

Mechanization of Lac Production - Vision and Challenges

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ABSTRACT

Lac production is an important source of income for the farmers of the Chottanagpur plateau region. These economically poor farmers are not able to afford for costly equipment. Due to limited use of locally made agricultural machines and equipment; more human labour is used for lac production operations. There is a shortage of agricultural labour in rural areas. They have migrated to factories, mines and urban areas. Use of low cost equipment/ machines in lac production will overcome the labour problem and will reduce human drudgery. The paper briefly discusses the different lac production operations, equipment used and the scope for further development.

Introduction

Lac is secreted by the tiny lac insect (*Kerria Lacca Kerr*). It is ovate in outline, slightly more pointed at the posterior (Fig. 1), soft-bodied, crimson in colour and very small in size, usually 0.6 mm long (excluding the antennae and caudal setae) and 0.25 mm wide across the thorax. Only the female insects secrete lac. It is the only resin from an animal source and it possesses certain peculiar properties that make it a versatile natural resin lending itself to diverse application, e.g. as a protective and decorative coating in the form of thin films, adhesive and plastics. India is a major producer of lac and export to several countries like Indonesia, U.S.A. and Germany (Mukhopadhyay and Muthana, 1962):

In India, although lac production is undertaken in a wide area, but it is concentrated in the tracts comprising Chotanagpur in Jharkhand, Chhattisgarh and part of W.B., Eastern Maharastra, Northern Orissa and Assam. Small pockets of lac production are also found in A.P., Tamil Nadu, Karnataka, Punjab, Rajasthan and U.P. (Krishnaswami, 1960).

Lac production involves pruning, inoculation, *phunki* removal, harvesting and

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lac scraping. Farmers perform these operations manually using traditional equipment, which require more human labour and need modification to increase their efficiency and ultimately the production.

Methodology

To study the status of mechanization in lac production a survey was conducted on 84 farmers belonging to three districts of Jharkhand (Ranchi, Gumla and Hazaribagh) and one from W.B. (Purulia). Each farmer were given proforma and asked to list the equipment used by them for different lac production operations and

Table 1. Equipment and methods used for different lac production operations by farmers.

Operations, methods & equipment	Adpoted by farmers (%)
Pruning	
Pruning knife (Dauli)	84.5
Axe	79.6
Secateur	1.2
Sickle	1.2
Bolba	1.2
Broodlac placement	
Climbing on tree	65.5
Bamboo V shape hook	57.1
Ladder used for tree climbing	3.6
Cloth bag to carry broodlac	15.5
Phunki removal	
Climbing on tree	71.4
Bamboo hook	40.5
Ladder used for tree climbing	2.4
Cloth bag to carry <i>phunki</i>	14.3
Insecticide/pesticide application	
Not used	92.8
Mechanical sprayer	3.6
Manual spray	3.6
Harvesting	
Pruning knife (Dauli)	78.6
Axe	57.1
Bolba	1.2
Secateur	1.2
Scraping	
Pruning knife (Dauli)	42.8
--- do --- small	52.4
Knife	33.3
Baithi	4.8
Sickle	4.8
Secateur	3.6

Note: Sum of percentages > 100 implies that some farmers used more than one equipment for the respective operation.

Table 1. Equipment and methods used for different lac production operations by farmers.

S.No.	Category	Holding size ha	% farmers
1.	Marginal	< 1	33.3
2	Small	1-2	36.9
3	Semi-medium	2-4	15.5
4	Medium	4-10	8.3
5	Large	> 10	6.0

Results and Discussion
It is evident from Table 2 that 70.2 % farmers were either small or marginal having less than 2 ha of land and majority of them were poor, which was a major hurdle in mechanization. However it is evident from Table 1 that 92.8 % farmers wanted development of new equipment for lac production.

Pruning

Pruning is an important and essential operation and can be compared to the tilling of the soil prior to the sowing of seeds. It induces the tree to put forth maximum number of shoots in suitable condition for successful colonization by the lac larvae. For young plants no particular preparation is required to receive their first infection since there is an abundance of tender shoots. For older plants, however, a process of pruning is to be observed prior to infection in order to stimulate the production of fresh and succulent branches. Ordinarily, branches less than 2.5 cm diameter are advisable to be pruned.

About 79.7 % of the farmers did pruning with axe (Fig. 2) and this may explain to some extent the thickness of the branches cut. Proper pruning cannot be done with an axe. If branches of the thickness recommended are cut with axes they will either break or split. About 84.5 % farmers used sharp edge knife (*dauli*, Fig. 3) for pruning, which is better than the axe for pruning but here also the perfection lacks. Only 1.2 % farmers used secateurs for pruning. Some farmers also used sickle (Fig. 4) and *bolba* (a protection equipment, Fig. 5) for pruning.

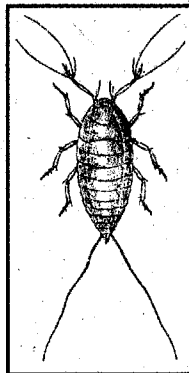


Fig. 1. Lac insect

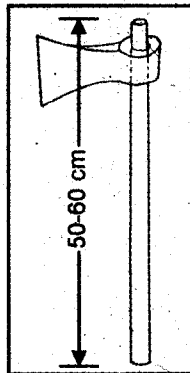


Fig. 2. Axe.

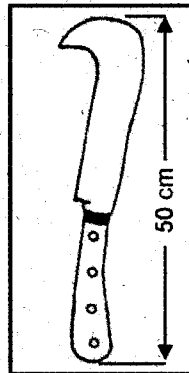


Fig. 3. Pruning knife.

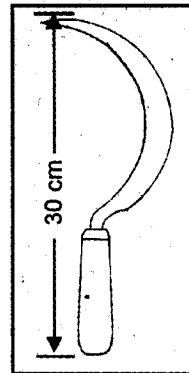


Fig. 4. Sickle.

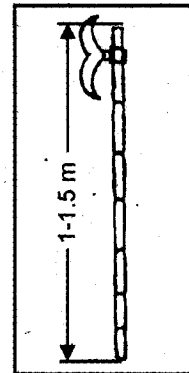


Fig. 5. Bolba.

The ideal pruning instruments are long handle tree pruner (Fig. 6) and secateurs (Fig. 7). The long handle tree pruner is most suitable for pruning. This type of pruner is simple in construction and could easily be made by village black smith if he has a sample to copy (Glover, 1937).

There is scope of improvement in the existing long handle tree pruner by increasing its mechanical advantage by changing the leverage mechanism. There is also scope of making power operated tree pruner with rotary cutting blade operated by small battery driven motor.

Inoculation (Infestation)

Introduction of lac insects on to a lac host is known as inoculation. A bundle of lac-bearing twigs known as broodlac (Fig. 8) is tied to an uninfected tree on which tender new shoots are plentiful. The broodlac produces larvae, which settle down on young branches of the tree. In existing practice, inoculation is mostly done manually. About 65.5% farmers climb on the tree on suitable branches and either tie broodlac bundle with the string or simply place on the suitable branches. About 57.1% farmers used bamboo made V-shaped at the top (Fig. 9) for placing broodlac bundle on branches of the tree. In some cases farmers (3.6 %) used ladder to reach up to suitable branches of the host tree to place broodlac. Thus the process is slow and laborious. There is need to develop suitable instrument for broodlac bundle placement so that the process becomes faster and less cumbersome.

Phunki (used up broodlac sticks) removal

Brood lac stick left on the tree after insect emergence, is popularly known as *phunki* lac. When broodlac is allowed to remain on trees even after emergence, adult of harmful insects might invade new crop. Therefore timely removal of *phunki* is necessary to prevent carryover of pests to new crops. In existing practice 71.4% farmers remove *phunki* from tree manually, which again requires climbing on the tree. Some farmers also use inverted J shaped cutting hook (Fig. 10) mounted on a bamboo-pole for pulling down the *phunki* bundles from ground level, thus avoiding tree climbing. As bundles fall on the ground, lac encrustation gets separated from sticks partially due to impact and is lost. About 2.4% farmers used ladder to climb on the tree and remove the *phunki*. There is scope of improvement in the *phunki* hook so that it removes the bundle from tree branches and traps it, not allowing falling on the ground.

Lac Harvesting

The removal of mature lac encrustation along with stick by cutting lac stick is known as lac harvesting. Nearly 78.6 % farmers harvested crop with the help of axe

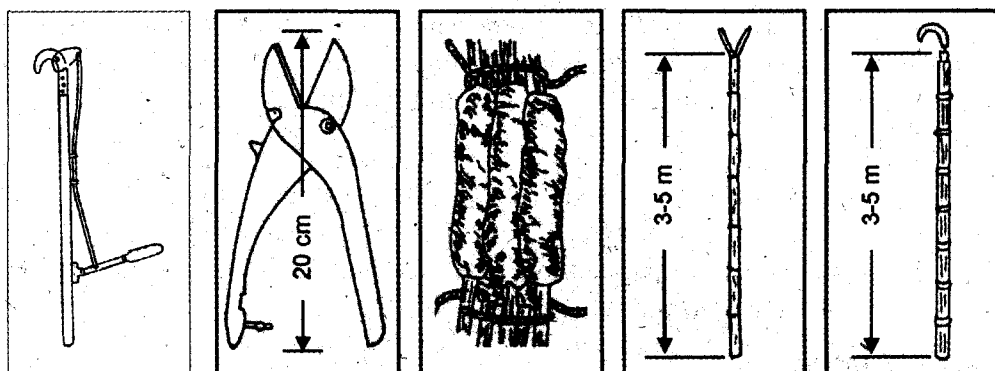


Fig. 6. Long handle pruner.

Fig. 7. Secateur.

Fig. 8. Broodlac bundle

Fig. 9. Inoculation tool.

Fig. 10. Phunki hook.

and 53.1% with pruning knife (*dauli*). A small percentage of farmer used secateur for harvesting. The use of axe for harvesting is unsuitable as it leads to cracking or splitting the branches. Further, for use of either axe or knife farmers climb on the tree, which makes harvesting process slow and laborious.

Lac Scraping

Lac scraping involves removal of lac encrustation from lac stick. Farmers scrape lac from lac sticks using traditional tools like pruning knife (*dauli*), sickle (Fig. 4) and vegetable cutting equipment (*baithi*, Fig. 11). Among these tools, small pruning knife (*dauli*) was used by nearly 52.4% farmers and *dauli* by 42.8 % farmers. The process is very tedious and slow. It involved sitting on the ground in a group and scraping by means of special type of knives. Lot of impurities such as sand, dirt, stick pieces etc. also get mixed with scraped lac.

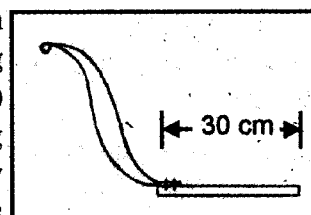
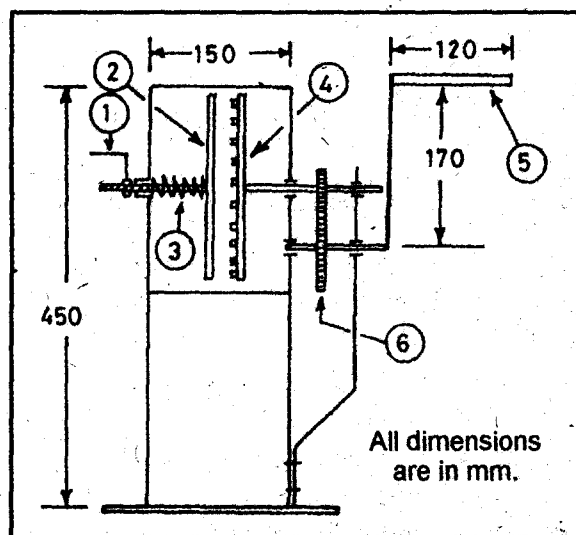


Fig. 11. Baithi.

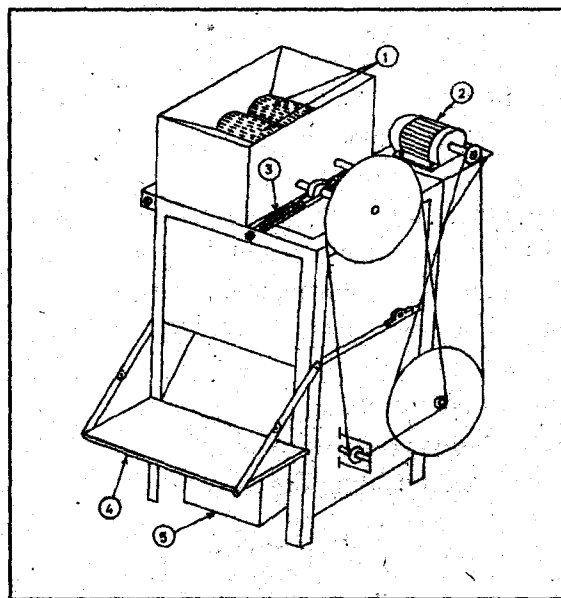
A disk type manual lac-scraping machine (Fig. 12) was developed by the Agricultural Engineering Department, Birsa Agricultural University, Ranchi. The machine scrapes 5 kg lac sticks in an hour and separates about 93.7% lac from lac stick. One person is required to operate the machine. There is scope to develop roller type manually operated lac scraping machine.

A power operated lac scraping-cum-grading machine (Fig. 13) was developed by the Central Institute of Post Harvest Engineering & Technology, Ludhiana (Anon., 1998). The machine scrapes about 20 kg lac sticks in an hour and separates about 92% lac from lac stick in two passes. The scraping machine also crushes the scraped lac and separates it in three grades (> 20 mesh, 20-30 mesh and < 30 mesh). Two persons are required to operate the machine. Power is supplied to the machine by a



1: Disk gap adjusting lever; 2: Stationary disk; 3: Spring; 4: Scraping disk; 5: Operating handle; 6: Gear.

Fig. 12. Disk type manual lac scraper



Overall dimensions: (LxBxH) = 0.9x1.0x1.8 m.
1: Scraping rollers; 2: Motor; 3: Scraping roller gap adjusting spring; 4: Platform; 5: Grading section.

Fig. 13. Power operated lac scraper-cum-grader.

1.5 kW 3-phase A.C. motor. Though efforts were made but this machine could not be popularized. Non-availability of electricity in villages and high cost are the major bottleneck in popularization.

Conclusions

- Lac growing farmers use locally made traditional equipment.
- Nearly 92.8% farmers were of the opinion that new equipment should be developed for lac production along with modification in existing equipment in use.
- Lac growing farmers are economically poor which makes the task of scientists challenging. Special attention needs to be given while developing equipment, which are affordable by the resource poor farmers.

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