Populus deltoides

Bartr.

Salicaceae

LOCAL NAMES
Dutch (Amerikaanse Populier); English (necklace poplar,Caroline poplar,cottonwood,eastern poplar,plains cottonwood,eastern cottonwood); French (peuplier noir d'Amérique,peuplier de Virginie); German (ostamerikanische Pappel,Texaspappel,Rosenkranzpappel); Hindi (phalash,chalaun,bahar,bagnu); Italian (Pioppo nero d'America); Spanish (álamo virginiana,chopo de Virginia)

BOTANIC DESCRIPTION
Populus deltoides is a medium-sized to large tree, 20-30 (max. 50) m tall, 100 cm dbh; bark greyish-green and smooth at first, later blackish and furrowed; trunk short and massive in the open, often divided into a few large, wide-spreading limbs near the ground to form a broad, irregular-shaped, open crown. In the forest, the trunk is long, straight, with a small, rounded crown; root system usually shallow, wide spreading, may be deep in deep soils. It is one of the fastest growing trees, often planted where fast growth is the main requirement.

Leaves broadly deltoid, 8-15 cm long and nearly as broad, glabrous on both sides, short-acuminate, dentate, with incurved glandular or callous-tipped teeth; bases truncate to subcordate, with 2-3 basal glands; petiole strongly flattened laterally.

Bracts of catkins fringed or fimbriate, the divisions narrow; staminate aments 7.5-12.5 cm long, thick; stamens about 60 or more; anthers red; pistillate aments green and slender; ovaries glabrous; stigmas 3 or 4.

Mature seed catkins 15-25 cm long; stalk hairless; capsules ovoid, 6-10 mm long, glabrous, green, splitting into 3-4 parts when mature; peduncle 3-10 mm long; seeds cottony.

The generic name is the classical Latin name for poplars, possibly from ‘paipallo’ (vibrate or shake) or originating in ancient times when the poplar was called ‘arbor populi’ (the tree of the people), because in Rome it was used to decorate public places. The specific name means ‘triangular’, referring to the shape of the leaves, from the Greek letter delta and ‘oides’ (resembling).

BIOLOGY
P. deltoides is dioecious with sex ratio of 1 to 1. Male buds develop somewhat earlier than female buds and are much larger. Flowering occurs before leaves appear.Trees as young as 4 to 5 years old have flowered.

Male flowers are 8 to 13 cm long, have 40 to 60 reddish stamens and are more conspicuous than the female flowers. Female flowers elongate to 15 to 30 cm. Flowering varies by as much as a month among trees in a stand. As a result, early-flowering trees do not have the opportunity to cross with late-flowering trees.

In India, anthesis occurs usually in the 1st week of April, and seed is ripe by early June. In the lower Mississippi Valley of the USA, seed ripening and dispersal take place from mid-May through late August, while in northeastern USA it occurs slightly later.

P. deltoides produces large seed crops nearly every year. When shed, the small seed has a small tuft of hair attached to its base that helps in wind dispersal.

Fertile branches (Dan Skean, Jr., 25 May 2003)

Bark (Chris Evans, The University of Georgia, www.forestryimages.org)

Stand (Dave Powell, USDA Forest Service, www.forestryimages.org)

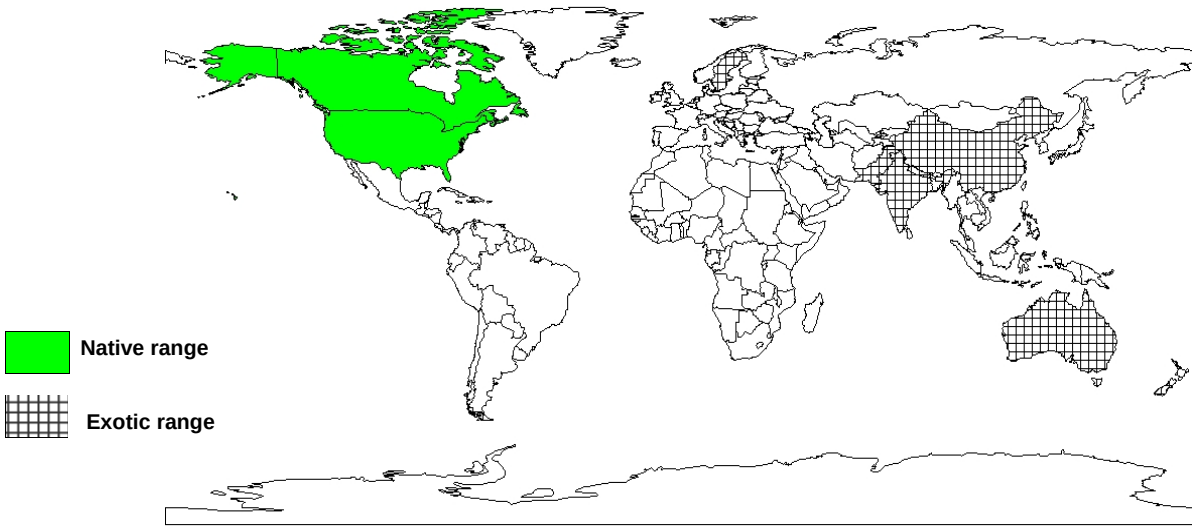
ECOLOGY
P. deltoides tolerates frost, heavy soil, sand, slope, and waterlogging. Because of its intolerance to competition and the absence of suitable seedbeds under existing stands, it does not usually succeed itself. It is estimated to range in forest life zones from warm temperate dry to moist through cold temperate dry to moist.

BIOPHYSICAL LIMITS
Altitude: Up to 1000 m, Mean annual temperature: 8-14 deg. C, Mean annual rainfall: 600-1500 mm

Soil type: Said to persist on infertile sands, fine, sandy loams, and fairly stiff clays, but thrives on moist, well-drained, fine, sandy loams or silts close to streams, pH of 4.5-8.

DOCUMENTED SPECIES DISTRIBUTION

Native: Canada, US
Exotic: Australia, China, India, Nepal, Netherlands, New Zealand, Pakistan, Sweden, United Kingdom



The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to your planting site.

PRODUCTS
Fodder: P. deltoides has been used extensively as a fodder species for sheep, goats and other livestock.

Fuel: Wood is used for fuel.

Fibre: A good fibre and pulp is obtainable from P. deltoides.

Timber: The timber is used principally for lumber, veneer, pulpwood and excelsior.

Tannin/dyestuff: Salicylic acid, derivable from this species, is now synthesized. In its technical form, it is used as a coupling agent in dye intermediates, in the foundry industry as a curing agent in the production of shell moulding compounds, as an agent for retarding the vulcanization process in rubber, as a preservative for glues and leather goods, and in alkyl and alkyd resins and latex paints.

Medicine: The bark is used to treat rheumatism, gout and scurvy and infections of the chest, kidneys and stomach; the buds are used as a vulnerary and pectoral. In Europe, the fresh flowers are steeped in cold water to purify blood. Used as a cancer remedy by native Americans, who also used the buds in many ways, for example, stewed in bear fat for earache, bronchitis or cough, or cooked in tallow to make an ointment for eczema, myalgia and sores, or in poultices for hip or lung pain, colds and respiratory problems. Rotten leaves are a herbal bath for general body pain; chewed root is applied as a haemostat. Bark is for heart ailments, sprains and strains, and the root for backache, female ailments such as metrorrhagia and weakness.

SERVICES
Shade or shelter: In India during the summer months it works as a windbreak and saves the crop from scorching winds. It is popularly used as a shelterbelt species.

Soil improver: P. deltoides produces a large quantity of leaves. The nitrogen contribution to the soil could be as much as 43 kg in 3 years and 102 kg in 11 years. Improvements in soil structure and chemical properties under P. deltoides are also possible.

Intercropping: Soya beans, sugarcane, wheat, maize, potatoes, mustard, lentils, fodder crops and aromatic herbs such as lemon grass are all commonly intercropped with P. deltoides.

Boundary or barrier or support: Trees planted in and around the edges of fields are regularly ploughed and planted with agricultural crops and hence develop vigorous roots, attain great height and diameter, and produce a high quantity of timber.

Ornamental: Widely used in the USA and Canada for amenity plantings

TREE MANAGEMENT
Annual productivity in P. deltoides ranges from 3 to 22 t/ha. Fast-growing trees in Sweden, harvested young, have given biomass yields of 14-28 t/ha. The maximum possible production of fast-growing P. deltoides, with optimum fertilization and moisture, is 44 t/ha in the Netherlands, but normal production levels are closer to 6 t/ha.

GERMPLASM MANAGEMENT
Seeds are microbiotic. However, with proper drying and cold storage in sealed containers, their viability can be maintained for several years. Seed storage behaviour is orthodox; 50-70% germination following 2 years of hermetic air-dry storage at 2-5 deg. C; 21% viability lost after 6 years of hermetic storage at -20 deg. C with 6-10% mc; 24-100% viability lost after 10 years hermetic storage at -18 deg. C with 8.4-13.5% mc.

PESTS AND DISEASES
Enemies of P. deltoides include many animal parasites, especially insects. One of the most dangerous is Anaera carcharias, a long-horned beetle of the Cerambicidae family, which does considerable damage, boring tunnels into the trunks, particularly of young trees, weakening them and bringing them down. In Nepal, a fungus, Fusarium oxysporum, is found on P. deltoides.

FURTHER READNG

Anon. 1986. The useful plants of India. Publications & Information Directorate, CSIR, New Delhi, India.

Farrah JL. 1995. Trees of the Northern United States and Canada. Iowa State University Press/AMES.

Goldstein M. et. al. 1984. The Macdonald guide to trees. Macdonald & Co. Ltd.

Hong TD, Linington S, Ellis RH. 1996. Seed storage behaviour: a compendium. Handbooks for Genebanks: No. 4. IPGRI.

Lanzara P. and Pizzetti M. 1978. Simon & Schuster's Guide to Trees. New York: Simon and Schuster

Li HI. 1996. Shade and ornamental trees: their Origin and History. University of Pennsylvania Press, Philadelphia.

SUGGESTED CITATION

Orwa C, Mutua A , Kindt R , Jamnadass R, Simons A. 2009. Agroforestree Database:a tree reference and selection guide version 4.0 (http://www.worldagroforestry.org/af/treedb/)