

PIPER PEDICELLATUM –A PROMISING NTFP FOR ENHANCING FOREST PRODUCTIVITY IN MOIST TROPICAL AND SUB –TROPICAL FOREST AREAS

LOKHO PUNI, B.P. TAMTA AND NEELAM DHAUNDIYAL

Non Wood Forest Products Division, Forest Research Institute, Dehradun, Uttarakhand, India.

E mail: punimao@icfre.org, tamtabp@icfre.org

Introduction

The productivity of India's forest is about 0.7 m³/ha per year which is significantly below the world average of 2.1 m³/ha per year. The same is true about the average stocking level of 4 m³ compared with 113 m³/ha in other developing countries. The productivity both in timber and non-timber forest produce per unit forest area has not increased but continue to deteriorate in spite of the increased demand. It is therefore, essential to increase the overall forest productivity to meet the needs of the local people from forest areas. Non Timber Forest Products (NTFPs) are important components of subsistence living, poverty reduction and generation of revenues of the country and therefore, enrichment of our existing forest areas with NTFPs is an option to increase the overall productivity of our forests. Development of NTFPs is one of the main thrust areas of Department of Forest in the 10th five year plan (2008-2013) also. Among many NTFP bearing plants which can be planted in the forest areas under tall tree canopy, *Piper pedicellatum* which naturally grows in moist tropical and sub-tropical forest areas, is one which has the potential to be profitably utilized to meet the needs as mentioned.

Importance of the plant

Piper pedicellatum C.D.C, belonging to family Piperaceae is an erect evergreen shrub attaining to a height of 1 to 2.5 meters. It is commonly called as 'pipla'. The plant grows well in the North Eastern part of India like Arunachal Pradesh, Nagaland and Manipur. In Bhutan, 'pipla' grows widely under the canopy of broadleaf forest and also in open areas at an altitude of 200 to 2200m particularly in Zhengang and Pema Gatsel Dzongkhags, and in other sub-tropical forest areas. 'Pipla' thrives best in damp and moist soils with good overhead shade and drainage. The plant is dioecious and produces male and female flowers on separate plants. The unisexual flowers develop in axil of peltate or basifixed bract. Male flowers are with 2-4 stamens and anther cells placed side-by-side or end-to-end, sometimes confluent. Female flowers with ovoid ovary

bearing 3-5 filiform stigmas. Drupes ovoid or globose, sessile or shortly stalked. Only female plants bear round fruits that have commercial value. Flowering commences as soon as the growth of the plants starts from April onwards. It bears mature berries from August to October (Dhital *et al.*, 2008). The plants are often found growing in association with tree species such as *Acrocarpus*, *Ailanthus*, *Bombax*, *Duabanga*, *Castanopsis*, *Cordia*, *Pterospermum*, etc.

In the North East India, collection of 'pipla' from forests is a source of income for economically weaker rural population and forest dependent communities, and therefore, economically it is an important NTFP species found in forest areas. The plant has multipurpose uses.

i. Uses in medicine : 'Piper' species in particular, are widely used medicinal plant in Ayurvedic medicine for treating various ailments and so trade of the berries are mainly for this purpose. The berries of *Piper pedicellatum* is often used along with *Piper longum* commonly known as *pippali*. It contain alkaloid 'piperine'. The 'Indian Ayurvedic System' as well as the Tibetan and Bhutanese Medical Tradition, recognize 'pipla' as a powerful stimulant for the digestive and respiratory system; as a rejuvenating agent; longevity enhancer and tonic for the immune system. It is also used for treating cold and cough, asthma, hoarseness and hiccupping (Export Intensification Program for Bhutan, 2007).

ii. Uses as food : The leaves of 'pipla' are reported to be used as a vegetable in Arunachal Pradesh and Sikkim and is locally called as *lori*. The food values of the leaves from plants of Arunachal Pradesh, in percentage wise are : edible parts 75.69; moisture 82.18; ash 2.74; potassium 191.1; calcium 261.3; magnesium 63.0 and iron 11.8 mgs Bhardwaj (2005). Leaves are sometimes chewed with betel-nuts by local people. The fruits of 'pipla' have a distinctive sour, sweet and hot taste and is used as spice as well. Leaves of *Piper pedicellatum* is a winter diet of Capped langur (*Trachypithecus pileatus*) in Arunachal Pradesh, India. Studies in Madhupur forest in Bangladesh also showed that the capped langurs eat mature leaves in winter (Stanford, 1991).

Resource Development

The plant is identified as one of the threatened category and globally significant under Conservation Assessment and Management Priorities (CAMP). However, not much research work for development of this plant has been done.

Nursery Technique

Nursery technique for *Piper pedicellatum* has recently been developed at Non-Wood Forest Products Division of Forest Research Institute, Dehradun (unpublished data). The plants can be multiplied either by seeds or by vegetative means. The forest department of Arunachal Pradesh has also studied the nursery practices of this plant and produced a small booklet. The techniques developed at FRI are described here.

i. About the seeds : Berries are green before maturity and blackish when matured. Berries from its natural habitat in Arunachal Pradesh were collected during September 2009 and studied. The size of each berry varies. The bigger berries attain a size upto 0.8 × 1.0 cm after drying. Each average sized berry weighs about 0.2g containing about 50 to 60 seeds with about 60 % viable seeds. A kilogram of dried berries of average sized 'pipla' contain about 5(five) thousand berries which can produce over 1 lakh seedlings.

ii. Multiplication through seeds : The information is based on the studies carried out at FRI by NWFP Division during 2010. The nursery establishment steps are as follows:

- Soaked the seeds in water during February end by mixing with rotten wood. In the experiment, rotten wood of *Entolobium cyclocarpum* (a leguminous tree in FRI) was used. Kept the mixture till the individual seeds from the berries can be easily separated out. It require 7 days.
- Then washed the separated seeds with water and immediately sown them on mother bed. Before sowing the seeds, separated out the floating immature seeds.
- Prepared the mother bed by mixing preferably with vermi-composts, and kept the ground always moist by watering.
- Seed germination started after 35 days when sown in the first week of March at FRI, Dehradun. Seed germination continued even after 3 month in the mother bed.
- Germination was uneven. Upto 30 % was achieved in 3 months time.
- Transplanted the seedlings in the polybags or root

trainers when they were over 1 month old and maintained it till the next season for planting. The seedlings may also be transplanted in the mother beds at a spacing of 4×4 inches from plant to plant. The seedling must be provided with adequate moisture and shade since it was a shade bearing plant.

- Plants grown from seeds were very slow growing and very sensitive to fungal infection and therefore sprayed antifungal solution on the plants.
- The nursery was provided with sufficient shade.

iii. Vegetative multiplication : Propagation can be done through nodal shoot cutting. There are three types of shoots: runner, runner shoots and shoot originating from the aerial node of the plant. All the three can be used for vegetative propagation. Runner and runner shoot give better rooting. The aerial shoot on rooting give rise to bush type plant. Plant multiplication by vegetative method is easier and more cost effective. Steps are given below:

- Runners also called stolons are developed from the mother plants during the rainy season. Runners from high yielding plants are kept coiled on wooden pegs fixed at the base of the plant to prevent shoots from coming into contact with soil and striking its roots.
- Cut the runners during Feb-March and from it prepare 1 node or 2 nodes cuttings and insert them into the soil filled polythene bags, or root trainers. They may also be planted directly in mother beds to reduce expenditure of nursery plant maintenance. One node cutting produces more plants (rooting 80%) but 2 node cuttings are more successful (rooting 90%) and growth is faster.
- Provide sufficient shade and moisture but the nursery must be well aerated and well drained. This can be achieved by mixing the soil with Vermicomposts.
- New shoots starts sprouting after 2 month.
- Aerial shoot node cuttings produce new shoots usually at the second node.
- Prepare the nodal cutting by cutting at half an inch away from the node. Insert the cutting to a depth of about half an inch length to the soil and preferably cover it with one inch thick layer of vermicomposts. Keep adequate moisture for rooting.
- The cutting is ready for field planting during monsoon rains by June-July. But it is better to keep the plants till the next season for field planting.

Post harvesting techniques

Farmers or collectors sell 'pipla' after drying. The drying method determines the quality of the product. Preferred methods for drying is soaking the berries in hot water (before boiling point) for less than two minutes, remove the water and place them to dry under the sun. These methods prevents fungal growth and give the berries a darker appearance. This treatment is likely to affect the medicinal properties of the products but the

details are not available. As per the guidelines produced by Royal Government of Bhutan (2008), people of Bhutan in Nganglim follow two different drying methods as under:

Method -1

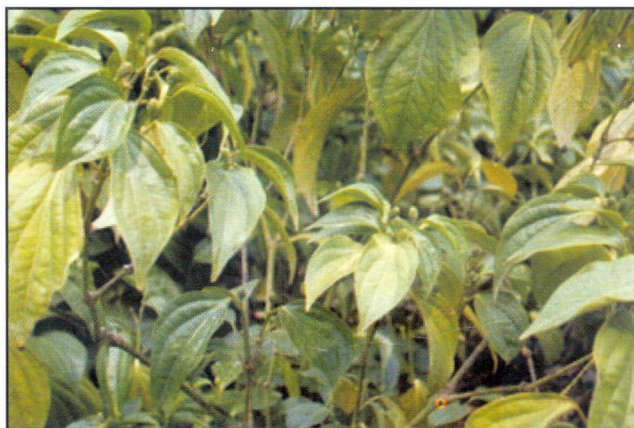
Step 1: Boil required quantity of water in a convenient pot

Step 2: Then put the berries into the hot water before

Fig. 1



Male catkins grows into a long spike.



Female flower -round in shape



Berries matures August-October.



Germination of Seeds



Encoiling of runners or stolons for multiplication



Production of planting materials from stolons

the water reaches boiling point

Step 3: This then is stirred slowly for maximum two minutes and then takes it out before boiling

Step 4: They are then dried in the sun

Method – 2

Dry the berries directly in the sun without any hot or heat treatment

Drying of the products under method-1 as above require only two to three days. Drying under this condition gives the berries a dark colour, hard and durable and no fungal infection takes place. The physical quality of the berries is also maintained for a longer period of time. Whereas, under method-2 drying of the berries takes up to twenty days and even though, the black colour is maintained, it is not durable and is prone to fungal attack in a short time.

Production in the North Eastern states

Plucking of the berries has been a main source of income for rural farmers. Due to rampant practice of shifting cultivation in the North East forest areas, the region has lost a vast extent of its habitat. People in the Kheng region of Bhutan have been harvesting 'pipla' since 1960 for sale in Indian markets. Indian traders living in border towns of Bhutan have for a long time shown interest in 'pipla' from Bhutan (Namgyel, 2005). However, the trade on this forest product is uncertain and not stabilized.

Table 1

Fluctuation in quantity of production in Manipur, India.

Year	Production in Kgs
1999	15,969
2003	43,9400
2009	3,309

Source: Statistical bulletin of Manipur Forest Department (2009).

Table 2

Fluctuation in price in Bhutan.

Year	Price in Nu* per kg
1998	90
2000	60-65
2006	20-35

*Bhutanese Nu is equivalent to Indian Rupee

Source: Ph.D.Thesis of P. Namgyel, The University of Reading

Production of 'pipla' in Manipur during 1999 was 15,969 Kg and 3,309 Kg during 2009. In Manipur, 'pipla' is traded in the name of long pepper locally known as

'Uchithi'. Total berries are collected locally as well as from neighbouring countries like Myanmar. Collection quantity from forest areas fluctuates with market price over the years.

In the NE areas, the selling price of 'pipla' ranges from ₹ 60 to 100 per kg of dry berry. The berries are collected or picked by hand from forest areas without disturbing or destroying the plant. Fruit or berry harvesting like this has the least ecological problems. The plant increases in number through runners or stolons and maintain a bush type. As per experience, the berries have long shelf life and can be stored in jute bags for few years after proper drying. However, only limited or no scientific study on post harvest techniques, especially the retention of the active principles of the berry have been made. 'Pipla' is mainly sold to the middlemen who either auction it or sell directly to them or by bartering in case of Bhutan.

The market for 'pipla' fluctuated strongly over the decade. In the neighboring country Bhutan, in the year 1998, collectors sell their products for Nu.90 per kg. In the year 2000, 'pipla' fetched a price of Nu.60-65 per kg, while in 2006, prices were as low as Nu.20 to 35 per kg for the collectors. The market for *Piper pedicellatum* is not secure. It is reported that during a marketing survey carried out by the Agricultural Marketing Services in 2007, buyers in India stated that they were interested in purchasing both 'pipla' species for Nu.150 per kg for *Piper longum* and Nu.75 for *Piper pedicellatum* with a minimum quantity of 1000 kg. For a period of two years (2006-2007), a private company Bio-Bhutan provided organic certified 'pipla', which was managed and collected by the Nangkor Pipla Management Group in Zhemgangin south-central Bhutan. Certification was carried out by INDOCERT, a certification agency based in Kerala (India) in accordance with EU regulation. Bhutan has developed sustainable harvesting procedure for this species (Royal Government of Bhutan, 2008).

Forest Enrichment plantation and Domestication possibility

Piper pedicellatum was introduced and tried out at NWFP Division nursery area of Forest Research Institute, Dehradun in Uttarakhand, India. The plants were brought from Arunachal Pradesh (North Eastern India) and was planted at the NWFP Nursery during 1990s. It was adapted well with the local environment and growing normally. The plant produced matured berries during August-October. However, planting in forest areas on a larger scale has not been attempted so far. Even though resource assessment and management has been developed in neighboring country Bhutan, Forest

enrichment intervention has not been tried. This species has the potential to be utilized as a forest enrichment species in natural forest, or in plantation forest areas as well.

Increasing the productivity of forests is a requirement of our country. However, information on forest enrichment techniques or species utilized in enrichment planting are still inadequate. The species is a shade tolerant plant having a wide adaptation range and therefore, the species can be tried in other parts of the country also. The plant is not browsed by cattle even though it is used as a vegetable. They are shallow rooted plants and have less competition with the growth of other tree species. The evergreen aerial parts provide good ground cover of the forest and check soil erosion. Once planted, it continues to multiply itself through runners and covers the forest floor. There is possibility of inducing continued interest among rural masses in preservation of existing forest by managing NWFP bearing plants such as this.

Conclusion

Collection of 'pipla' from forests generates employment especially among women. One person can collect even up to 30kgs of fresh berries in a day from forest areas depending on the abundance of the plant. However, information on its cultivation or domestication is so far, not available. Enrichment of the natural forest areas or planting in the forestry plantations with this species even outside its natural habitat has a promising future for employment generation and income to the rural masses. This will in turn, contribute to the increase in overall productivity of moist tropical and sub-tropical forest areas. This species being able to grow well under shade, can be a suitable candidate for preparing carbon sequestration projects in forest areas. Domestication and cultivation of this species is being tried under tree plantations at Dehradun under a project on trials for increasing NWFP productivity. More information can be obtained from NWFP Division of Forest Research Institute, Dehradun, Uttarakhand.

SUMMARY

Piper pedicellatum C.D.C, belonging to family Piperaceae is an erect evergreen useful under shrub of moist tropical and sub-tropical forest areas. The plant commonly known as 'pipla' in its natural zone in the North East India. Among many NTFP bearing plants which can be planted in the forest areas under tall tree canopy, this plant is one which has the potential to be profitably planted for its fruit or berry used as spice and in Ayurvedic preparations, to enrich the existing forest areas. This will help to generate employment and income to the rural masses. Nursery techniques, post harvesting treatments, importance of the plant and market potential of the species is presented in the paper.

Key words : *Piper pedicellatum*, Pipla, NTFP, Nursery technique, Forest Enrichment.

आर्द्र-उष्ण और उपोष्ण वन क्षेत्रों की वनोत्पादकता बढ़ाने वाला एक संभावना वाली गैर-प्रकाष्ठ वनोपज - पाइपर पेडिसिलेटम्
लोकखो पुनी, बी.पी. टम्टा व नीलम ढौंडियाल

सारांश

पाइपरेसी कुल का पाइपर पेडिसिलेटम् सीडीसी आर्द्र-उष्ण और उपोष्ण वन क्षेत्रों का उगने वाला उदग्र सदाहरित उपयोगी अनुक्षुप है। इस पौधे को उत्तरपूर्वी भारत में इसके प्राकृतिक प्रदेश में 'पीपला' कहा जाता है। गैर-प्रकाष्ठ वनोपज प्रदायी पादपों में, जिन्हें ऊँचे वृक्ष वितान तले वन क्षेत्रों में लगाया जा सकता है, यह पादप ऐसा है जिसे विद्यमान वन क्षेत्रों को सम्पन्न बनाने के लिए इसकी बदरियों या फलों के कारण, जो मसाले या आयुर्वेदिक औषधियों में काम आते हैं, सलाह लगा सकने की संभावनाएँ हैं। इसे लगाने पर ग्रामीणों के लिए नए रोजगार निकालने और उनकी आमदनी बढ़ाने में सहायता मिलेगी। इसकी रोपण विधियाँ, कटाई करने के बाद किए जाने वाले उपचार, पादप महत्व और इस पादप जाति की बाजार-बिक्री की संभावनाएँ इस अभिपत्र में बताई गई हैं।

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