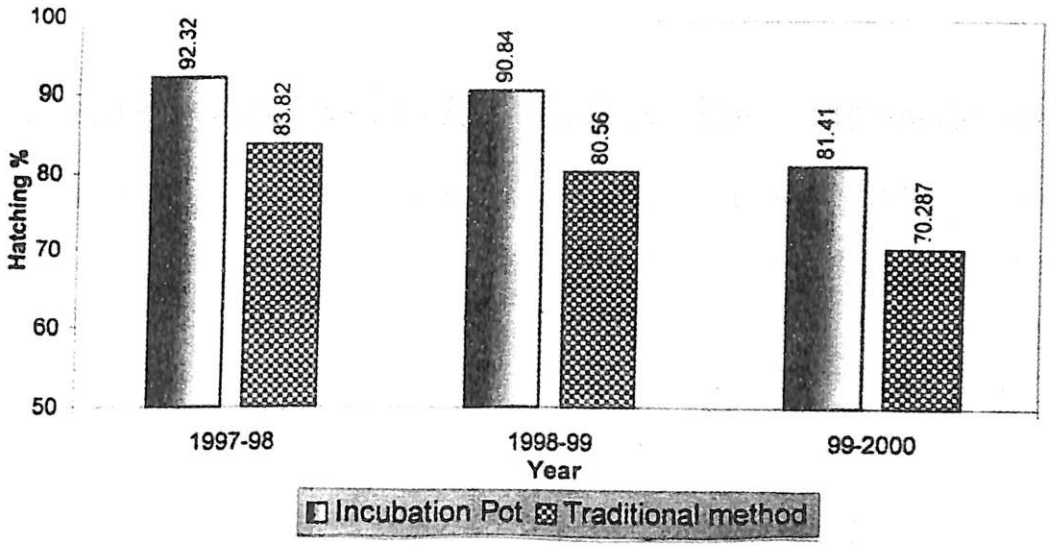


Table III : Evaluation of low cost incubation pot at farmers' level.

Name of the Unit	No. of Farmer	Breed/ Hybrid	Hatching %			Yield/100 dfls (kg)		
			Inc. Pot	Tradi-tional	t-value	Inc. Pot	Tradi-tional	t-value
1997-1998 West Bengal, Bihar & N.East	23	M x M M x B	92.320	83.820	14.89**	20.920	18.980	8.32**
1998-1999 West Bengal, Bihar & N.East	41	M x M M x B	90.840	80.560	04.78**	28.260	24.510	3.15*
1999-2000 West Bengal & Bihar	30	M x M M x B	81.410	70.287	17.72**	20.853	19.173	9.160**

M x M=Multi x Multi; M x B=Multi x Bi; * = Significant at 5% level; ** = Significant at 1% level.

COMPARATIVE HATCHING % OF DLS INCUBATED IN INCUBATION POT & TRADITIONAL METHOD AT FARMERS LEVEL



It may be concluded that this newly innovated low cost incubation pot is ideal for incubation of silkworm eggs even in dry summer when the temperature is excesively high and humidity is very low. Seeing its efficacy in the farmers level also, it may be utilized by the farmers for proper incubation of eggs resulting in bumper cocoon crop.

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