INDIAN POPLARS WITH SPECIAL REFERENCE TO INDIGENOUS SPECIES

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Introduction

Family Salicaceae, embracing poplars (*Populus*) and willows (*Salix*). *Populus* is the classical name of the Poplar, others consider that this plant was used in ancient times to decorate public places in Rome where it is called "*arbor populi*" 'people's tree' i.e. *Populus alba*. These plants are usually dioecious, rarely monoecious viz. *Populus lasiocarpa* Oliv., native of Western China (Anon., 1979). Exceptionally bisexual in *Populus jacquemontii* var. *glauca* a species endemic to Eastern Himalaya (Haines, 1906; Grierson and Long, 1983). Genus *Populus* Linn. includes 30 species in five sections. These are White poplars (*Leuce*), Black poplars (*Aigeiros*), Balsam poplars (*Tecamahaca*), *Leucoides* and *Turanga*. These are widely distributed in the temperate and sub-tropical regions of the Northern Hemisphere. In the plateaus of Near-East and in the borderlands of Mediterranean Sea, since antiquity, people have being planting poplars near their homes, around their fields or along ditches and roads; these trees not only furnished fuel and timber for domestic use as well as forage to cattle but also provided shade, shelter and greenery in countries that would be otherwise.

Realizing the importance of poplars, a National Poplar Commission was created in France in 1942 and subsequently an International Poplar Commission was set up under the aegis of the FAO during 1947. India became a member of this Commission in 1965 and constituted a National Poplar Commission with the objective of cultivation of poplars to meet the requirements of timber, fuelwood etc. However, before the establishment of National Poplar Commission the cultivation of Poplar was traditional in Kashmir for a very long time and in recent years extended in Uttar Pradesh, Punjab, Haryana, Himachal Pradesh and, on a very small scale, in West Bengal. Poplars, because of their fast rate of growth, high financial return and multiple utility, have become a very important species for cultivation both in the forest and farms. Poplar wood is widely used in plywood and match splints. Market has been developed for Poplar in Haryana, Punjab and Uttar Pradesh.

Regarding the occurrence of Poplar in India, Bor (1958) mentioned eight species, viz. *Populus alba* Linn., *P. euphratica* Oliv., *P. microcarpa* Hook.f. & Th., *P. nigra* Linn., *P. laurifolia* Led. (*P. balsamifera* Linn.), *P. ciliata* Wall. ex Royle, *P. gamblei* Dode

and *P. glauca* Haines. There is controversy regarding the indigenous poplars in India. Many authors viz. Tewari (1993), Singh and Kumar (1998) considered *Populus laurifolia, P. euphratica* and *P. alba* as indigenous. In fact many of them are exotic viz. Sind poplar, bahan, bhan, padar (*Populus euphratica*) has a remarkable geographical distribution. It occurs in Ladakh, plains of the Punjab and Sind (Pakistan), Tibet; westwards it is indigenous on riverine areas in Afghanistan, Turkey, Iran, Iraq and Palestine, which exhibits a wide range of leaf polymorphism. *Populus alba* and its cultivars known from Southern Europe, Western Siberia and Central Asia, were introduced and naturalised in Kashmir and Ladakh, known by the local name 'Safeda' and 'Mal'. Black poplar (*Populus nigra*) and its cultivars are native of temperate Europe, introduced in Kashmir, Himachal Pradesh and in some parts of Garhwal Himalaya. Balsam poplar (*Populus laurifolia* Ledeb.) (*P. balsamifera* Linn.) a species of Central Asia, was planted in Leh (Ladakh), Lahaul and Spiti (Himachal Pradesh) and Tawang district of Arunachal Pradesh, where it is generally planted by the Buddhists near monasteries. Eastern cottonwood (*Populus deltoides*) from North America is very commonly planted by the farmers in agroforestry plantations in Punjab, Haryana, Uttar Pradesh and Uttaranchal.

Identification key to the common exotic species introduced in India

1. Leaves lobed (or sometimes narrowly oblong) and entire on young plants and suckers).

   Buds pubescent,not sticky _____2

   - Leaves not lobed; buds sticky_____3

2 Leaves glabrous, polymorphous, entire in young plants and suckers_____*P. euphratica*

- Leaves white tomentose beneath_____*P. alba*

3 Leaves with clearly defined translucent border_____4

- *Leaves without translucent* border_____*P. laurifolia*

4 Leaves rhomboidal, cuneate at base; gland at the base of the blade absent_____*P. nigra*

- Leaves deltoid at base; glands present at the base of blade_____*P. deltoides*

There are four indigenous species of *Populus* namely *Populus ciliata, P. gamblei, P. jacquemontii* var. *glauca* (*P. glauca*) and *P. rotundifolia* found in the Himalaya. These species are important for cultivation in Himalayan zone and deserve attention for improvement. These need recognition, systematic survey, collection and evaluation of desirable geographical races and development of suitable clones.

Key to the indigenous species

1. *Leaves ovate, acuminate*_____2

- Leaves broadly ovate or orbicular, shortly acute or apiculate _____*P.rotundifolia*

2. Leaf margin crenate or dentate-serrate; plant dioecious_____3

- Leaf margin sharply serrate; flowers bisexual___*P. jacquemontii* var. *glauca*

3. Leaves strongly cordate at base; capsule 3- valved_____*P. ciliata*

- Leaves truncate at base; capsule 2-valved_____*P. gamblei*

***Populus ciliata* Wall. ex. Royle (Himalayan Poplar)**

Vern. : *Safeda, piplas, pahari pipal, chelaun, chalni, banpipal, bagnu, syan.*

This species is distributed from Kashmir to Arunachal Pradesh at an altitude between 1300-3000 m. It is most widely distributed species in India and grows well on alluvial deposits along the water channels, road cuttings, land slides, occasionally forming small gregarious patches on banks of the large water courses. In Western Himalayas it grows in Ban-oak (*Quercus leucotrichophora*), Pangar (*Aesculus indica*), Toon (*Toona serrata*), Deodar (*Cedrus deodara*), Kail (*Pinus wallichiana*), Fir (*Abies pindrow*) and Spruce (*Picea smithiana*) forests. In Eastern Himalaya it is sparsely distributed in Sikkim, Bhutan and Arunachal Pradesh often grown with *Salix wallichiana*. Outside India it is known from North Myanmar and Yunnan Province of China. It has been observed by one of the authors (HBN) that *P. ciliata* grown near Bomdi La and Tawang areas in Arunachal Pradesh has different shape and size of leaf as compared to Western Himalaya.

Keeping in view of fast growing nature various exotic species of Poplar have been planted in many parts of Northern India. However, not much emphasis has been provided to indigenous species. Thus to encourage the indigenous species of Poplar a project entitled "*Conservation of Indigenous Poplar in India*" in Garhwal and Kumaun hills for selection of provenance and plus trees. About 500 trees were observed and marked with numbers for the selection. In the survey best trees were located at Govind Pashu Vihar in Taluka Range (Tons Forest Division) and in Gangotri Range, Uttarkashi Forest Division, where a tree of maximum 4.5 m girth was observed. Earlier probably record girth was measured 4.62 m from Kulu Forest Division, Himachal Pradesh (Singh, 1981) and 3.5-4 m from Hazara (Troup, 1921). Joshi (1981) stated that in Uttar Pradesh, the total area of *P. ciliata* (in mixture with other coniferous and broad leaved species) would be around 40,000 ha, but this species generally constitutes a small component (less than 5%) of the whole crop. Its pure patches are also located at Hanuman Chatti, Badrinath Forest Division below Bhayundar, on way to the Valley of Flowers and Dharali area of Uttarkashi. These pure patches for conservation point of view should be declared as 'National Poplar Reserve'.

According to Rajawat *et al.* (1987) suitability of *Populus ciliata* has been studied for making various grades of plywood and Blockboards like *P. deltoides* tested earlier. *P. ciliata* has also been found to give good veneers on peeling. Plywood prepared from the veneers using U-F and P.F. glues has been found to be suitable for making general purpose plywood, marine plywood, plywood for concrete shuttering work, preservative treated plywood and fire retardant plywood. The species could thus be included in the relevant Indian Standards Specifications for their manufacture. It is also suitable for Hardboards (Shukla *et al.*, 1985). It is

suitable for making packing cases and crates (Shukla, 1981), also supports doors. Its wood is of excellent quality for the manufacture of matches (Anon., 1979). It is also used in manufacture of artificial limbs. These includes knee skin assemblies and knee mechanism of all types, hip disarticulation joint, wooden foot and wooden block. The laminated wooden blocks manufactured cover block thigh, block foot, block knee, block ankle etc. (Misra, 1981). In Kashmir it is used for building purposes and also as fuel. The bark is used as tonic, stimulant and blood purifier. The leaves are used as a fodder for goats (Khan and Kachroo, 1981). Guha and Mathur (1959) stated that *Populus ciliata* is suitable for writing and printing paper. It is useful for afforesting unstable hill slopes.

Haines (1906) and Parker (1918) mentioned that the male trees are rare in *Populus ciliata*. However, Anon. (1978) states that natural stands of *P. ciliata* and also plantations were analysed for sex ratio around Manali, Harlu, lower Kulu and Parvati Ranges in Himachal Pradesh. Based on survey of 3,531 trees, it was observed that male trees dominate and have 67.71% frequently as compared to 38.9% female. This gives an approximately 3:2 male to female ratio. Singh (1981) stated that pooling the data of 586 trees examined in various localities of Himachal Pradesh gave the ratio of male and female trees as 2:1. However, during our survey during 1995-1998 in Garhwal Himalaya we found maximum population of female trees, male tree were very less. Joshi (1981) also stated that in the Uttar Pradesh region most of trees are female, male trees are scarce. Gupta (1969) while mentioning its occurrence in Jaunsar and Tehri Garhwal also stated that the male trees are very scarce. At present this indicates that the ratio of male and female trees varies with the locality.

Populus ciliata can easily be propagated by cuttings. Troup (1921) stated that its regeneration through seeds is negligible. However, the commonest form of its natural reproduction is by root-suckers. The seeds of *P. ciliata* are light about 14,000 to 15,000 seeds weigh one gram (Singh, 1981; Beniwal and Singh, 1989). In laboratory condition, 75-95% germination of seed noted by Singh and Gupta (1981). Mathur *et al.* (1982) mentioned that under laboratory condition its germination is 86.25%, while on land slip under natural condition, only 0.30% was noticed. Under natural conditions, however, seed germination is considerably poor. Some seedlings, manage to grow in crevices of rocks or newly exposed ground such as landslips and road cuttings and on alluvial boulder deposits along streams. The seedling establishment in uncommon because of the following reasons (Singh, 1981) :

- Most of the seeds are caught on the grass, weed and moss covering the soil fail to come in contact with mineral soil.
- Unfavourable moisture conditions at the time of seed dispersal. Sufficiently moist soil is needed at the time of germination and for a fairly long time after germination.
- Susceptibility of seedlings to fungal attacks particularly damping off.
- Washing away of seeds and tiny seedlings by run-off water on slopes and their desposition in depressions

where they get covered by soil and fail to germinate.

Recently Nautiyal *et al.* (1995) have reported its profuse natural regeneration in Tons Forest Division, Uttar Pradesh. They also stated that the area of around 40 m radius was full of the seedlings. The site was sunny and slopey.

A study of the performance of forest clones of poplars and the farm forestry condition trial was laid down at Khaltoo (Himachal Pradesh) in 1976 with 6 species namely *Populus ciliata, P. casale; P. yunnanensis, P. trichocarpa, P. oxford* and *P. deltoides* planted 60 x 30 cm spacing. It was found that maximum survival was recorded in *P. ciliata* followed by *P. deltoides* while height and diameter was maximum in *P. yunnanensis* followed by *P. ciliata* (Anon., 1978).

Populus gamblei Dode

Vern. : *Pipalpate, pilpile.*

It is the southern-most Poplar in the Northern Hemisphere and is distributed in Yazuli and Yachuli area of Subansiri District of Arunachal Pradesh. In Darjeeling hills it is naturally found in Damson forests, where it is sometimes observed colonizing the slip areas. Also occurs along the roads from Kalimpong to Teesta. It grows between the elevations of 600-1100 m as an associate with *Schima wallichii, Alnus nepalensis, Bauhinia variegata* in the forest type East Himalayan Sub-tropical wet hill forest (8B/C1). During March-April each year, natural regeneration of *P. gamblei* is found in profusion under the areas affected by land slips, the young seedlings appear to colonize the slip affected areas.

Populus gamblei provides an annual output from 16.3 m/ha to 35.9 m/ha depending on age (Lahri, 1979). The wood of *P. gamblei* has been found to the suitable for ply, match and packing case industries. Eighteen trees of *P. gamblei* planted in the year 1975 are growing in the Tashiding I Compartment beat in Kalimpong Division, North Bengal. The seeds of *P. gamblei* are very minute, weighing about 1500 an ounce and attached to fluffy floss, often difficult to collect because of short time gap between flowering, fruiting and quick dispersal (Ghose, 1969; Lahri, 1979). Muhle-Larsen (1970) has reported 12 species of *Populus* showing change in sex in standing population. Recently Sharma *et al.* (1999) have reported sex reversion in *P. gamblei* from male to female. This 19 years old tree is growing in the Plant Physiology section of Forest Research Institute, Dehra Dun.

Branch cuttings of most of the Poplar species root easily without any pre-treatment of synthetic growth regulators but cuttings of *P. gamblei* do not root easily (Guhathakurta, 1973). Ghose and Bhatnagar (1977) stated that rooting response of branch cuttings of *P. gamblei* to different growth regulator treatments and seasonal variation in rooting. Growth regulators have considerably increased rooting. Twenty-four hours dip treatment in aqueous solution of 200 ppm concentration of Indole Acetic Acid has given best results in which 70% rooting has been achieved. In view of its good rate of growth it offers potential of developing hybrid clones (Guhathakurta, 1973).

Populus jacquemontii Dode var. *glauca* (Haines) Kimura (*P. glauca* Haines)

Vern. : *Pipalpate or dude malata.*

This is the only Indian Poplar which has bisexual flowers. It is distributed in Tonglo in Sikkim and Eastern Nepal at an altitude between 2,500-2,900 m. It is generally found in forest clearing; quite common around villages. A beautiful colour photograph of this rare species is given Stainton (1997). It is also regarded by some experts as a form of *Populus ciliata* (Anon., 1979). At present which is not correct because *P. ciliata* is dioecious.

Populus rotundifolia Griff. (*P. microcarpa* Hk.f. & Th.; *P. bonatii* Leve.)

Vern. : *Kashing, kashi.*

A shrub or tree, 2-10 m. This species is endemic to Thimpu, Punakha and Bumthang District of Bhutan Himalaya, distributed in Blue pine forest at an altitude between 2300-3050 m (Grierson and Long, 1983). This little known species has been included here because phyto-geographically Bhutan is a part of Eastern Himalaya. Therefore in future it can found in adjacent States like Sikkim and Arunachal Pradesh as the vegetation of these states is similar to Bhutan.

In the plains, introduced clones of *Populus deltoides* have given good performance. However, instead of depending solely upon introduced clones of *P. deltoides* for the hills, work should be initiated in indigenous species to generate new clones or hybrids. Suggested lines of work are :

- Where there pure patches of wild Poplar are growing, these should be declared and maintained as "National Poplar Reserves".
- Germplasm banks of plus trees of indigenous poplars are growing, these should be raised at plantation sites in hills to study genotype and site interaction should be studied.
- A Poplar breeding programme incorporating indigenous and exotic poplars should be taken up on priorities to generate superior clonal material for planting under agroforestry in hill areas and plains.

SUMMARY

Genus *Populus* is usually dioecious, rarely monoecious viz. *Populus lasiocarpa*; exceptionally bisexual i.e. *Populus jaquemontii* var. *glauca*. There are only four species of *Populus* native to India viz. *Populus ciliata, P. gamblei, P. jacquemontii* var. *glauca* and *P. rotundifolia*. Rest all are exotic and some of them are naturalized in Kashmir i.e. *P. alba, P. euphratica* and *P. nigra*. A key to the identification of both wild and exotic species, nomenclature and distribution of species; work done on the endemic species and suggested lines of work have been provided for the improvement of indigenous species.

देशज जातियों के विशेष सन्दर्भ में भारतीय पोपलर (वन पिप्पल)

एच०बी० नैथाणी, सुमेर चन्द्र व मोहिन्दर पाल

साराशं

पोपुलस प्रजाति प्रायः एकलिंगी तथा यदाकदा द्विलिंगी होती है उदा० *पो० लैसियोकार्या* । उपवादतः उभय लिंगी जाति अर्थात् *पोपुलस जैकमाटिआई* विभेद *ग्लौका* भी है । *पोपुलस* की भारत में केवल चार देशज जातियां मिलती हैं अर्थात् *पोपुलस*

सिलियाटा, पो० जैकमांटिआई विभेद *ग्लौका, पो० गैम्बलेई* और *पो० रोटण्डिफोलिया* । बाकी सभी परदेशीय जातियां हैं और उनमें से कुछ जातियां यहां प्राकृतिकवत् बन गई हैं जैसे कश्मीर में *पो० एल्बा, पो० युफ्रेटिका* और *पो० नाइग्रा* । इन वन्य और परदेशीय दोनों तरह की जातियों को अलग-अलग कर पहचानने की कुंजी, इन जातियों का नामकरण और विस्तार, स्थान सीमित जातियों पर किया गया कार्य तथा भविष्य में काम करने के लिए सुझाई गई दिशाएं ताकि देशज जातियों में परिष्कार लाया जा सके, इस अभिपत्र में प्रस्तुत की गई हैं ।

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