Magnolia acuminata L. Cucumbertree

Magnoliaceae Magnolia family

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Cucumbertree *(Magnolia acuminata),* also called cucumber magnolia, yellow cucumbertree, yellow-flower magnolia, and mountain magnolia, is the most widespread and hardiest of the eight native magnolia species in the United States, and the only magnolia native to Canada. They reach their greatest size in moist soils of slopes and valleys in the mixed hardwood forests of the southern Appalachian Mountains. Growth is fairly rapid and maturity is reached in 80 to 120 years. The soft, durable, straight-grained wood is similar to yellow-poplar *(Liriodendron tulipifera)*. They are often marketed together and

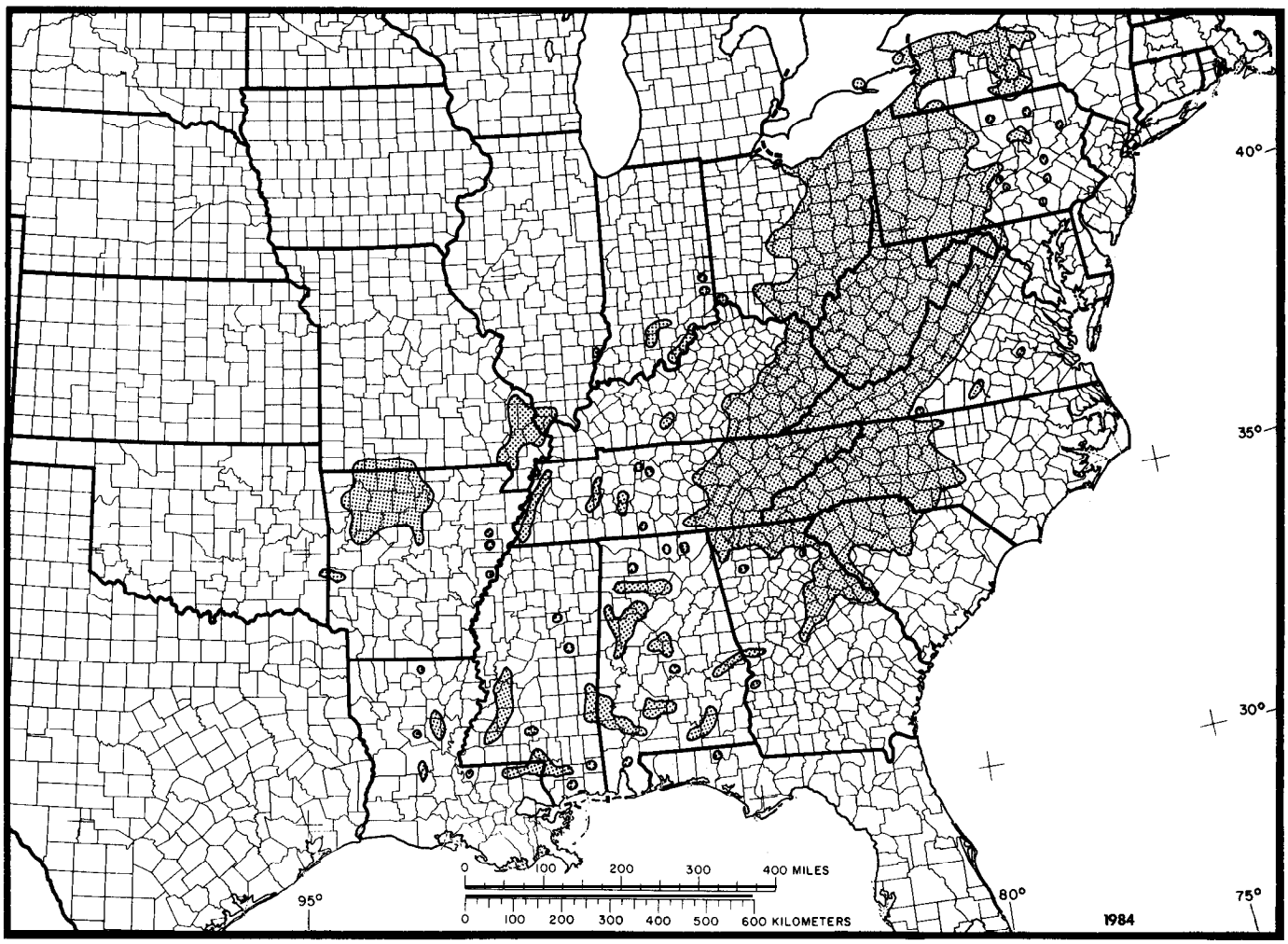

Figure *1-The native range of cucumbertree.*

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used for pallets, crates, furniture, plywood, and special products. The seeds are eaten by birds and rodents and this tree is suitable for planting in parks.

Habitat

Native Range

Cucumber-tree (figs. 1, 2) is widely distributed but never abundant. It grows on cool moist sites mostly in the mountains from western New York and southern Ontario southwest to Ohio, southern Indiana and Illinois, southern Missouri south to southeastern Oklahoma and Louisiana; east to northwest Florida and central Georgia; and north in the mountains to Pennsylvania.

Climate

Cucumber-tree is the hardiest of the native tree-size magnolias. The climate is described as humid to subhumid throughout its range. There are 110 to 260 days in the growing season, with 150 to 160 frost-free days in the northern portion of the range and 180 to 230 frost-free days in the southern portion. Annual precipitation measures 890 to 2030 mm (35 to 80 in), of which about 510 to 1020 mm (20 to 40 in) fall during the growing season. The mean annual temperature varies from a low of 7" C (45" F) in the northern range to 18" C (65" F) in the south. January temperatures usually are between -7" to 10" C (20" to 50" F); July temperatures are between 18" to 27" C (65" to 80" F); however, sometimes there are extremes well above and well below these temperatures for relatively short periods of time. Average annual snowfall measures from 200 cm (80 in) or more in the north to only a trace of snow in the south *(25,29)*.

Soils and Topography

This species prefers rich soils of bottomland and north to east slopes and is most plentiful in mountains and hills. The soils must be well drained, moist, and deep. Most slopes where this species is found are gentle to moderate, up to 25 percent, though cucumber tree is also found on steeper slopes. The species is found at elevations as high as 1524 m (5,000 ft) above sea level.

Cucumber-tree is found in three orders and five suborders of soil (28). The dominant order, Inceptisols, occurs on approximately 60 percent of the species range, particularly in the Appalachians. On steep slopes greater than 25 percent, cucumber-tree

Figure 2—*Cucumbertree in the Pisgah National Forest, NC.*

grows on coarse loams. On gentle to moderate slopes it is found on fine loams. Here, water is readily available to plants during more than one-half of the year or more than three consecutive months during the growing season. Soil textures are liner than loamy sand and these soils have a moderate to high nutrient content.

Approximately 35 percent of the soils are Ultisols, occurring on gentle to steep slopes in the southern range. These soils are low in nutrients. On slopes greater than 25 percent, cucumber-tree grows on fine to coarse loams, clays, and on well-drained quartz sands. On slopes up to 25 percent it is confined to coarse loams (28).

The remaining soils on which cucumbertree grows are in the order Alfisols.

Associated Forest Cover

Cucumber-tree is found scattered in the oak-hickory forest. It is an associated species in six eastern intermediate to climax forest cover types (5). In northern hardwoods cucumbertree is a minor component in Sugar Maple (Society of American Foresters Type 27) and Black Cherry-Maple (Type 28). In upland oaks of the central forest region it is a component in White Oak-Black Oak-Northern Red Oak (Type 52), Yellow-Poplar (Type 57), Yellow-Poplar-Eastern Hemlock (Type 58), and Yellow-Poplar-White Oak-Northern Red Oak (Type 59).

In the northern and central hardwoods and Appalachian Highlands, cucumbertree commonly is associated with sugar maple (*Acer saccharum*), yellow-poplar (*Liriodendron tulipifera*), yellow buckeye (*Aesculus octandra*), several oaks (*Quercus* spp.), and black walnut (*Juglans nigra*). Common understory vegetation includes spring beauty (*Claytonia caroliniana*), trilliums (*Trillium* spp.), violets (Viola spp.), Solomons-seal (*Polygonatum pubescens*), and sweet cicely (*Osmorhiza* spp.). In the Allegheny Plateau of northern Pennsylvania and southern New York, cucumbertree usually is associated with black cherry (*Prunus serotina*), sugar maple, yellow birch (*Betula alleghaniensis*), sweet birch (*B. lenta*), yellow-poplar, hemlock (*Tsuga* spp.), basswood (*Tilia* spp.), northern red oak (*Quercus rubra*), and butternut (*Juglans cinerea*). Understory vegetation includes black cherry, white ash (*Fraxinus americana*), sugar maple, beech (*Fagus grandifolia*), red maple (*Acer rubrum*), striped maple (*A. pensylvanicum*), witch-hazel (*Hamamelis virginiana*), hobblebush (*Viburnum alnifolium*), and other viburnums.

In the upland oak types throughout the East, cucumber-tree is associated with white oak (*Quercus alba*), red oak, black oak (*Q. velutina*), chestnut oak (*Q. prinus*), yellow-poplar, elms (*Ulmus* spp.), hickories (*Carya* spp.), maples, blackgum (*Nyssa sylvatica*), white ash, basswood, yellow birch, and black cherry. Common understory species include dogwood (*Cornus* spp.), sassafras (*Sassafras albidum*), sourwood (*Oxydendrum arboreum*), serviceberry (*Amelanchier arboreal*), viburnums, witch-hazel, grape (*Vitis* spp.), greenbrier (*Smilax* spp.), tick trefoil (*Desmodium* spp.), and hawthorn (*Crataegus* spp.).

In the Appalachian and Cumberland Mountains, cucumbertree commonly occurs with yellow-poplar, eastern hemlock (*Tsuga canadensis*), white ash, basswood, birches, sugar maple, northern red oak, black oak, and white oak. Common understory vegetation includes hemlock, sugar maple, beech, birch, rhododendron (*Rhododendron* spp.), viburnums, wild hydrangea (*Hydrangea arborescens*), and several ferns (*Dyopteris* spp.). At higher elevations in the central uplands oak types, cucumber-tree is associated with yellow-poplar, white oak, northern red oak, black cherry, buckeye, white ash, beech, eastern white pine (*Pinus strobus*), and maples. Understory vegetation includes maples, oaks, hickory, black cherry, grape, spicebush (*Lindera benzoin*), wild hydrangea, viburnum, dogwood, and ferns.

At its southern limits in the Coastal Plains from Louisiana to west Florida, cucumbertree is associated with Sweetbay (*Magnolia virginiana*), bigleaf magnolia (*M. macrophylla*), and southern magnolia (*M. grandiflora*) in addition to white oak, water oak (*Quercus nigra*), swamp chestnut oak (*Q. michauxii*), and southern red oak (*Q. falcata*), elms, hickories, yellow-poplar, beech, maples, white ash, and blackgum.

Life History

Reproduction and Early Growth

Flowering and Fruiting—Cucumbertree flowers from early April through early July depending on location (22). Self-pollination usually does not occur because the flowers do not produce ripe pollen until the female stigma is no longer receptive (12). Magnolia flowers are perfect and are borne singly at the ends of the branches. They appear after the leaves start developing. The flowers close at night and do not last longer than 2 to 4 days. Pollination is largely by insects. The fruit, a green cucumber-shaped cone, ripens in late August or September. The thickened, rounded, red knobby follicles open exposing reddish-orange seeds that hang on slender threads before falling to the ground (7). The outer seedcoat is fleshy,

oily, and soft; the inner seedcoat is hard, thin, and membranous enclosing a large and fleshy endosperm.

Weather adversely influences the sensitive flower receptivity and available pollen. Also, cucumbertrees have a shorter period of receptivity and pollen shedding than other native magnolias ***(14).***

Seed Production and Dissemination—Cucumbertree produces from 10 to 60 seeds per fruit. Good seed crops usually occur every 4 to 5 years, but less frequently at the margins of the geographic range. Light seed crops occur in intervening years. Seed bearing begins at about 30 years and is optimum at age 50 and beyond *(18).* The average number of uncleaned seeds per kilogram is about 3,530 (1,600/lb); for depulped, cleaned seed, the average ranges from about 6,400 to 14,600/kg (2,900 to 6,600/lb) *(7,18).* Seeds are usually disseminated by birds, wind, water, and gravity soon after ripening in the fall.

Seedling Development-Magnolia seed of all species seems more sensitive to adverse temperatures and moisture factors than other tree seed *(7).* All seeds of magnolia species lose viability if fully dried or stored over winters at room temperatures. During germination, the cotyledons (epigeous) emerge from the ground. Germination occurs the first or second spring following seed production. Seed dormancy can be overcome by several months of low temperature. Normally, it is essential to stratify the seed for first-year germination. Moist, cold storage is recommended ***(14).*** Average seed germination is 55 percent; seeds germinate in 35 to 60 days. The clean or uncleaned seed can be stored at 0° to 5" C (32" to 41" F) in sealed containers for several years with little loss of viability.

Reproduction of cucumbertree in the forests is scarce because of the destruction of seeds by birds and rodents, high susceptibility of the seedlings to freezing, and the exacting conditions required for germination *(18).* Nursery practices used to artificially propagate magnolia seed include sowing the seed in the fall or stratifying the seed several months and then sowing the seed in the late winter or spring. The beds should be mulched and the mulch not removed until there is no possibility of a late spring frost. Young seedlings need half shade during most of the first summer in the seedbed. Normally plantings are done with 1-O bare root seedlings *(18).* Cucumbertree is easy to transplant *(30).*

Vegetative Reproduction—Cucumbertree sprouts readily and often is used as grafting root stock for named varieties and ornamental species. Propagation is from seed or grafts; use of cuttings is unsuccessful ***(15).*** Successful grafting allows this species to be grown far north of its natural range *(17).*

Sapling and Pole Stages to Maturity

Growth and Yield-Cucumbertree can reach a height of about 30 m (100 ft) and a d.b.h. of 91 to ***122*** cm (36 to 48 in). Typically, this tree is 18 to 24 m (60 to 80 ft) tall and 60 cm (24 in) in d.b.h. Cucumbertree grows fast in moist, deep soils of coves and lower slopes. This species matures in 100 years and seldom lives more than 150 years (8). Generally, the species is rapid growing and short lived. There are no available published data on the growth rate and yield of individual trees.

Rooting Habit-The root system for cucumbertree is deep and widespread, and trees rarely develop a taproot *(30).* Cucumbertree is susceptible to windthrow, especially on steep slopes.

Reaction to Competition-This species is classed as intermediate in shade tolerance (24). Observations on the Fernow Experimental Forest, Parsons, WV, indicate that cucumbertree regeneration is more frequent in clearcuts than in partial cuts. In early development of central Appalachian hardwood stands, cucumbertree competes favorably with yellow-poplar and black cherry on good oak sites and with oak species on fair sites. Cucumbertree is similiar to yellow-poplar in that it usually develops a straight bole at a young age. Cucumbertree produces considerable branches, but since it self-prunes well in closed stands, it is usually clear boled *(8).*

Damaging Agents—Cucumbertree has no important disease agents; however, it is very sensitive to ground fires and frost ***(8). Nectria galligena*** is common on cucumbertree stands on unsuitable sites, particularly in the southern Appalachian region. ***Nectria*** cankers cause defects but seldom kill the tree.

Ambrosia beetles such as ***Platypus compositus,*** a common wood borer, seriously degrade recently felled trees during warm months. In the South, it is common to saw logs within 2 to 3 weeks after felling *(2).* The magnolia scale *(Neolecanium* ***cornuparvum),*** one of the largest scale insects in the United States, can seriously injure magnolia species. Other sap-sucking insects that attack cucumbertree are the European fruit lecanium ***(Parthenolecanium*** *corni);* the oleander pit scale ***(Asterolecanium pustulans);*** and the San Jose scale ***(Quadraspidiotus*** *perniciosus).* Common insect defoliators of cucumbertree are

Odontopus calceatus, Phyllocnistis magnoliella, and ***Phyllophaga forsteri (2).***

Sapsucker damage is common on cucumber-tree. Bird peck causes stain streaks in the wood several feet above and below each peck, resulting in lumber degrade.

Special Uses

In general, wildlife use of cucumbertree for food is low; however, the seeds are eaten by several species of birds and small mammals ***(11).*** Grackles and blackbirds also eat the young fruit of the cucumber tree ***(14).*** Twigs, leaves, and buds are browsed by deer; although cucumbertree is classed as non-palatable by some investigators *(9),* others have considered it an important deer plant food in West Virginia during one or more seasons *(1).*

Cucumbertree is a valuable forest and shade tree, highly desirable for ornamental planting because of the showy flowers, fruits, and attractive foliage and bark ***(18).*** This species has been planted successfully well north of its native range (4); it grows well in slightly acid, well-drained soil (26).

Cucumbertree is used for wood products and resembles yellow-poplar except that the wood is heavier, harder, and stronger (3). This species is commonly used for lumber in the Appalachian Mountains, especially in West Virginia and adjoining States. The wood is usually sold as yellow-poplar; it has not been sold as cucumbertree lumber since 1928 (3). The wood is used in furniture, fixtures, Venetian blinds, siding, interior trim, sashes, doors, boxes, and crates ***(10).*** Cucumber-tree is not as desirable for fuelwood as the denser hardwoods. Compared with hickory, which has a fuel value of 100, cucumber-tree has a fuel value of 57 (on a volume basis).

Cucumbertree has a specific gravity of 0.44 based on oven-dry weight and green volume, and 0.48 based on oven-dry weight and volume at 12 percent moisture content (27). Generally, the wood is close grained, durable, and susceptible to decay. Sapwood typically is a light color while the heartwood is pale brown. The branches of this species are soft and break easily, making tree climbing difficult (22).

Genetics

Population Differences

The magnolia genus is one of the most ancient among flowering trees. Though subgenera may be intergrafted, pollinations across subgenetic divisions have yielded only apomicts of the female parent (13). Cucumber-tree is tetraploid and is the only American species of subgenus ***Yulania.***

Races and Hybrids

Most of the variability of the species is in the southern part of its range (17). Geographic varieties of cucumbertree include ***Magnolia acuminata*** var. ***cordata*** in the Piedmont; var. ***ozarkensis*** in the Ouachita and Ozark Mountains; var. ***acuminata*** over the range except for the Piedmont; ***M. acuminata*** forma *aurea* in the mountains and upper Piedmont of North and South Carolina, Georgia, and Tennessee; and ***M. acuminata*** var. ***alabamensis*** and ***M. acuminata*** var. ***subcordata*** in the Piedmont and Coastal Plain *(6,20,21).*

Cucumber-tree is used successfully as root stocks, for chip-budding, and in other grafting methods with ***Magnolia macrophylla.*** Factors complicate hybridization possibilities. This species is the latest of the subgenus ***Yulania*** to open its flower in the spring. Some successful hybrids include "Woodsman" ***(M. acuminata x liliflora)*** called ***Magnolia x brooklynensis.*** There have been successful crosses of ***Magnolia acuminata*** with ***M. x brooklynensis*** and ***M. x soulangiana.*** A hybrid has been developed from ***M. acuminata x sprengeri.*** If the possibility of a spring frost is great, newly developed hybrids may not flower *(13,15,16,20,21).* Natural crosses of ***M. acuminata*** and ***M. denudata*** seldom occur ***(19).*** Artificial hybrids with other species are possible in the subgenus ***Yulania.*** Several successful additional combinations of hybrid crosses have been noted (23).

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