Nyssaceae—Sour-gum family

Nyssa L.

tupelo

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Growth habit and use. The 4 deciduous, arboreal species of tupelo—the genus *Nyssa*—native to North America (table 1) are valued for pulp, veneer, specialty wood products, wildlife food, and honey production. Water tupelo, black tupelo, and swamp tupelo were cultivated in North America before 1750 (Bonner 1974; Brown and Kirkman 1990).

Flowering and fruiting. The minute, greenish white flowers that appear in spring (table 2) may be either perfect or staminate and pistillate; flowers may be borne separately on different trees. Fruits of the tupelos are thin-fleshed, oblong drupes about 10 to 38 mm long (figure 1). Their colors range from red to blue-black when they ripen in the autumn (table 2). Each fruit contains a bony, ribbed, usually 1-seeded stone (figures 2 and 3). Stones of water tupelo range in color from white to dark brown or gray, and some are pinkish white. Stones of all colors have germinated equally well (Bonner 1974). Trees of Ogeechee tupelo will bear fruit when they are about 5 years old (Kossuth and Scheer 1990), and 2-year-old stump sprouts of both swamp tupelo and water tupelo have produced viable seeds (Priester 1979). Major seed production can be expected when trees reach a dbh of about 20 cm, and all of the tupelos typically fruit abundantly each year (Johnson 1990; Kossuth and Scheer 1990; McGee and Outcalt 1990).

Collection, extraction, and storage. Ripe tupelo fruits may be picked from the ground, from standing trees, or from freshly felled logging tops. Newly shed fruits of water tupelo with exocarps intact will float for as long as 100 days, and they may be skimmed from the top of the water or picked from drift piles (Johnson 1990; Schneider and Sharitz 1988). Ogeechee tupelo fruits that are partially dried may float also (Kossuth and Scheer 1990), but fruits of the other tupelos do not (McGee and Outcalt 1990). External fruit color is the best index of maturity in the field (table 2). To extract the seeds, the fruits should be run through a macerator with running water to float off the pulp. Small samples may be de-pulped by rubbing the fruits over a large-meshed screen, such as hardware cloth. For water tupelo, observed numbers of fruits per weight have been from 340 to 600/kg (155 to 270/lb). Fifty kilograms (100 lb) of black tupelo fruits should yield 12 kg (25 lb) of cleaned seeds (Bonner 1974). Seed weights are listed in table 3.

Water tupelo seeds are orthodox in storage behavior. They can be stored for at least 30 months in polyethylene bags at either 3 or –10 °C, if seed moisture contents are <20% or <10%, respectively (Bonner and Kennedy 1973). Seeds of black tupelo can be stored satisfactorily over 1 winter in cold, moist stratification in sand or in just cold storage (Vande Linde 1964). Removal of the pulp did not appear to be essential for retention of viability in either condition. There are no published storage data for other tupelo species, but it is probable that the same methods

would be successful for them also.

Pregermination treatment. Tupelo seeds exhibit moderate embryo dormancy, and they benefit from cold, moist stratification. Treatment in moist sand and in plastic bags without medium have been used successfully (Bonner 1974; DeBell and Hook 1969). Good germination has been reported after only 30 days of stratification, but periods up to 120 days may be needed for some seedlots (Bonner 1974; DuBarry 1963).

Germination tests. Official seed testing prescriptions for tupelos in North America (AOSA 1993) call for a temperature regime of 8 hours at 30 °C in light and 16 hours at 20 °C in the dark. Testing should be on moist blotters or creped cellulose wadding for 21 days (water tupelo) or 28 days (black tupelo). Stratification for 28 to 30 days should precede the test. Germination of stratified seeds has been tested in several other media (table 4), and each of these probably would be satisfactory for seeds of all tupelo species.

Nursery practice. Although untreated seeds may be sown in the fall (Heit 1967) spring- sowing of stratified seeds is recommended, particularly in the South. They may be broadcast or drilled in rows, with 50 seeds/m (15/ft) for water tupelo. Seeds should be planted 12 to 25 mm (½ to 1 in) deep or sown on the bed surface and rolled into the soil and mulched (Bonner 1974; Vande Linde 1964). Mulching with 2 to 3.5 cm (.8 to 1.4 in) of sawdust is recommended for water tupelo and with 6 mm (¼ in) of sawdust or 1 cm (.4 in) of pine straw for swamp tupelo. After sowing, the seeds and mulch must not be allowed to dry excessively. Shading with tobacco shade cloth can help keep beds moist and aid the newly emerged seedlings (Vande Linde 1964). Germination is epigeal (figure 4). Desirable seedbed densities for water and black tupelos are 100 to 150 seedlings/m^2 (9 to 14/ft^2) (Williams and Hanks 1976. Vegetative propagation of tupelos is possible by softwood cuttings and grafting (Dirr and Heuser 1987).

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Figure 1—*Nyssa,* tupelo: fruits, × 1.

Figure 2—*Nyssa,* tupelo: stones (seeds), × 1.

Figure 3—*Nyssa sylvatica*, black tupelo: seedling development at 1, 4, and 39 days after germination.

Table 1—*Nyssa,* tupelo: nomenclature, occurrence, and height

Scientific name & synonym(s)	Common name(s)	Occurrence	Height at maturity (m)
***N. aquatica* L.** *N. uniflora* Wangenh.	**water tupelo,** tupelo-gum, sourgum, cotton-gum, swamp tupelo	Coastal Plain from Virginia to N Florida & Texas N to Missouri & S Illinois	24–30
***N. biflora* Walt.** *N. sylvatica* var. *biflora* (Walt.) Sarg. *N. sylvatica* var. *ursina* (Small) Wen & Stuessy	**swamp tupelo,** blackgum, swamp black-gum	Coastal Plain, chiefly from Delaware to S Florida & E Texas, N to W Tennessee	40
***N. ogeche* Bartr. ex. Marsh**. *N. acuminata* Small	**Ogeechee tupelo,** Ogeechee-lime, sour tupelo, sour tupelo-gum, white tupelo	Coastal Plain from South Carolina to NW Florida	12–15
***N. sylvatica* Marsh.**	**black tupelo,** blackgum, sourgum, tupelo-gum, pepperidge	Maine W to Michigan & Missouri, S to E Texas & S Florida	15–18

Source: Little (1978).

Table 2—*Nyssa,* tupelo: phenology of flowering and fruiting

Species	Flowering dates	Fruit ripening dates	Color of ripe fruits	Dates of fruit drop
N. aquatica	Mar–Apr	Sept–Oct	Dark purple	Oct–Dec
N. biflora	Apr–June	Aug–Oct	Blue-black	Sept–Dec
N. ogeche	Mar–May	July–Aug	Red	Nov–Dec
N. sylvatica	Apr–June	Sept–Oct	Blue-black	Sept–Nov

Sources: DeBell and Hook (1969), Kossuth and Scheer (1990), Radford and others (1964), Vande Linde (1964).

Table 3—*Nyssa,* tupleo: seed yield data

Species	Collection place	Cleaned seeds/wt Range /kg	Range /lb	Ave. /kg	Ave. /lb	Samples
N. aquatica	—	—	—	1,000	456	—
N. biflora	South Carolina	—	—	5,320	2,415	10
N. ogeche	—	2,300–3,100	1,040–1,420	2,700	1,230	2
N. sylvatica	—	4,100–8,820	1,850–4,000	7,280	3,300	5
	North Carolina	5,750–8,500	2,610–3,860	7,450	3,380	10
	Midwest	—	—	5,500	2,492	2+

Sources: Bonner (1974), Earle and Jones (1969).

Table 4—*Nyssa,* tupelo: germination test conditions and results on stratified seeds

Species	Daily light period (hrs)	Germination test conditions: Medium	Temp (°C): Day	Temp (°C): Night	Germination rate: Days	Germination rate: Amount (%)	Germination %: Days	Germination %: Ave Purity (%)	Germination %: Samples	Germination %: (%)
N. aquatica	8	Kimpak	30	20	27	87	18	97	5	100
	0	Water in petri dish	29	29	28	57	14	79	24	—
N. biflora	ND	Sand	—	—	60	—	—	51	—	—
N. ogeche	8	Kimpak	30	20	70	69	12	85	1	—
N. sylvatica var. *sylvatica*	8	Kimpak	30	20	27	—	—	71	8	99

Sources: Bonner (1974), Debell and Hook (1969).
ND = natural daylength in a greenhouse.