

Propagation of Some Prioritized Exportable Medicinal Plants in Khokana, Lalitpur District, Nepal

*Ila Shrestha¹, Budhi Ratna Dangol² and Nirmala Joshi³

¹ Patan Multiple Campus, Tribhuvan University, Patan Dhoka

² Society for Community Development Professionals (SOCODEP), Lalitpur

³ Department of Plant Resources, Thapathali, Kathmandu, Nepal

*E-mail: shrestha_ila@yahoo.com

Abstract

This paper describes with some high valued and exportable medicinal plants propagated by seeds and rhizome. The program was supported by Department of Plant resources, Thapathali, Kathmandu, Nepal, for the community development, income generation, agroforestry farming system to establish demonstration plot for the conservation and education. The purpose of this program was to produce seedlings of high value and exportable medicinal plants and distribute to the local communities, educational institution and community forestry for the *ex situ* conservation.

Keywords: Education, Ex Situ Conservation, Propagation, Rhizomes, Seeds, Seedlings

Introduction

Medicinal plants are one of the important natural resources for the economy of this country (DPR, 2016). These natural resources are one of major income source for the community as well as national level. The contribution of plant resources to health of rural people is extremely important because more than 80 percent of the population rely on traditional medicinal systems for their health care (WHO, 2002).

Nepal comprises about 6,000 flowering plants (Press et al., 2000) of which 1,792 species have been estimated to be used in traditional medicine (Baral & Kurmi, 2006). Department of Plant Resources (DPR) published a book 'Medicinal Plants of Nepal' that provides comprehensive information on 819 plant species with their therapeutic uses (DPR, 2016). Press et al. (2000) published detailed list of Medicinal and Aromatic Plant Database of Nepal. This list covers over 1624 species of MAP, including 1515 species of angiosperms, 18 species of gymnosperms, 58 species of pteridophytes, 6 species of bryophytes, 18 species of lichens, and 9 species of fungi. Tiwari & Joshi (1990) published lists of medicinal plants of Nepal enumerating 310 species of medicinal plants in three volumes published in Journal of Nepal Medical Association.

Similarly Government of Nepal has prioritized 30 medicinal plants for cultivation (DPR, 2009). Department of Plant Resources produced the Good Agricultural and Collection Practices (GACP) of *Cinnamomum tamala* (DPR, 2015), *Zanthoxylum armatum* (DPR, 2011), and *Valeriana jatamansii* (DPR, 2012).

Mostly Tejapt are cultivated in Salyan, Makawanpur, Udaypur and Palpa districts (DPR, 2015). *Asparagus racemosus* have been practices in Dhanusha, Makawanpur, Kailali district of Nepal (Personal observation).

Zanthoxylum armatum have been cultivated in western Nepal as Rolpa, Salyan, Pyuthan, Rukum districts (DPR, 2011), but not reported from Lalitpur district. The community forest user groups and local farmers in Doti, Dadeldhura, Baitadi and Darchula district in Far Western Nepal have considered *Valeriana jatamansi* as one of the essential medicinal plant in terms of local livelihood improvement (DPR, 2012).

Study Area

The study programme was carried out in Khokana area of Kathmandu Valley in Lalitpur District. It lies in the southern part and about eight kilometer distant from capital Kathmandu with 1300 – 1400 m as sea

level. Soil is very fertile and traditional farmland is the dominant rather than forestland.

Khokana is a small medieval Newar town and popular for production of mustard oil since ancient time. Recently, government has formed a new municipality called Karyavinayak Municipality merging Khokana, Bungamati and Bhaishepati VDCs. Population of the area is 12,786 (CBS, 2011) comprising with homogenous community newar. The village was badly affected by the last devastated earthquake 2015, April.

In Nepal, there is only one traditional mustard-oil seed industry, which is produced by local expert people, physically. They have rich traditional knowledge on health care system using existing wild medicinal plants for caring health. But the cultivation practice of medicinal plants are lacking. Most of the medicinal plants are collected by the local people from the forest and fallow land. At present, these medicinal plants are disappearing from Nepal. Thus, the purpose of this program was to cultivate the prioritized medicinal plant in the village.

Materials and Methods

The program activities were carried out from January to June 2016 with support from the Department of Plant Resources. The site for nursery preparation was selected at Khokana village, Lalitpur District. The plant species were selected based on physiographic condition of the location. The selected species were *Cinnamomum tamala* (Tejpat), *Asparagus racemosus* (Kurilo), *Rubia manjith* (Majitho), *Bergenia ciliata* (Pakhanbhed), *Valeriana jatamansi* (Sugandhwal), *Dioscorea deltoidea* (Bhyakur.), *Zanthoxylum armatum* (Timur), *Sapindus mukorossi* (Riththa), and *Acorus calamus* (Bojho) for production of seedlings. The procedures of the plant propagation were applied as follow:

Site selection

The site for nursery preparation was selected

in Khokana, Lalitpur District. In the Khokana there are different types of landscape as elevation, slope. South and west facing site area was selected which a well has drained, deep black soil, slightly acidic and sandy soil enriched with humus with access to water for irrigation. The nursery sites were protected with fences. The fencing was done using available local materials such as bamboo and sticks.

Nursery bed preparation

Altogether nine nursery beds were prepared by digging about 12 cm dip properly and removing all unwanted materials found in the soil such as shrubs, weeds, gravel, stone, etc. Margins of the bed size 1 m x 8 m were fixed with using bricks and wooden flat. All the sand, soil and manure were fined with the help of sieve. The top layer of the bed was covered with newly prepared soil mixture using soil, sand and manure (1:1:1) in equal ratio.

Seed Collection

Almost all seeds except *Asparagus racemosus* were collected from wild variety of Salyan, Makawanpur, Dolakha, Lalitpur, Kavre Districts. *Asparagus racemosus* was collected from cultivated variety. The collected seeds are shown in Table 1 and Figure 1 below.



Figure 1: 1. Seeds of *Zanthoxylum armatum* 2. Seeds of *Asparagus racemosus* 3. Seeds of *Dioscorea deltoidea* 4. Seeds of *Cinnamomum tamala* 5. Seeds of *Rubia manjith* 6. Seeds of *Sapindus mukorossi* 7. Rhizome of *Valeriana jatamansi* 8. Rhizome of *Acorus calamus* 9. Rhizome of *Bergenia ciliata*

Seed sowing and mulching

Good qualities of seeds were selected by applying conventional technique manually. These selected seeds were soaked overnight in a bowl. All the floated seeds were removed considering non-viable seeds. The viable seeds were separated and dessicated using paper. Then the seeds were ready for sowing and were sown in 3 cm dip soil and 4 cm spacing from each other. The sown seeds were covered with mixture of soil, sand and manure (1:1:1). Finally, the bed was mulched with straw.



Figure 2: Seedlings 1. *zanthoxylum armatum* 2. *Asparagus racemosus* 3. *Dioscorea deltoidea* 4. *Cinnamomum tamala* 5. *Rubia manjith* 6. *Sapindus mukorossi* 7. *Valeriana jatamansi* 8. *Acorus calamus* 9. *Bergenia ciliata*

Irrigation, Weeding and Manuring

Irrigation was done regularly and carefully using watering pot. Watering is done regularly twice in a daily. When germination of plants was seen, the mulching straws were removed from the bed. Weeding process was carried out frequently from initial to last stage. It was done by hand without using any kinds of tools and weedicide.

Transplanting the seedling into poly-bags

Mixture of soil, sand and manure (1:1:1) were filled in 3 x 6 cm poly-bags size. When the seedlings became upto 3 - 5 cm height, the seedlings were uprooted from the beds using digger. These seedlings were transplanted into poly-bags one in one. All the transplanted poly-bags were kept inside the shade house to prevent from wilting. Watering and manureing were done regularly.

Sapling distribution

About 10-20 cm long saplings were distributed to institutional sectors, community forest user groups, members of SOCODEP, local people of Khokana, social organization for conservation and educational purposes.

Results and Discussion

Total 500 numbers of seeds of *Asparagus racemosus* seeds were sown in the month of March 2016. After two months of seeds sown, 80% of the seeds started to germinate in the nursery bed.

Total 7000 number of the *Cinnamomum tamala* seeds were sown in the month of April 2016, 90% of seeds were germinated within 15 – 20 days.

Total number of 500 seeds of *Rubia manjith* were sown in the bed in February 2016. After one month, 95% of seeds were germinated. It grows as dark orange color at firstly, then 3 days later it changed into green color. The seedlings were transplanted into poly-bags. In Dolakha, 200 *Rubia manjith* plants were propagated by seeds (SADP, 1999).

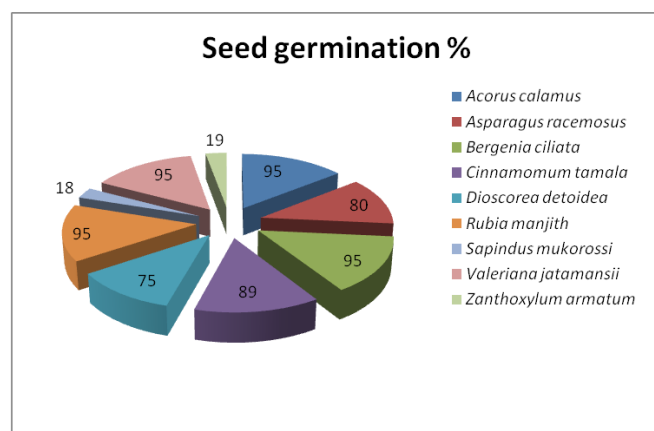
Altogether 800 seeds of *Sapindus mukorossi* were sown in May 2016. The seeds germinated after 25 days and the germination percentage was just fifteen. Low percentage of germination occurred. The seeds were also not pre-treated for sowing.

The germination of seeds were shown in higher percentage in *Cinnamomum tamala* while low percentage were observed in *Sapindus mukorossi*.

Table 1: List of seeds and rhizome sowing and germination

S.N.	Scientific name	Propagation part	No. of seed sown	Days require for seed germination /rhizome propagation	No. of germination	Seed germination %
1	<i>Acorus calamus</i> L.	Rhizome	200	15-25	190	95
2	<i>Asparagus racemosus</i> Willd.	Seed	2000	50-60	1600	80
3	<i>Bergenia ciliata</i> (Haw.) Sternb.	Rhizome	300	15-25	285	95
4	<i>Cinnamomum tamala</i> (Buch.-Ham.) Nees & Eberm.	Seed	7000	15 – 20	6330	90
5	<i>Dioscorea detoidea</i> Wall. ex Griseb	Seed	300	15-20	225	75
6	<i>Rubia manjith</i> Roxb. ex Fleming	Seed	500	3-5	475	95
7	<i>Sapindus mukorossi</i> Gaertn.	Seed	800	25-40	144	18
8	<i>Valeriana jatamansii</i> Jones	Rhizome	500	15-25	475	95
9	<i>Zanthoxylum armatum</i> DC.	Seed	4000	50-60	760	19

The seeds of *Zanthoxylum armatum* soaked for 12 hours before they were sown. 4000 seeds were sown with regular gap of 3-5 cm in the bed in January 2016. Seeds started to germinate only after two months and the germination percentage was just nineteen. The seedlings were transplanted into poly bags after 3 cm height.

**Figure 3:** Percentage of seed germination

Vegetative propagation

Acorus calamus, *Valeriana jatamansii* and *Bergenia ciliata* were propagated by rhizome cutting from at least one-year-old plants. Cutting of rhizomes were made pieces with 2-3 cm long with at least one node from matured and healthy plants. The pieces were cut in slanted way with sterilized sharp knife or secateurs without breaking. The cuttings pieces were planted in the bed where top layer were covered with mixture of soil, sand and compost (1:1:1). The cutting parts were buried in slanted way with node inside the soil. After 15-25 days of planting,

rhizomes were developed. It was also reported that *Valeriana jatamansii* and *Acorus calamus* propagated in Dolpa and Ramechhap Districts (SADP, 1999).

Seedling distribution

Altogether 200 plants were distributed to community forest user groups in Attarpur VDC, Sindhupalchowk district, 50 plants to the members of Society for community Development Professionals, (SOCODEP), 3000 plants in local people of Khokana, 100 plants in Patan Multiple Campus and 150 plants were distributed in Natural History museum, Swoyambhu, Tribhuvan University. The distribution of prioritized medicinal plant such as, *Cinnamomum tamala*, *Zanthoxylum armatum*, *Asparagus racemosus*, *Sapindus mukorossi* community forest and institutional sectors, would be benefited for the *ex situ* conservation as well as educational awareness.

Conclusion

Seeds germination percentage were found higher when the seeds were sown immediately after collection. So seed should be sown within one week after harvesting to get high percentage of germination. This medicinal plant nursery is one of model for the demonstration plot for science students in Lalitpur district, Nepal. The propagation methods recommend conserve and utilize existing high value medicinal plants for the nation and strengthen the indigenous health practices in the country.

Conservation and cultivation of high value medicinal plants has been initiated in Khokana by establishing nurseries. It also help to improve the *ex situ* conservation of prioritise medicinal plants.

Acknowledgements

We are very grateful to acknowledge Department of Plant Resources (DPR) providing financial support for the program. We would like to extend our sincere thanks to Mr. Raj Dev Prasad Yadav, Former Director General, Deputy Director Generals Ms. Sushma Upadhyaya and Mr. Sanjeev Kumar Rai of DPR Thapathali, Kathmandu for providing necessary support. We would like to express our sincere thank to Ms Kalpana Dhakal, Assistant Scientific officer (DPR) for providing necessary suggestions in time. Our sincere thanks go to Khokana community people for their valuable help for nursery development, and seedling production. Finally, we are deeply indebted to Society for Community Development Professionals (SOCODEP) for necessary administration supports and thankful to Devaki Shrestha, Prof. Dr. Narendra Nath Tiwari, Ms. Rajani Shrestha for their valuable help during the program.

References

- Baral, S.R. & Kurmi, P.P. (2006). *A Compendium of Medicinal Plants in Nepal*. Rachana Sharma, Maiju Bahal, Chabahil, Kathmandu, Nepal.
- CBS (2011). *Statistical Year Book of Nepal*. Central Bureau of Statistics (CBS), National Planning Commission Secretariate, His Majesty's Government of Nepal (HMGN), Thapathali, Kathmandu.
- Chaudhary, R.P. (1998). *Biodiversity in Nepal: Status and Conservation*. S. Devi, Saharanpur and Teeppress Books, Bangkok, Thailand.
- DPR (2009). *Nepal ko Arthik Bikashka Lagi Prathamikta Prapta Jadibutiharu*, Department of Plant Resources (DPR), Thapathali, Kathmandu, Nepal.
- DPR (2011). *Good Agricultural and Collection Practices (GACP) of Zanthoxylum armatum*, Department of Plant Resources (DPR), Thapathali, Kathmandu, Nepal.
- DPR (2012). *Quality Standard, Good Agricultural and Collection Practices (GACP) of Valeriana jatamansii* Jones, Department of Plant Resources (DPR), Thapathali, Kathmandu, Nepal.
- DPR (2015). *Good Agricultural and Collection Practices (GACP) of Cinnamomum tamala* (Buch.-Ham.) Nees & Eberm, Department of Plant Resources (DPR), Thapathali, Kathmandu, Nepal.
- DPR (2016). *Medicinal Plants of Nepal (Revised)* Department of Plant Resources (DPR), Thapathali, Kathmandu, Nepal.
- Manandhar, N.P. (2002). *Plants and People of Nepal*. Portland, Oregon, USA: Timber Press.
- Press, J. R., Shrestha K.K., & Sutton, D.A. (2000). *An Annotated Checklist of Flowering Plants of Nepal*. British Museum (Natural History) London and Central Department of Botany, T. U. Kirtipur, Nepal.
- SADP (Special Area Development Programme) (1999). *Management of Medicinal and Aromatic Plants*. In 25 Mountainous Remote Mountainous District of Nepal, Kathmandu 75.
- Tiwari, N.N. & Joshi, M.P. (1990). Medicinal plants of Nepal: I-III. *Jour. Nep. Med. Assoc.*, 28,181-190; 221-232; 266-232.
- WHO (2002). *WHO monographs on selected medicinal plants*. Volume 2. Geneva, World Health Organization.