

Plant diversity and Ethnobotanical notes on tree species of Syabru Village, Langtang National Park, Nepal

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Issued May 01, 2009

Abstract

In the course of the survey of the useful plants of Nepal, 25 tree species belonging to 20 genera representing 17 families have been documented with their indigenous uses from the Syabru village and adjoining areas of the Langtang National Park, Nepal. At present, these useful plants and their habitats are under serious threat due to anthropogenic pressure. In this paper, an attempt has been made to enumerate these plants with their present status and local traditional knowledge as well as practices and to recommend some strategies for integrated management of the useful species and their habitats.

Keywords: Plant biodiversity, ethnobotanical uses, indigenous knowledge, habitats.

Introduction

In the recent years, more attention is given to sustainable use and integrated management of the economically important species due to an increasing recognition of their contribution to fulfill basic needs of the people, household economies, food security and conservation of natural resources. In Nepal, the rural communities rely heavily on plant biodiversity for their primary healthcare and daily requirement of food and rawmaterials. However, at present, most of ecosystems with useful species are under threat due to habitat destruction, unsustainable harvesting and over-exploitation. It is now realized that priority should be given to the documentation and conservation of the existing species and habitats before some of these are eliminated from the area, or before the inhabitants shift over to modern life style. In this context, some sporadic works have already done to collect ethnobotanical data and traditional knowledge systems (Joshi and Edington, 1990; Joshi, 1991; Bhattarai, 1992; Joshi and Joshi, 2000; 2005; Manandhar, 2002; Joshi *et al.*, 2003 Siwakoti, *et al.*, 2005). But the vast store of ethno-botanical wealth of the present study areas has not been comprehensively documented. In this background, present study was devised to document the trees with their indigenous uses and practices.

Study Areas and Methods

After reconnaissance of some villages of the Central Development Region, Syabru village of Langtang National Park was selected for the ethnobotanical study. This village has enjoyed some measures of environmental protection and lie on trekking routes. The major physical and socio-economic characteristic features are given in Table 1.

Table 1. Physical and Socio-economic characteristic features.

Location	85° 22' E 28° 09' N
Land forms	Slopy to steep terrain
Altitude (m)	500-2600
Geology	Biotite-Garnet,-gneiss,Schist,Garnet,Gritty hyllite, Limestones, Auge gneiss
Precipitation (mm)	2165
Major river	Langtang
Vegetation	Mixed pine/broad leafed and pine forest Forest
Population	351
No. of households	61
Tribal affiliation	Tamang
Occupation	Agriculture and livestock rearing

Several field trips in and around the study areas were undertaken with a view to collect plant species of ethnobotanical value and document the indigenous practices. The information was gathered using various techniques such as open and structured interview, and discussion with local informants, such traditional healers / “jhankri”, and experienced village elders including midwives and by direct observations on the way different plant materials were being collected and used (Joshi and Edington, 1990). Voucher specimens are deposited in the SchEMS, Pokhara University, Kathmandu, Nepal.

Results and Dicussion

Plant Biodiversity

The study areas are endowed with rich and varied biodiversity with various ecosystems i.e. forest, scrub, grassland, waterbodies etc. Diverse geomorphology, climatic variations and vegetation have made the forests and adjoining areas flourish with diverse species. The forest types of Syabru and the adjoining areas is charecterized by pine forest, alder forest and pine- broad leaved forest. Pine (*Pinus wallichiana*) is an important dominant tree in the pine forests and pine–broad leaved forests with other associated species i.e. *Alnus nepalensis*, *Lyonia ovalifolia*, *Quercus* spp., *Rhododendron arboreum*, *Pyrus pashia*, *Princepia utilis*, *Berberis asiatica*, *Mahonia nepalensis*, *Artemisia indica*. In Alder forest *Alnus nepalensis*, *Quercus lanata*, *Lyonia ovalifolia*, *Rhododendron arboreum*, *Princepia utilis* are dominant trees with some shrubs i.e. *Mahonia nepalensis*, *Dodecadenia grandiflora*, *Berberis chitria*, *Buddleja asiatica*, *Viburnum cylindricum*, *Gauitheria fragrantissima* and some herbs, such as *Achyranthes bidentata*, *Allium wallichii*, *Artemisia indica*, *Cannabis*

sativa (Table 2). Species composition of trees in the forest types and production of wood in the forest areas are presented in Table 2 and 3 respectively.

Table 2. Dominant species composition of trees in Syabru.

Forest types and species	Basal area m/ha	Density No./ha	IVI
Pine forest			
<i>Pinus wallichiana</i>	15	140	262.7
<i>Lyonia ovalifolia</i>	0.2	8	13.8
<i>Pyrus pashia</i>	0.1	4	10.8
<i>Rhododendron arboretum</i>	0.04	4	10.5
Total	15.34	156	
Alder Forest			
Stumps (<i>Alnus nepalensis</i>)	2.2	132	61.6
<i>Quercus lanata</i>	5.6	32	60.0
<i>Lyonia ovalifolia</i>	1.7	60	52.8
<i>Alnus nepalensis</i>	2.8	68	48.8
<i>Rhododendron arboretum</i>	1.7	28	28.5
<i>Mahonia napaulensis</i>	0.1	4	28.3
<i>Pinus wallichiana</i>	1.0	28	21.7
<i>Princepia utilis</i>	0.05	16	12.5
<i>Dodecadenia grandiflora</i>	0.01	16	9.6
Total	15.16	384	
Pine/ broad-leaved forest			
<i>Lyonia ovalifolia</i>	3.1	93	80
<i>Rhododendron arboretum</i>	2.4	57	63
<i>Pinus wallichiana</i>	2.6	57	59
<i>Quercus lanata</i>	1.0	20	35
<i>Berberis asiatica</i>	0.3	20	18.4
<i>Quercus semecarpifolia</i>	0.5	16	13.7
<i>Princepia utilis</i>	0.4	12	12.1
<i>Pyrus pashia</i>	0.2	8	8.0
Palere (unidentified)	0.1	8	5.3
<i>Alnus nepalensis</i>	0.1	8	5.0
<i>Dodecadenia grandiflora</i>	0.04	3.2	3.3
<i>Mahonia nepaulensis</i>	.002	3.2	3.0
Total	10.7	305.4	

Table 3. Production of wood in the forest areas of Syabru.

Tree (.10cm diam)									
Forest type	Number of trees/ha	Mean diam. (cm.)	Mean height (m)	Mean standing crop (m/ha)	Mean age (yr)	Mean product. (m/annum/ha)	Forest area (ha)	Total product (m/ annum)	Total product (t/annum)
Pine forest	156	31.8	17.9	182.4	31	5.9	122	719.8	669.4
Alder forest	384	19.5	5.5	87.7	28	3.1	56	173.6	161.4
Pine / broad leaved forest	307	18.8	6.0	45.1	31	1.4	122	170.8	158.8
						10.4		1064.2	989.6

Shrubs (<10cm diam.)										
Forest type	Number of shrubs / ha clumps/ ha	Mean no. of sprouts / clump	Mean sprout diam. (cm)	Mean stool length (m)	Mean standing crop (m/ha)	Mean age (yr)	Mean product (m/ annum/ha)	Forest area (ha)	Total product (m/ annum)	Total productivity (t/ annum)
Pine forest	3600	4.1	3.9	1.4	3.0	9	0.33	122	40.3	37.4
Alder forest	3000	6.6	2.4	1.2	0.81	5	0.16	56	8.9	8.3
Pine/broad leaved forest	2914	4.5	2.9	1.4	1.35	8	0.17	122	20.7	19.3
							0.66		69.9	65

The wood productivity estimates obtained at Syabru (11.06 m/ha/annum) fall within the range 10-30m quoted by Joshi (1988) for forests in the hills of Nepal (Table 3). The fact that the village estimates are at the lower end of this range is probably related to substantial reduction in forest cover caused by over-exploitation.

Ethnobotanical uses

During the field survey, ethnobotanical information of 25 species of medicinal plants belonging to 17 families have been collected from various habitats of the study areas. Table 4 lists the plants recorded as being used in Syabru village and adjoining areas. The species are arranged alphabetically with family, local names, habitat and uses.

Table 4. Ethnobotanical uses of the trees of Syabru.

Species and Family	Nepali name	Habitat	Parts used and Uses
<i>Abies spectabilis</i> (D. Don) Mirbel Pinaceae	Talispatra	Forest	--- Decoction of leaves is taken for cough and bronchitis. --- Wood is used as firewood, and raw materials for houseframes, furnitures, doorframes etc.
<i>Aegle marmelos</i> (L.) Correa Rutaceae	Bel	Forest,	--- Decoction of leaves is taken to cure diabetes; fruit juice is drunk every morning on an empty stomach for stomach ache and gastric problems; decoction of leaves is used in dysentery and dyspepsia; young fruit is crushed with a piece of turmeric which is applied to cure ulcers. --- Fresh pulp of the ripe fruit is taken as sarbat (the local cold drink).

<i>Alnus nepalensis</i> D. Don Betulaceae	Uttis	Exposed slopes, riversides, Forest	<p>--- Bark or fresh leaves are pounded and paste applied externally to cuts and wounds.</p> <p>--- Wood is used as firewood and for construction, houseframes, fencing, furnitures.</p> <p>--- Leaves are used as fodder.</p> <p>--- Twings are used in mulching or in making green manure.</p>
<i>Benthamidia capitata</i> (Wallich) H. Hara Cornaceae	Dimmar	Forest	Ripe fruits are eaten and are also used for preserved.
<i>Bombax ceiba</i> L. Bombacaceae	Simal		<p>--- Stem is used as firewood.</p> <p>--- wood is used for construction and as rawmaterials for furnitures..</p> <p>--- Root paste is applied externally in case of pimples.</p>
<i>Castanopsis indica</i> (Roxb.) Miq. Fagaceae	Dhale katus	Forest,	<p>--- Leaves are used as fodder.</p> <p>--- Cotyledons of the fruit are consumed as well as used to sell in markets</p> <p>--- Wood is used for fuel and home frames, window, shutters, beds, tables, stools etc.</p>
<i>Castanopsis tribuloides</i> (Sm) A. DC Fagaceae	Musure katus	Forest,	<p>--- Bark paste is applied to cure snake bites.</p> <p>--- Wood is used as firewood and for construction purposes i.e. home frames, windows, shutters.</p> <p>--- Dried cotyledons of the fruit are eaten and used to sell in market.</p> <p>---Leaves are used as fodder</p>
<i>Ficus benghalensis</i> L. Moraceae	Bar	Roadsides,	<p>---Ripe receptacles are eaten by village children.</p> <p>--- Leaf power is applied against gum swelling till cure teeth; latex as medicine for treatment of genital diseases; bark power is used externally to cure scabies.</p> <p>--- Leaves are used as fodder</p>

<i>Ficus religiosa</i> L. Moraceae	Papal	Roadsides	<p>---Bark is chewed to treat stomach pain; latex is applied in the infected areas to treat scabies; fruits are eaten for asthma; decoction of stem bark is used as mouth wash to remove the foul smell of breathing</p> <p>--- Leaves are used as fodder</p>
<i>Lindera pulcherrima</i> (Nees) Benth. ex Hook. f. Lauraceae	Phusure	Forest	<p>---Ripe fruits are eaten without seeds.</p> <p>---Leaves are used as fodder</p>
<i>Lyonia Ovalifolia</i> (Wall) Drude Ericaceae	Angeri	Forest	<p>---Infusion of young leaves applied for skin diseases.</p> <p>----Leaves are used as insect repellent;</p> <p>--- Young leaves are used for fish poisoning</p> <p>--- Wood is used as raw materials for house frames, doors, bed etc.</p> <p>---Plant is used for fenceing</p> <p>--- Leaves are used as fodder</p>
<i>Melia azedarach</i> L. Meliaceae	Bakaino	Cultivated field, scrub, forest	<p>--- Leaves are used as as fodder</p> <p>---Dried fruits, stem, bark and leaves are largely employed to protect woolen fabrics from insect attacks.</p> <p>--- Fruits are used as fish poison.</p> <p>--- Wood is used as firewood and for construction i.e. house frames, doors, bed etc.</p> <p>--- Wood is also used to make the handles of agricultural tools</p> <p>----leaves are pounded and extract is then applied to treat skin disease; fruits are used as antihelmintic;</p>
<i>Myrica esculenta</i> Buch.-Ham. ex D. Don Myricaceae	Kaphal	Forest, cultivated fields	<p>---Ripe fruits are eaten and also used to sell in market.</p> <p>---Wood is used for fuel</p> <p>---leaves are used as fodder</p> <p>--- decoction of bark is drunk to cure dysentery; steambark is decocted and then decoction is drunk to treat bronchitis;</p>
<i>Myrsine capitellata</i> Wall Myrsinaceae	Seti kath	Forest	<p>--- Ripe fruits are eaten.</p> <p>---Wood is used as firewood and for construction i.e. house frames, doors, bed etc.</p> <p>---Leaves are used as fodder</p>

<i>Myrsine semiserrata</i> wall. Myrsinaceae	Kali Kath	Forest	---Fruits are eaten. --- Wood and twigs are used as fuel .---Leaves are used as fodder
<i>Pinus wallichiana</i> A.B. Jacks Pinaceae	Gobre sallo	Forest	--- Resin is used as rawmaterial for soap, waxes; --- Wood is used for fuel and for making Windows, shutters, doors, house frames, and furnitures. --- Resin is used to cure blisters and boils
<i>Prinsepia utilis</i> Royle Rosaceae	Dhatelo	Dry slopes & shady places, forests	---Paste of fruit is applied on warts ---Fruits are eaten by children --- Plant is used for making fence; --- Oil from seeds are used for lighting; --- Wood is used as firewood
<i>Prunus napaulensis</i> (Seringe) Steudel Rosaceae	Jungali aaru	Forests, scrub	--- Fruits are eaten without seeds --- Wood is used as firewood and for construction i.e. house frames, doors, bed etc
<i>Pyrus pashia</i> Buch.-Ham. ex D. Don Rosaceae	Mayal	Open and shady places, forest,	--- Ripe fruits are eaten. --- Fruit juice is taken to cure dysentery. --- leaves and twigs are lopped for fodder --- Wood is used as fuelwood --- Twings are used for agricultural tools
<i>Quercus glauca</i> Thunb Fagaceae	Phalat	Forest	--- Wood is mainly used for fuel and construction. --- leaves as fodder
<i>Quercus lanata</i> Smith Fagaceae	Baanjh	Forest	--- Wood is used for house frames, poles, furniture and other construction; --- wood is used for fuel --- Leaves as fodder
<i>Quercus semecarpifolia</i> Sm. Fagaceae	Khasru	Forest,	--- Stump is used for making charcoal; --- leaves are lopped for fodder ---Wood is used as fuel and timber. It is commonly used for construction i.e. house frames and furniture

<i>Rhododendron arboreum</i> Smith Ericaceae	Laligurans	Forest,	<ul style="list-style-type: none"> --- Flowers are eaten raw by the children --- paste of young leaves applied to the forehead for headaches; flowers are chewed to cure dysentery --- Wood is extensively used as fuel wood; it makes excellent charcoal; --- immature leaves are used as fish poison; --- wood is also used to prepare household utensils.
<i>Salix babylonica</i> L. Salicaceae	Bains, Tissi	Riverside, forest	<ul style="list-style-type: none"> --- Leaves are used as fodder --- Wood is used as fuelwood
<i>Schima wallichii</i> (DC) Korth. Theaceae	Chilaune	Forest	<ul style="list-style-type: none"> --- Leaves are used as fodder and making compost --- Bark is used for dyeing --- Bark power is taken with water for the treatment of gastritis; bark paste is applied to cure wounds. --- Pounded bark and fruits are employed to stupefy fish. --- Wood is used as timber for construction i.e. home frames, window shutters, doors; --- wood is used for fuel.

The results of the present study revealed that trees and their parts are widely used for various purposes as fuelwood, timber, medicines, rawmaterials etc.

Fuelwood

In the study village, wood cut from the forest is the principal source of domestic energy for cooking and heating. The preferred species for fuel wood by local people are given in Table 5.

Table 5. Fuelwood preferences expressed by respondents from 24 households at Syabru.

Species	Cited by
<i>Alnus nepalensis</i> , <i>Bombax cebia</i> , <i>Pinus wallichiana</i> , <i>Quercus lanata</i> , <i>Rhododendron arboreum</i>	> 75% of respondents
<i>Quercus glauca</i> , <i>Quercus semecarpifolia</i>	50-75 % of respondents
<i>Abies spectabilis</i> , <i>Castanopsis indica</i> , <i>Castanopsis tribuloides</i> , <i>Lingustrium confusum</i> , <i>Myrica esculenta</i> , , <i>Prinsepia utilis</i> , <i>Prunus nepalensis</i> , <i>Pyrus pashia</i> , <i>Salix babylonica</i> , <i>Salix babylonica</i> ,	25-50% of respondents
<i>Rhus wallichii</i>	>25% of respondents

Fuelwood Consumption Patterns in the study area are as follows:

- (a) fuelwood used by village residents
- (b) fuelwood used by tourist trekkers or on their behalf (e.g. where teahouse provide food and regreshments)
- (c) fuelwood cut on the village land by outsiders who subsequently export it for consumption elsewhere.

Estimate for the annual consumption of fuelwood from the study village is set out in Table 6. It will be seen that the trekkers use greater fuelwood (22 metric tons/annum) due to Syabru is a overnight stoping place for treeker between national park and Dhuche (Joshi, 1988). The other feature to notice is that wood was also being harvested on village land by people who had come in from surrounding villages and were subsequently carrying loads of wood from Syabru (18 metric tons/annum) out of the area.

Table 6. Wood production and consumption for Syabru village (value expressed as mt/ per year).

Production	10 cm diam.	989.5
	10 cm diam	65.0
Consumption	Consumption by Village residents	180.0
	Consumption by collection from other villages	18.0
	Consumption by trekkers	22.0

The most striking feature of the relationship between wood production and consumption is the excess of consumption over production in the small wood category the both villages. Small wood includes the branches of trees and shrubs, the truks of small wood probably has a varietyb of causes. It can be easily cut using the traditional nepali tools i.e. khurpi or Knief, it can be conveniently tied into bundles, and subsequently, it is easily fed into the apertures of clay stoves or between the legs of tripod type stoves. If one is to look for environmental consequences of this over-use of small wood, one of these appear to be the suppression of tree regeneration. In counts of regenerating trees in the 25 m survey plots, it was found that few seedlings survived to a height greater than 100 cm. presumably the main reason was that at this hight the samplings became

usable as fuelwood and were cut and removed (Joshi, 1988).

Timber for house construction, furnitures and household utensils

Nepalese village houses have a supporting framework of wooden uprights with additional pillars, to support a balcony if this is included in the design. At Syabru the roof also usually consists of flat wooden slabs or shingles. When asked about the amount of wood used for building purposes with the local people, no reliable information were available from the study area. However, Mauch (1976) and Joshi (1988) have made a calculation of building-timber use per person for hill village in Nepal and arrive at a figure of 0.3m³/person/person / annum.

Though the hardwoods are generally favoured for constructional purposes of their greater durability and relative freedom from fungal and insect attack, pine is more widely used at the Syabru village because of the greater availability. Other preferred species for house frames are *Alnus nepalensis*, *Castanopsis indica*, *Castanopsis tribuloides*, *Melia azedarach*, *Myrsine capitellata*, *Quercus glauca* and *Q. semicarpifolia*. Wood of *Pinus wallichiana* and *Schima wallichii* are usually chosen for window shutters, doors and ladders. Wood is also used in the manufacture of household furnitures including storage boxes, chairs, stools, table and beds. Species used for these purpose include *Abies spectabilis*, *Bombax cecilia*, *Castanopsis indica*, *C. tribuloides*, *Myrsine capitellata*, *Myrsine semiserrata*, *Pinus wallichiana*, *Quercus glauca*, *Q. lanata*, and *Q. semicarpifolia*. For fencing, favoured species included *Alnus nepalensis*, *Lyonia ovalifolia* and *Rhododendron arboreum*. *Rhododendron arboretum* finds a particular use in the manufacture of such household items as wooden paddles, spoons and bowls.

Medicine

The present study revealed that gastro intestinal disorders and stomach ache, dematological illness and cuts, wounds and headache are the major diseases and illness in the study area. The local people use the plants and their parts for the treatment of these alignments following the traditional practices. During the treatment of the diseases, various forms of preparation are used. Among the documented species, 7 species were used to treat gastrointestinal disorders, 2 for fever, cough, headache, 7 for dermatological illness, 1 for genito-urinary complaints, 3 for respiratory ailments, 2 for dental problems, and 2 for others (Table 2).

Food

Wild foods are collected by local people from a wide variety of habitats i.e. forest, scrub, edges of cultivated areas and waste lands. The major food plants are *Myrica esculenta*, *Castanopsis* spp., *Pyrus pashia*, *Prunus nepaulensis*, *Lindra pulcherrima*. The local communities have also excellent knowledge about the poisonous plants of the study area

Fodder

18 tree species are recorded as being used as fodder plants in these villages. Among them, local people prefer *Castanopsis indica*, *Castanopsis tribuloides*, *Myrsine capitellata*, *Myrsine semiserata*, *Quercus glauca*,

Quercus lananta, *Q. semiserrata* and *Salix babylonica*. The people of the villages have comprehensive knowledge about fodder plants, as they are in constant association and dependence on these resources for integrated agriculture development.

Rawmaterials

Various plant and parts of the plants are used as rawmaterials for the manufacture or preparation of commodities. The major products and uses as follows:

Dye

At Syabru the main dye used is a dark brown dye derived from the bark of *Schima wallichii*. The dye are used for coloring wool and for painting designs (usually with a stick) on baskets, mats, and cloth.

Handals of agricultural tools

Species especially favoured for the handles of tools and agricultural implements include *Melia azedarach* and *Pyrus pashia*.

Manufacture of soap and wax

Pinus wallichiana is an important source of resin and turpentine in the study area. Resin is used in the manufacture of soap, grease, and waxes and is exported for these purpose to Trisuli and Kathmandu.

Insectisides and Fish poison

The village people use a variety of plant materials to deter flies in the houses and to protect stored grain from insect damage. Leaves of *Lyonia ovalifolia* or dried fruits, leaves, bark of *Melia azaderach* are placed in the mouth of grain bags and in the tops of open-air storage bins (bhakari), to discourage the entry of grain-feeding beetles and moths.

Plant extracts are widely used in the studied village for capturing fish. Crushed leaves of *Lyonia ovalifolia* or immature leaves of *Rhododendron arboreum* are introduced into streams and river with the aim of stupefying fish. The affected fish float to the surface and are removed from the water usually with a piece of cloth stretched across a branched stick. Similarly fruits of *Melia azaderach* or bark and fruits of *Schima wallichii* are also used as fish poison.

Strategies for Sustainable Management

Despite the formulation and adoption of various policies, plans, strategies and implementation of programmes for the conservation of the species and their habitats, there is a growing consensus among the conservationists that the conservation of bio-resources, especially of plant biodiversity is entering into a stage of crisis, since there has been hardly any attempt to conserve these resources in an integrated manner (Joshi and Joshi, 1998). Therefore, the following strategies should be implemented in order to conserve and sustainable use of trees in particular and other plant diversity in general in an environmentally sound way.

1. *Inventory, Documentation of the species and research*

Though the inventory of plant biodiversity has initiated in different biogeographical areas, many parts of the country are still remained unexplored. Hence, it is strongly recommended that major thrust should be given to an intensive inventory and documentation of the useful trees as well as other species and their products. The research related to chemical screening should also be initiated to analyse chemical contents and their implications on health, food and plant products.

2. *Documentation of ethnobotanical uses, Traditional knowledge and practices*

Regarding the ethnobotanical information, there is still a paucity of quantitative data about the traditional uses, effectiveness, sideeffects and traditional techniques. The rural people have excellent ethnobotanical knowledge which they have developed due to constant association with the forest ecosystems. These existing valuable information are needed to be documented before lost or disappeared. Therefore, it is strongly recommended that emphasis should be given to the action activities for the documentation of indigenous uses, traditional knowledge and practices following in quantitative methods.

3. *Conservation of useful species and their habitats*

At present urbanization trend is rapidly spreading even in the forest and waste land. Deforestation and habitat destruction due to land use change would pose a serious threat to the useful species and habitats. Hence, efforts should be directed to formulate and implement appropriate conservation strategies and programs for habitat management and sustainable uses of the plants and their products taking consideration of the needs of the people.

Acknowledgements

The authors are thankful to the inhabitants of the study areas for their kind cooperation and help during the field survey. Thanks are due to Dr. John F. Edington, University of Wales, U.K. for his guidance and suggestion, and Dr. S. K. Jain, Founder and Ex-Director, Institute of Ethnobiology, Lucknow, India, Profs. P. K. Jha, R. P. Chaudhary and K. K. Shrestha, Central Department of Botany, Tribhuvan University, Kathmandu, Nepal for constant encouragement.

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