

## CULTIVATION PROSPECTS OF EXOTIC AND INDIGENOUS POPLARS IN PAKISTAN

by

A.R. BEG AND MAHMOOD IQBAL SHEIKH\*

### SUMMARY

*After field trials with scores of cultivators of exotic poplars it has become possible to pinpoint a few hybrid and deltoides clones for the northern and central regions and some deltoides clones for the southern parts of the country. It has been especially emphasized that due attention should also be given to cultivation techniques as well as improvement, through selection and breeding, of indigenous poplars such as *P. euphratica*, *P. ciliata* and *P. alba*, as the natives and their hybrids are, in the long run, likely to prove more adaptable to the diverse climatic conditions obtaining in the country.*

### Introduction

Poplars are amongst the fastest growing trees in the world. Because of the ease with which they can be propagated and grown, they have become hot favourites to make up for the wood deficiencies in many a country of the world. With the passage of time it has convincingly been proved that given the proper climatic and edaphic conditions, various poplars can successfully be planted over large areas. It is, however, absolutely essential to select the proper stock and put it in a habitat most suited to its growth and development.

For the past number of years, trials have been underway to select proper material for planting. They have, however, been limited both in scope and in space and have mostly been restricted to exotic poplars, viz., *P. deltoides* and *P. euramericana* and that too, in tropical and subtropical habitats. From amongst the natives, some small scale selection studies were initiated with *P. ciliata* and *P. euphratica* but were not followed up.

Comparative growth studies for all poplars are, therefore, required to be made in various climatic zones so that suitable material could be selected for large scale planting in

---

\*The authors are Forest Botanist and Director, Forestry Research Division, Pakistan Forest Institute, Peshawar, respectively.

different parts of the country. Studies on improvement, through selection and breeding, of indigenous poplars are also desirable as they and their hybrids are likely to perform better in varied climatic conditions as compared to exotics.

In a developing country like Pakistan, poplar wood is in great demand by the wood based industry. Pulp and paper, for which poplars are eminently suitable, are being imported to the tune of crores of rupees. In view of this situation, mills are prepared to take even one year plants for use as raw material. It is, therefore, highly imperative that this resource is properly and timely developed to meet the ever-increasing demands of the industry as well as needs of the local population.

### Work on recent introductions

Work on introduction of exotic poplars in Pakistan was started in late fifties. In the first instance, only *Populus x. euramericana* cv. I-214 (hybrid poplar) was imported. Subsequently, a large number of clones of *P. deltoides* and hybrid poplar were introduced from many countries such as Yugoslavia, Turkey, Australia, etc. They were planted as avenue trees, in the form of compact plantations, as windbreaks and just single trees, here and there. With the passage of time, scientific methods of producing nursery stock and necessary measures, to plant the tree successfully in field, have been streamlined through small scale studies in different parts of the country. (3.)

Work conducted by the poplar specialists over a period of last 5-6 years (8, 7) has indicated the suitability of following poplar clones for some parts of the country:

#### A. Southern region:

Hyderabad (Oceanic climate) 25° 23' N lat., 68° 30' E long.

- |   |                               |
|---|-------------------------------|
| 1. <i>P. deltoides</i> × <i>caudina</i> | Y—509; Y—510 <sup>1</sup>     |
| 2. <i>P. deltoides</i>                  | I—6/64 <sup>2</sup>           |
| 3. <i>P. deltoides</i> (?)              | A—65/27; A—65/31 <sup>3</sup> |

It has convincingly been proved that:

- Hybrid poplar has no future in the southern region.
- *deltoides* clones can be planted successfully only at close spacing since they perform poorly on wider spacing.
- the recommended *deltoides* clones especially Australian ones can be planted on large scale, at a close spacing of 0.9 m × 0.9 m to 1.5 m × 1.5 m, either from cuttings or plants, on a short rotation of 2-3 years.

---

(1) Y—Yugoslavia.

(2) I—Italy.

(3) A—Australia.



When raised from cuttings, these clones attain an average height of 4.0 m and a diameter of 10.0 cm. in one year.

### B. Central Plains

Changa Manga      31°00' N lat., 73°52' E long.  
Daphar (Gujrat)    32°32' N lat., 74°10' E long.

One of the clonal trials, laid out in Changa Manga irrigated planttion in March, 1970, where three clones were used, has given the following results: (6)

Clone	Height (m)		d.b.h. (cm)	
	1970	1974	1970	1974
<i>P. deltoides</i> cv. I—63/51 ..	4.4	16.0	2.5	21.3
<i>P. × euramericana</i> cv. I—214	4.0	13.6	2.0	16.8
<i>P. × euramericana</i> cv. I—021 ..	4.0	11.4	2.3	13.7

It clearly shows that *P. deltoides* cv. I—63/51 definitely performs better than the two hybrids in this habitat. However, there is a serious drawback in *deltoides* clones; they are difficult to root. (1)

*P. × euramericana* cv. I—214 has, however, done well in Daphar.

### C. Northern region

Peshawar      34°00' N lat., 71°30' E long.  
Mingora (Swat) 34°36' N lat., 70°17' E long.

Following clones have shown promise in this area:—

1. *P. × euramericana* cv. I—214; cv. I—021  
cv. I—488; cv. I—79/234
2. *P. deltoides* I—63/51; I—90/60  
I—69/55
3. *P. deltoides* × (?) I—18/62

### Performance of hybrid and deltoides poplars in Pakistan

Studies have indicated that grown on suitable sites and provided all the requisite after-care, including irrigation, soil working, etc. hybrid poplar can attain an average height of 19.7 m (65') and a diameter of 40.6 cm (16") over a period of 10 years. It means that a tree can yield 1 m<sup>3</sup> (35 cft) of wood.

However, both the deltoides and the hybrid poplar clones have been attacked by a number of defoliators and stem borers such as *Gypsonoma hapalosarca* Meyr., *Ichthyura anastomosis* Staph. and *Melanophila picta* Pall. Some fungal pathogens, most important of which is *Melampsora epitea* (Kze. and Schm.) too, do not spare them. All these insects and fungi were already recorded on willows in the country and seem to have afflicted poplars as well.

### Earlier introduction of poplars

Among the earlier introductions is *P. nigra* var. *italica*. However, no record of the period of introduction is available. Because of its beautiful form, reasonably good timber and easy method of growing, it has ultimately spread throughout the country. It is mostly grown along water channels, as an avenue tree or as dependable windbreaks in the plains as well as in the mountains upto an altitude of about 4000 m in N.W.F.P.; Dir, Swat, Chitral, Gilgit District; Gilgit, Naltar, Astor, Yasin, Ishkoman, Baltistan District; Nubra, Ladak, Skardu, Shigar, Parkuta, Khaplu, Rondu vy., Kashmir, Punjab and Baluchistan. Thus, over a period of long time, the tree has adapted itself in different parts of the country.

It, however, grows differently in different climates. In tropical and subtropical localities, its performance is rather poor and it fails miserably as a timber species. It is attacked by all sorts of insects and fungal diseases and is not considered of much value. In Peshawar, Buner and Lower Swat, the tree is attacked by insects while still young and topples over with the slightest wind. In moist temperate climates, too, it does not perform well. In the inner dry temperate valleys such as Gilgit and Kashmir, it does wonderfully and is the chief source of timber for the region. It yields as much volume of wood as a mature conifer tree in the area, or even more and that too, in much fewer years as compared to any other local timber species.

Growing in the Chilghoza pine zone in the Astor-Gorikot area, these gigantic poplars dominate the landscape and form a very impressive sight against an otherwise desertic mountain environment. (Fig. 1) They are reported to perform equally well also in the juniper zone in the Ishkoman-Yasin valleys. Mature trees, as at Astor, attain an average height of about 30m and d.b.h of about 1m. This roughly means about 16m<sup>3</sup> volume of timber which certainly is enormous. The tree matures in 65 years (2). The trees at Astor are over-mature as they show signs of top dying. They, however, appear yet free from any insect or fungus attack. The tree is raised from shoot cuttings planted along irrigation channels at about 2 m spacing.





*Populus nigra* attains huge size in Northern Areas.



Although details of the ecology of *P. nigra* var. *italica* are not fully known, much can be learnt from past sporadic trials. Whenever water is available, the tree is most suited to growth in the dry temperate climates particularly in the Chilgoza pine and Juniper zones. It has great prospects for extensive cultivation in these habitats in Gilgit, Baltistan and Diamir Districts, Chitral, upper Kaghan vy., Swat Kohistan, north western parts of Azad Jammu and Kashmir and Baluchistan. These are somehow also the areas locally with great timber and fuelwood shortage as well as low income levels. With enough wood produced small scale wood-based industries could be set up in these areas to raise the income level of the common man. This would also release the pressure on natural vegetation, which is disappearing at an accelerated pace, in such high altitude steep watershed areas.

Other cultivated poplars recorded in Pakistan are *P. afghanica* (Aitch. et Hemsl.) C.K. Schneider and *P. pamirica* Komar. (Balsam poplar). The former is reported from two localities, viz., South Waziristan and Kurram valley at Shalizan and the latter from West and South Waziristan at Wana, Chitral, Swat, Hindu-Kush, Karakoram; Pajju, Ashkol, Hushe vy., Ladak; Leh, Zaskar from 1360—4000 m. Nothing more is, however, known about either of them.

### Native poplars

Three species of poplars grow in nature in Pakistan. They are *P. ciliata* Wall. ex Royle, *P. alba* L. and *P. euphratica* Olivier. *P. ciliata* and *P. alba* are strictly temperate species *P. euphratica* descends even lower into the subtropical and tropical environments.

1. *P. ciliata* grows at altitudes of 2000-3000 m in the Murree Hills, Hazara, Swat, Dir, Chitral, Gilgit, Astor, Naltar, Gudai, Chillam. Baltistan and Azad Jammu and Kashmir. It occupies cool and moist sites in the moist temperate and the riverain tract in the dry temperate zones. As a gallery forest, its status is only seral. This azonal forest is, however, nowhere in tact due to severe human interference. Large sized crops are absolutely non-existent as are the large sized trees. The tree, however, does attain a big size with a long straight clean bole on suitable sites. The tree certainly has great prospects of reintroduction and development in its natural habitat with further improvement through selection. Some casual selection work already done has indicated lots of prospects(5) and more serious attention in this particular direction has to be given. It regenerates freely from seed. It can be propagated artificially from cuttings and rhizomatous branches.

2. *P. euphratica* occupies the riverain tract right from sea-level to 4000 m in the mountains. It has been reported to grow in Karachi, Quetta, Pishin District, Sibi, Bela, South Waziristan, Multan, Lahore, Sohan River, Attock District, Peshawar, Gorikot (Astor), Baltistan, Shyok vy. Pakuta, Tolti, Tubrak and Ladak. The forest is usually not available in its habitat due to severe biotic action. The crop is, therefore, only patchy and consists generally of small trees. Large-sized trees are, however, also occasionally met with at a few protected places in the southern plains area. The tree grows to a con-



siderable size but generally does not have a straight bole. For tropical plains, this is the poplar. The tree has great prospects of re-introduction and development in its natural environment as well as improvement through selection.

It regenerates freely from seed and rhizomatous branches. According to some researehers the seed is viable only for a few hours. Care has, therefore, to be taken to sow the seed soon after it is collected.

3. *P. alba* grows at altitudes of 1300—3000 m in the Murree hills, Hazara, Swat, Chitral, Gilgit, Asior, Gudai, Shigar, Baltistan, Skardu, Khaplu, Rondu and Hushe valleys. It has subsequently also spread into Baluchistan at Quetta, Mastung, Mach and Loralai, Tank and Peshawar by cultivation. Like *P. ciliata*, it occupies cool and moist sites in the moist temperate and riverain tract in the dry temperate zones. As a gallery forest its status, too, is seral. The tree has been completely exterminated from riverain belt due to severe biotic influence. It usually occurs as single trees. Large sized trees are usually not met with but it does attain a big size in proper environment. The bole is often quite straight and clean. The tree certainly has great scope for re-introduction and development in its natural habitat as well as improvement through selection and further multiplication. It regenerates freely from seed. It can be propagated artificially from cuttings and rhizomatous branches

### Hybridisation

*P. alba* occupies almost the same habitat as *P. ciliata* and *P. euphratica* in the upper limits and *P. euphratica* in the lower. It has a wider ecological amplitude than *P. ciliata* but a narrower ecological range than *P. euphratica*. However, inter-specific hybrids have hitherto not been reported nor sighted but chances of their occurrence are not scarce. These three native poplars form a big gene pool for hybridisation and selection of suitable planting material for various parts of the country.

In order to develop good local stock for planting in both temperate and tropical areas it will be worthwhile to try crossing *P. ciliata* and *P. alba* with *P. euphratica*. If crossing succeeds, high yielding hybrids, suited to growth in a wide range of climatic conditions, could ultimately be selected. These hybrids will definitely be better adapted to the local environment than the exotic poplars which are not entirely suited to tropical areas. Not only will this offer suitable planting material for growth under tropical conditions but will also save waste, made on plant protection measures, on one hand and lessen chances of air pollution on the other.

### Conclusion

As the performance of hybrids and deltoides clones indicates so far, quite a few of them can be planted in different climatic zones of the country. However, the indigenous poplars provide a great scope for further development on their own merit. These species

have a wide range of distribution, the best course would be to develop a suitable research programme on their selection and hybridization.

### References

1. Hafeez M. & M.I. Sheikh 1973 Effect of various factors on rooting of poplar in Pakistan. Pakistan J. For. 23 (3).
2. Rasul, G 1975 Personal communication.
3. Sheikh M.I. 1964 Introduction of Hybrid poplar in Pakistan. Pakistan J. For. 14 (2): 104—109.
4. Sheikh M.I. 1972 A comparative study of hybrid poplar and eucalypts. Pakistan J. For. 22 (1): 29—42.
5. Sheikh M.I. 1973 Selection of *P. ciliata* clones. Pakistan J. For. 23(2) 149—154 (illus).
6. Sheikh M.I. 1975 Interim results of the poplar clonal trials in the Punjab (under print).
7. Sheikh M.I. 1975 National poplar Commission Report.
8. Sheikh M.I. & Raja Walayat Hussain. 1972 Poplar clonal trials in W. Pakistan. Pakistan J. For. 22 (3): 301-302.