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## Leech Farming: An Overview Over Leech Breeding and Multiplication.

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## ABSTRACT:

**Introduction:** There are various descriptions regarding blood letting or *Raktamoksha* using leeches (*Jaloukavacharana*) in ayurvedic classics. *Acharya Susruta* considers *Rakta* as the fourth *Dosha* and mentions *Raktamoksha* as a *Shodhana karma* (purificatory therapy) and is indicated in many diseases with vitiation of *Raktha*. As a matter of time, leech therapy is becoming more popular due to its benefits but there is no known established reliable suppliers of leeches for medical needs especially for medical purpose, maintenance of leeches in adequate environment, reproduction of leeches and storage of leeches on a large scale.

**Materials and Methods:** This study is based on analysis of classical ayurvedic texts, modern books and internet sources. Some help was also been taken from previous articles published on the same topic. All the relevant information are compiled here.

**Result :** Parameters for successful leech farming are studied and application of these facts can improve leech farming and thus ensure increased availability of leeches for medical needs.

**Discussion:** The increased demand of leeches and its lesser availability forms a challenge especially in extreme weather. Basically, leech farming is a research topic and also an innovative idea for ayurvedic scholars. Leech farming provides special knowledge regarding selection and breeding of leeches

**Keywords:** Hirudi culture, Leech, *Jalouka*, Hirudotherapy

## INTRODUCTION

The practice of bloodletting by leeches (*Jaloukavacharana*) is a well known treatment modality from ancient period till now. This is still practiced in various medico surgical conditions or diseases. The species of leeches used for medicinal purpose is *Hirudo medicinalis*. In various regions *Hirudo verbena*, *Hirudo*

*orientalis*, *Hirudinaria granulosa* are also being used as per their availability. *Hirudo medicinalis* is the leech mostly used in plastic and reconstructive surgery.<sup>1</sup>

Leech therapy is a result oriented therapy and is specially indicated in hypertension, varicose veins, hemorrhoids, gonarthrotic, and secondary ischemia related dermatosis.



Joint diseases such as osteoarthritis and epicondylitis, extremity vein diseases, and flap surgery (skin grafting) are major indications for medical leech therapy. Medical leech therapy is also useful for soft-tissue and periorbital hematoma, purpura fulminans, macroglossia, penile replantation, postphlebotic syndrome, and ecchymosis<sup>2</sup>. Due to its wide range of indications, the demand of leeches is continuously rising among clinicians. It is a challenge to make permanent availability of leeches at every clinic or health centre. Till now, there is not any known reliable vendor, who could supply specified leech continuously. Although the popularity of leech therapy is increasing day by day, the scientific research work regarding leech farming and its dissemination hindered due to no frequent availability. This scenario demands studies in leech farming. Standard parameters for leech farming has to be made and practical application of these can improve leech farming techniques that can further ensure availability of good quality leeches for medical needs.

## MATERIALS AND METHODS

This study is based on analysis of classical ayurvedic texts, modern books and internet sources. Some help was also been taken from previous articles published on the same topic. All the relevant information are compiled here.

Successful leech farming practice requires a suitable environment for leech breeding. Following requirements are needed for leech farming.

1. Air conditioner
2. Plastic pans
3. Water purifying system
4. TDS meter
5. PH meter
6. Farm
7. Pumping fittings
8. Aquarium
9. Prevention of leech escaping
10. Heating, cooling and humidifying system.

### Don'ts In Leech Farming

Temperature above 18 degree Celsius after 10 days feeding.

No disinfection of water

Presence of chlorinated water

Lack of water in storage tanks

PH below 5 and above 6

Lack of oxygen in water

Fluctuations in water of storage tanks

No foreign matter such as salt and doxycycline should be added to water up to one week after feeding.

### Breeding Techniques For Leeches

There are 3 breeding techniques for leech breeding.

1. Breeding in laboratory conditions
  2. Intensive breeding in artificial ponds
  3. Semi intensive breeding in natural ponds
- Semi intensive breeding in natural ponds is the cheapest method in which breeding is monitored in natural ponds and enough food is available in natural environment. Intensive breeding in artificial pond requires construction of an artificial environment with adequate water, temperature, pH and other facilities. Adequate food should be provided to prevent leech loss. Laboratory breeding is suitable in cold countries because leeches prefer warm environment, it requires proper care and vigilance, it is considered as the best way to breed hygienic leeches for human use.

### Leeches And Leech Therapy

In Ayurveda, the descriptions of leeches and leech therapy is detailed in *SusrutaSamhita, Sutrasthana chapter 13. Jaloukavacharana* (leech therapy) is described as one among parasurgical procedures. The *Jalouka* of ancients are leeches and their application in clinical practice is known as *Jaloukavacharana* or leech therapy. The taxonomic position of leech in animal kingdom is phylum annelida and class hirudinea. These are segmented worm like sanguivorous, hermaphrodite organisms commonly found in ponds, freshwater etc. The average lifespan of leeches is maximum of 10 years and depends upon various factors. Leeches have good reproduction capacity and growth mature rate period is 6 to 12 months. They copulate in annual season during march to April.<sup>1</sup>

The most important feature in leech therapy is that leeches inject Hirudin, an anticoagulant substance present in its saliva into human circulation. Treatment that involves using medicinal leeches is collectively referred to as a hirudotherapy<sup>3</sup>. Due to the anaesthetic effect, bite of leech is painless. Leeches inject an anticoagulant serum into human blood that prevents blood clotting. Leeches engorge itself until it has had its fill and then it fall off. The time for bleeding from the site of leech bite varies upon different factors. It can even bleed for 10 hours. Recent studies shows that by extracting anti clotting serum from leeches, these can be used in eventual treatment of heart diseases. Leech therapy is used to stimulate circulation, reduce blood coagulation, and get relief from venous pressure. The

therapeutic importance of leeches is steady and continuous blood flow is maintained after their detachment from the skin. Sometimes there are mild complications to leech therapy like allergic reactions, infections at attached site, and excess bleeding.<sup>3</sup>

Ayurveda classics mention *panchakarma* as main protocol for elimination of diseases. *Raktamokshana* is one among *panchakarma*. According to *Acharya Susruta*, *Raktamokshana* is of 2 types, *Sastrakrita* (by using instruments) and *Asastrakrita* (without using instruments). *Jaloukavacharana* or leech therapy is one among *Asatrakrita raktamoksahana*. Leech therapy provides an easy and invasive means of treatment by its bloodletting property in a variety of conditions.<sup>4</sup>

### Types Of Leeches

There are 3 broad classification of leeches.

1. Freshwater leeches
2. Marine leeches
3. Terrestrial leeches

Freshwater leeches are found in shallow water of ponds, streams, lakes and rivers. The medicinally important leech ‘*hirudo medicinalis*’ is a freshwater leech. They increase blood flow to a reattached appendage. These leeches have saliva containing anaesthetic and anticoagulant properties which keeps blood flowing painlessly from the patient.

Marine leeches feed on aquatic life forms that dwells in ocean depths. They feed on bony or cartilaginous fish.

Terrestrial leeches are found on land. Highly humid environment is needed for such leeches to survive. They need high amount of moisture in environment to maintain their protective covering of mucous. They are found in moist areas of rainforests in South America, Africa and Asia. Such types of leeches are adapted to live in land but can survive for shorter period in submerged water. If conditions are quite dry, they can burrow in mud and aestivate there until moisture revives them.

### Reproduction And Lifecycle of Leech

Leeches are hermaphrodite<sup>4</sup> organism( having both female and male sex organs) that mate in spring season (june to august). Like earthworms they also have clitellum, a region of thickened skin which is only obvious during the reproductive period. Mating involves intertwining of bodies where each deposits sperm in the others clitellar area. The sperm then moves to the ovaries where fertilisation takes place. The clitella secretes a tough gelatinous cocoon which contains nutrients ,and it is in this that the eggs are deposited. The leech shrugs itself free of

cocoon ,sealing it as it passes over the head. The cocoon is either buried or attached to a rock, log or leaf and dries to a foamy crust. As weeks and months passes, the young emerge as miniature adults. Leeches die after one or two bouts of reproduction.<sup>4</sup>

### Types Of Leeches According To Age And Size

- 1.Larvae ( 1 to 2 cm )
2. Needle (2 to 4 cm)
3. Match(4 to 6 cm)
- 4.Medical( 6 to 8 cm)

Life span of leeches is about 10 years. It can cocoon for up to 5 years. High cocooning ability is seen in first 3 years. The identification of young and old productive leeches is not very recognizable.<sup>5</sup>

### Leech Farming

Leech farming also called hirudiculture<sup>4</sup> is the culture or farming of leeches in both natural and artificial environments. Best varieties of leeches for leech farming are *Medicinalis* and *Orientalis*. They usually take about a year and a half from cocoon to puberty. They are usually fed from the blood of cows, sheep or frogs every two months.

### Leech Storage Pans

The volume of leech storage pans should be more than 50 litres and less than 100 litres<sup>5</sup>. A little contamination in storage pans spread quickly. Changing of water as and when needed is thus an important factor in leech farming. In the storage tanks temperature at upper part of water level is more than lower part of water level. Thus it is not recommended to move leeches from upper part to lower part or vice versa because temperature fluctuations can harm leech life. In the cocooning season mosquito net pans should be used to prevent mosquitoes from entering in to the pan and feed cocoons.

### Temperature Requirements

Leeches withstand temperature of 10-to-30-degree Celsius<sup>5</sup>. For breeding, temperature of 18 degree Celsius is adequate. At the time of reproduction, room temperature should be 25 to 26 degree Celsius and water temperature varies from 4 to 5 degrees. In leech farming the most important factor is water and as a measure the amount of total dissolved solids (TDS)<sup>6</sup> Is considered. This corresponds to total solid suspended particles in water. For maintaining adequate environment for leech farming, 50 ppm TDS is desirable. If TDS in water is above 400 ppm,

the water is not suitable for breeding.<sup>5</sup>

### Leech Nutrition

In leech farming leeches are fed with peat, soil, moss, algae and aquatic plants. They are fed from the blood of cows, sheep or frogs every 2 months. Leeches usually take 3 months to digest a meal. Negligence in leech nutrition can lead to loss of leeches in leech farming.

No foreign matter such as salt and doxycycline should be added to water up to one week after feeding.

### DISCUSSION

Leech therapy or *Jaloukavacharana* is the most popular bloodletting practise in *Ayurveda*. It is well known for its multiple benefits but due to the lesser availability of leeches, its use is limited. Leech therapy provides practical solution to skin disorders, peripheral vascular diseases, non healing wounds, deep vein thrombosis, rejected skin graft, alopecia aerata etc. it helps by increasing blood circulation and by breaking up clots. The clinical improvements observed in such cases fetch the attraction of ayurvedic and modern physicians regarding explorability of leech farming to increase availability of medically important leeches for leech therapy. For the development of this clinically important parasurgical procedure like leech therapy, availability of good quality leeches are necessary. The pilot observations reveal that environmental factors have an important role in leech breeding.

The natural water, temperature, humidity, soil, moisture, mud, shadow, oxygen, nutrients, planktons, algae, greenary etc are needed to be made available in a suitable range. Successful leech farming implies availability of quality assured leeches for medical use. Following a standard

protocol for leech farming can assure availability of good quality leeches for leech therapy.

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