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CELLULAR MOTH EXAMINATION: A PARADIGM SHIFT IN OAK TASAR GRAINAGE ACTIVITY

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ABSTRACT

In India during some past years, the oak tasar cocoon production has drastically reduced due to certain disease in oak tasar silkworms, which has led to significant mortality to the batches of oak tasar silkworms. The damage caused by this disease decreases cocoon crop production up to 80%. As the disease is transmitted through mother moth, it is very essential to avoid the transmission of disease during the grainage activities. The seed sector is backbone for the development of the silk industry. Quality of oak tasar seed and efficiency of grainage depend on the quality of the cocoons, selection of healthy seed cocoon, effective microscopic examination and production of healthy & quality Dfl's. Since long, many techniques have been identified to produce disease free layings (Dfls). Among them REC, Palampur preferred cellular moth examination technique (CMET) for the production of Dfl's. During the year 2016 to 2018, REC, Palampur used CMET by using small paper box of size length-3.5'', width-4.5'' and height-2.5'', in which single female moth was kept for oviposition. After the completion of oviposition, each moth was microscopically examined for identification of any infection such as bacteria, pebrine etc and in case of any infection, Dfl produced was rejected and destroyed instantly. Before the year 2016, mass oviposition was practiced, in which small nylon net was used to keep 10-15 moths together. This resulted to remarkable loss/ rejection of the Dfl's, leading to the reduction in Dfl's production. Pooled data of mass examination and cellular examination indicated that, cellular examination resulted with decrease in cocoon-Dfl ratio (from 13.64:1 to 4.36:1), decrease in rejection of Dfl's after microscopic examination (from 51.74% to 4.54%) and increasing trend in grainage from 48.26% to 95.21%. This trend clearly indicated that, cellular examination of egg layings is very much encouraging for production of oak tasar seeds and successful grainage activities.

Keywords : Cellular and mass examination, Grainage, Paper box, Laying, *Antheraea proylei*

Introduction

In India, tasar and oak tasar culture is practiced from the immemorial in tropical and temperate belts even prior to the introduction of mulberry in India. The tasar culture has substantial income generation potential especially for the tribal folk who lives in undulating forest regions (Binkadakatti and Verma 2021). Indian oak tasar silk is produced by non-mulberry silkworm, *Antheraea proylei*. The oak tasar silkworm is a temperate species feeds on different species of the leaves of oak tree *Quercus* species found only in the states of Arunachal Pradesh, Assam, Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalya, Nagaland and Uttarkhand, is an important source of oak tasar silk, a rough and coarse silk usually with natural shades of beige (Goel and Rao, 2004). Recently, the oak tasar cocoon production was drastically reduced due to certain disease in oak tasar silkworms. The infection lead to the significant mortality of the batches of oak tasar silkworms and the damage caused by this disease decreases cocoon crop production up to 80%. Some of the diseases transmitted through mother moth. Therefore, it is very essential to avoid the transmission of disease during grainage activities itself. The seed sector is important for the development of the silk industry. A Grainage activity usually takes place during

January/February for early spring crop, April/may for summer/Monsoon crop and in August for autumn crop. Quality of oak tasar seed and efficiency of grainage depend on the quality of the cocoons, selection of healthy seed cocoon, effective microscopic examination and production of dfl's. The many techniques were identified to produce Disease free layings, among which REC, Palampur started using Cellular moth examination technique. During the year 2016, REC, Palampur started cellular moth examination by using small paper box with the following objectives i.e., 1) Reduction in rejection of dfl's after microscopic examination 2) Decrease in Cocoon-dfl ration and 3) Increase in success of grainage after layings obtained.

Materials and Methods

Cocoons harvested during summer/monsoon and autumn crop were kept in the form of garland in hanging condition in preservation room at high altitude. During first grainage (Fig. 3), after coupling and rejection of poor/dead layings, each single mother moth was kept in small paper box of size Length-3.5'', Width-4.5'' and Height-2.5'' (Inch) for oviposition (Fig. 4). Same procedure was used for rest of the mother moths. After oviposition was completed, each single mother moth kept in paper box separately and microscopically examined for identification of bacteria,

pebrin etc. if any microbes identified, then the dfl produced was rejected and destroyed immediately. The procedure was carried out from 2016 to 2018. The data on numbers of cocoons processed, numbers of pairs obtained, numbers of layings obtained, number of layings rejected after

microscopic examination, numbers of dfl's produced and cocoon dfl's ratio for both mass and cellular examination was collected. The three year data for Mass examination (from 2013 to 2015) and cellular examination (from 2016 to 2018) was collected separately for data analysis.



Fig. 3 : Oak tasar Grainage activities



Fig. 4 : Cellular moth examination

Results and Discussions

Comparative Experimental data on mass examination and cellular examination of mother moths had shown considerable difference with respect to dfl rejection and success of the grainage. Table No. 1 indicated the comparison between mass examination and cellular examination of the mother moth. Pooled data of mass

examination of mother moths of three years 2013 to 2015 has been analyzed. The trend showed that, the cocoon-dfl ratio of pooled data was at higher side (13.64:1). Further year wise data revealed that higher cocoon-dfls ratio 17.16:1 was observed during 2014 grainage followed by 14.18:1 (2013) and 5.87:1 (2015). Rejection of dfl's after mass examination pooled data showed that, rejection of dfl's was high (51.74%)

and among the three years highest (76.07%) rejection was noticed during the year 2013 grainage. Success of grainage after laying obtained (pooled data) was less than 50% (i.e.48.26%) and lowest was observed during 2013 (23.93%) grainage. Therefore, the pooled data for mass examination clearly suggests that mass examination is not suitable for successful grainage activities because it involves keeping 10-15 layings in single nylon bag for oviposition. During examination of the mother moth from this mixed layings, if we find any microbes in a lot of 10-15 dfls, we straight away reject whole lot. This resulted in loss of dfl's production, increase in cocoon-dfl ratio, increase in dfl's rejection percentage and decrease in success of grainage percentage.

At the same time the data of three years 2016 to 2018 has been pooled and analyzed for cellular examination of mother moth. i.e. Single mother moth examination. The trend showed that, the cocoon-dfl ratio of pooled data was at lower side (4.36:1). Year wise data showed that lower cocoon-dfls ratio 4.08:1 was noticed during 2017 grainage followed by 4.31:1 (2018) and 7.98:1 (2016). Rejection of dfl's after mass examination pooled data revealed that, rejection of dfl's was low (4.50%) and very low i.e. 2.2.64% was noticed during the year 2018 grainage. Pooled data indicated that, Success of grainage after laying obtained was more than 90% (i.e. 95.21%) and highest was recorded during 2018 (97.01%) grainage. Hence, pooled data trend for cellular examination indicated that cellular examination of each mother moth is very useful in success of grainage activities as compared to mass examination (Fig. 1&2). This is due to keeping of each mother moth in small paper box separately and remarkable result was achieved for the success of grainage activities in

Oak tasar. In India, we have separate seed organization for mulberry silk worm (NSSO), Tasar silk worm (BTSSO) and muga and silk worm (MSSO) but there is no such separate organization available for Oak tasar seed organization. To produce a greater number of quality Oak tasar dfls is very much necessary. Now days, availability of oak tasar seeds for commercial rearing is in scarcity as compared to other type of silk worms seeds. Therefore, technique of cellular examination with help of a small paper box may be the paradigm shift in Oak tasar grainage activities. Similar results were observed by Kumar (2017), Dinesh Kumar (2012), Ahsan, (1974) and Dash *et al.* (1993) in tropical tasar activities.

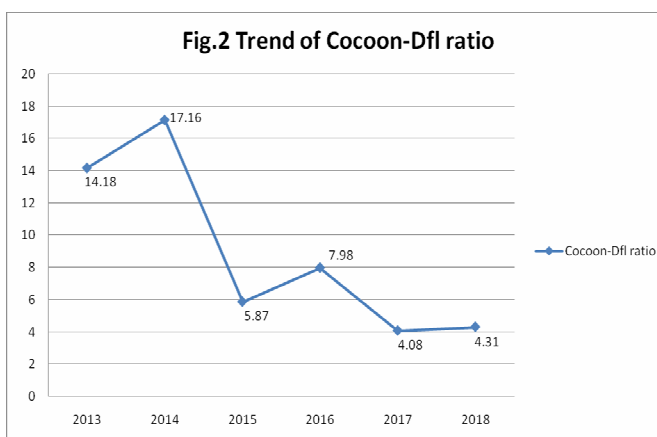
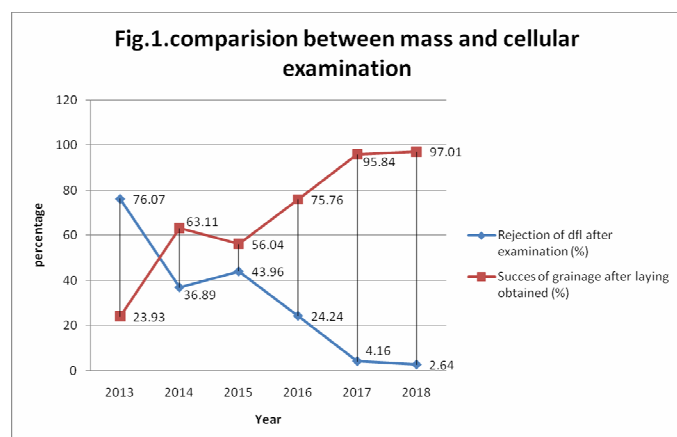
Conclusion

Pooled data of mass examination and cellular examination indicated that, cellular examination resulted with decrease in cocoon-dfl ratio (from 13.64:1 to 4.36:1), decrease in rejection of dfl's after microscopic examination (from 51.74% to 4.50%) and increasing trend in success of grainage after layings obtained (from 48.26% to 95.21%). This trend clearly indicated that, cellular examination of mother moth was very much helpful for production of oak tasar seeds and successful grainage activities. It will help to increase the commercial production of the Oak tasar industry in India, which leads to indirect benefit to farming communities, scientist, students and other stake holders who are in connected with Oak tasar industry. Finally, it will definitely overcome the shortage of Oak tasar seed production in India, since oak tasar seed is very precious as compared to other silk worm seed sector.

Table 1: Comparison between mass examination and cellular examination of the mother moth

Sl.No	Year	Mass Examination				Cellular examination			
		2013	2014	2015	Pooled	2016	2017	2018	Pooled
1	Cocoons processed (No's)	7800	31859	5178	44837	2396	13652	12862	28910
2	Pairs obtained (No's)	2298	2941	1572	6811	396	3519	3490	7405
3	Laying rejected (poor)	0	0	0	0	0	31	415	446
4	Laying obtained (No's)	2298	2941	1572	6811	396	3488	3075	6959
5	Rejection of dfl's due to disease after microscopic examination (Bacteria, Pebrin etc) (No's)	1748	1085	691	3524	96	145	92	333
6	Dfl's prepared (No's)	550	1856	881	3287	300	3343	2983	6626
7	Cocoon-dfl ratio	14.18:1	17.16:1	5.87:1	13.64:1	7.98:1	4.08:1	4.31:1	4.36:1
8	Rejection of dfl's after microscopic examination (%)	76.07	36.89	43.96	51.74	24.24	4.12	2.64	4.50
9	Success of grainage after laying obtained (%)	23.93	63.11	56.04	48.26	75.76	95.84	97.01	95.21

Data: REC, Palampur Grainage report from 2013 to 2018.



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