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Importance of mechanization in sericulture industry

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Abstract

Sericulture is a cottage based rural industry comprising of three different but inter-related sectors namely, moriculture, silkworm rearing and post cocoon sector, which involves mulberry cultivation for rearing of monophagous silkworm *Bombyx mori* L. and the ultimate aim is to produce the quality raw silk. As it is a cottage based industry, use of machines is limited due to high installation cost. But there is the utmost importance of mechanization in each and every sector of the industry. China being the number one country in Sericulture advocated the implementation and importance of various machines and equipments in almost all sectors of the industry, resulting in maximization of production with high grades. In India, recent developments have been made for the utilization of machines in the field of sericulture in order to improve the productivity level. Thus in this review an attempt has been made to throw some light on role of various equipments and importance of mechanization in sericulture industry.

Keywords: Sericulture, moriculture, mechanization, production

Introduction

Sericulture is an eco-friendly and rural industry comprising of three different sectors namely, moriculture, silkworm rearing and post cocoon sector. These sectors are inter-related involving the cultivation and maintenance of host plant mulberry for quality leaf production which is utilized in rearing of monophagous silkworm *Bombyx mori* L. forming the protective covering known as cocoon from which raw silk is obtained through various processes in post cocoon industry and silk yarn is produced out of it which undergoes several processes of throwing, weaving, knitting and dyeing etc. to make the final product the silk fabric. As it is a cottage based industry, use of machines is limited due to high installation cost. In India, Sericulture is mainly practiced by the weaker section of the society and the implementation of highly sophisticated technology is quite difficult because of high input cost of it. China ranks number one in sericulture and accounts for about 90 per cent of world's total silk production. The reason can be attributed to the implementation of various machines and equipments in almost all sectors of the industry, resulting in maximization of production with high grade. India ranking second after China in total production has the monopoly to produce all the four different types of silk namely mulberry, tasar, eri and moga. Owing to the potential of sericulture industry in India, recent developments have been made for the utilization of machines in various fields of sericulture in order to improve the productivity level. The economics, role and importance in different sectors of sericulture are described here under three headings:

Mechanization in Moriculture

Moriculture forms the base of silk industry as it involves the cultivation and maintenance of primary host plant of silkworm *Bombyx mori* L. First step in mulberry cultivation is preparation of land. Mulberry is a deep rooted perennial plant and has the ability to survive under different soil types. Soil for mulberry should be deep, porous and well prepared to ensure sufficient aeration and supply of nutrients, minerals and water to root zones. Different types of machines used in preparation of land and other operations of mulberry cultivation are discussed below;

1. Machines for making pits

a). Tractor operated sub-soiler: It is a farm-implement used for deep tillage in order to break up and to loosen the soil at depth below the levels worked by ordinary plough and disc harrows etc. this tillage tool has typically only one thin blade with sharpened tip.

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Efficiency: It has the ability to break up and turn over surface soil to a depth of 30-40 cm and efficiency of 4000 sq m/hr.

b). Tractor Operated Auger Digger: used for making pits and mainly employed in pit system of mulberry plantation.

Efficiency: 25 pits/hr.

3. Mulberry Cutting Preparation Machine: used for preparing mulberry cuttings of uniform size.

Efficiency: 1200 cuttings/hr

4. Irrigation equipments

Sprinkler irrigation,
Drip irrigation

5. Machines for inter-cultural operations

a) Power Rotavator, Cultivator and Weeder: Inter-cultural operation can be carried out with the help of machines like Power Rotavator, Cultivator and Weeder etc. They are easily available at affordable prices or can be hired and with very little adjustments can be used in different types of mulberry plantations including pit, row, tree or bush plantation etc.

Efficiency: 2000 sq m/ hr

6. Knapsack Mulberry Pruner cum Harvester: Knapsack Mulberry Pruner cum Harvester are used by the sericultural farmers for fast harvesting of mulberry leaves as well as appropriate and faster pruning also.

Efficiency: 500 kg/ hr

7. Shoot Chorusing Machine

Efficiency: 500 kg/ hr

2. Power Operated Sprayer for application of chemicals

a) For use in mulberry gardens: various types of hand as well as power operated sprayers are employed for spraying chemicals in mulberry field and also in rearing room for the purpose of complete dis-infection. The most commonly used are knapsack compression sprayer, power operated mist blower, self propelled, power tiller and tractor operated sprayers which are employed in the mulberry gardens for spraying chemicals.

b) For use in rearing house: CSRTI Mysore has developed a power operated sprayer for disinfection of rearing house. The sprayer has a ½ hp electric pump set or a twin piston HTP pump.

Efficiency: it is suitable for disinfection of rearing house with capacity of 400 or above dfls

c) Flame gun: it is an ecofriendly, cheap and best tool used for disinfecting the incubation, rearing, storage rooms as well as rearing equipments and mountages etc. Disinfection is carried out by means of fire flames and LPG is used as fuel. It can also be employed for floss removal for various types of mountages.

Mechanization in Silkworm rearing

1. Chawki Leaf Chopper

Efficiency: 200 kg/ hr

2. Semi-humidifier cum heater: This machine is designed by CSRTI Mysore with unique feature that it can be used as a heater and as a humidifier according to the requirement of the rearing room.

3. Young Age Silkworm Dusting Machine and battery operated duster: designed by CSRTI Mysore for dusting of bed disinfectants. It reduces the chances of health hazards to the operators as it insures the minimum flying of the dust or powered chemicals. In addition to this more number of trays can be treated in short span of time.

Efficiency: 400 trays/ hr

4. Mechanical Silkworm Picking Equipment and matured silkworm separator: it can be employed for separation of fully grown or matured silkworm larvae from mulberry twigs or rearing trays thus facilitate the picking up for larvae and transfer to the mountages. It also reduces the risk of injury to the worms.

Efficiency: 40-50 dfls in one hour.

Mechanization in Post Cocoon Sector

1. Rotary Mountage

2. Cocoon Harvester: in order to speed up cocoon harvesting from mountages such as rotary mountage CSRTI Mysore has developed cocoon harvester having handle and pedal operated system.

Efficiency: Hand operated harvester: 25-50 frames/hr and foot operated harvester: 50-60 frames/hr.

3. Cocoon Defloser: floss forms the outermost layer of the cocoon and it should be removed prior to the process of reeling. Mostly it is done manually the farmers, which is time consumable process. Recent developments in mechanization have introduced the use of i) hand operated, ii) hand operated cum motorized and iii) fully motorized deflosing machines.

Efficiency: i) hand operated defloser: 25-30 kg/ hr, ii) hand operated cum motorized: 50-60 kg/hr and iii) fully motorized deflosing machines: 75-80 kg/hr.

4. Plastic Tray Washing Machine: this can be employed for washing of plastic trays as it ensures complete disinfection of the trays.

Efficiency: 120 trays/ hr

5. Cocoon Cutting Machines: this can be employed for cutting of cocoons for sex determination in grainages and estimation of commercial characteristics of cocoon including cocoon weight, shell weight and cocoon shell ratio etc.

Efficiency: 5000 cocoons/ hr

6. Power Operated reeling machine: various types of reeling machines are used in present era of sericulture industry. Some important ones are mentioned as below:

a) Sitting type reeling machine: it may be either foot operated or motor driven but the later is not provided with the stop motion attachment. This hinders the production of high

quality raw silk as the silk thread is wound too rapidly to maintain the quality control.

b) Multi-ends reeling machine: it ensures reeling of high quality raw silk by eliminating the limitations of the sitting type of reeling machine by increasing the number of reeling thread ends per basin by twenty folds as well as increasing the reeling speed of the machine. This is also called as Standing type of reeling machine.

c) Automatic reeling machine: this machine is designed in such a way that it mechanizes all the processes of grouping ends, picking ends, cocoon feeding to reeling threads and separation of dropped end cocoons during the reeling process. The only limitation with automatic reeling machine is that it requires manpower to overcome the problems with reeling thread that needed to be corrected by hands.

Conclusion

Mechanization in sericulture involves the use of farm tools, equipments and machineries for preparation of land for mulberry cultivation, maintenance of plants through training and pruning, harvesting of leaves, proper storage of leaves, equipments of disinfection, silkworm rearing appliances and mainly the industrial part i.e. the post cocoon sector involving reeling, weaving and manufacturing of silk fabric. Some factors reflecting the importance of machines in sericulture industry are briefly summarized below:

- Mechanization is of utmost importance for increasing the productivity of land and labour
- Managing various mulberry cultivation and silkworm rearing activities within stipulated period of time
- Getting more precised work in post cocoon sector where the core activities require machines
- Improving the quality and quantity of silk fabric produced as the ultimate output.

In India, 65-70 per cent cost of the cocoon accounts for labour wages involved in various sectors. Therefore, there is a need to reduce the labour dependency to reduce the cost of cocoon production.

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