OSTRYA VIRGINIANA
CHARACTERISTICS AND POTENTIALS OF A LITTLE KNOWN NATIVE

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ABSTRACT -- Ostrya virginiana (Mill.) K. Koch is a useful and durable native tree that is infrequently planted. The literature contains little reliable information about the species. General characteristics of Ostrya are discussed and available information is presented on growth rate, pest problems, soil and moisture requirements, root system characteristics, propagation and nursery practices, and transplanting techniques. The need for more accurate information on these topics is repeatedly expressed.

Of the native trees of Eastern North America, Ostrya virginiana (Mill.) K. Koch is overlooked as an ornamental and specimen tree. This is due orimari1.v to the lack of knowledge of the species and the subtlety of its ornamental characteristics. The-real beauty of Ostrya lies in its versatility and elegance of form and texture.

Ostrya is found nearly everywhere in the eastern half of the United States. It is primarily an understory tree and is one of the most shade tolerant of our smaller forest trees. However, it also grows well in the open (Green 1934, Dirr 1978, Hamilton 1974) and it is there that Ostrya develops its most desirable branching structure and form. Ostrya has a "distinctly irregular" (Kammerer 1953) form ranging from conical (Hightshoe 1978) to oval, to irregularly rounded (Dirr 1978). The form of this species varies from tree to tree as well as with age in a single tree.

Estimates of mature height seem to vary. Depending on the author, mature height is reported to be anywhere from 25 to 60 feet with 35 feet being the most common estimate. Open grown and cultivated trees will be somewhat shorter at 25 to 30 feet (Chapin 1975). Mature spread ot Ostrya is almost universally reported as being 2/3's or equal to height.

Ostrya's texture is one of its greatest assets. The slender and

numerous reddish-brown twigs and the thin, flaky strips of grey-brown bark exhibit a fineness of texture that few trees in its size category can match. The foliage of Ostrya is also veryfine textured. The thin, birch-like leaves have a fine toothed margin and are light to medium yellow-green in the summer. The fall color is poor by some accounts (Dirr 1978) and a clear yellow (Kammerer 1953) to red (Chadwick 1980) by others. Fall color is one of the many characteristics of this species that is not agreed upon by all observers reporting in the literature.

Ostyra is monecious. The staminate catkins are visible from late summer to the following spring. They expand gradually and open in April to pollinate the female flowers that emerge from beneath the bud scales (Dirr 1978). The fruits are nutlets borne in clusters of bladdery sacs (involucres) that are reminiscent of the true Hop fruits. Fruits ripen in August to October during which time the clusters turn from a pale green to a buff color. The abundance of fruit borne from year to year is also the subject of some debate. One account (Green.1934) states that fruit set is abundant every year after maturation and another (Hamilton 1974) reports that fruit set varies from year to year and no great quantity of fruit is produced until after the age of twenty-five.

Characteristics of Ostrya that all observers seem to agree on are growth rate, hardiness, longevity and durability. Ostrya's growth rate has been described as "tardy" (Kammerer 1953) to "very slow" (Anon. 1965, Green 1934). Leigh Young's (1933) data support these assessments of Ostrya's growth rate. In this study, over 1800 trees were measured for height, diameter and age. The findings show an average height growth rate of 11 feet in 10 years, 19½ feet in 20 years, and 24½ feet in 30 years. Young points out that "all the trees in the study had had their growth unfavorably affected by either overhead shading or crowding, or both." But he concludes, "... the slow growth indicated by the figures is not due entirely to the inherent characteristics of the species." Ford (1983) cites an unpublished study in New Jersey that found growth rates of Ostrya to be 15 - 20 feet in 20 years, 20 - 40 feet in 40 years and 40 - 50 feet in 60 years on average but moist soils. These two studies were the only accounts found in the literature or elsewhere that dealt with detailed information on Ostrya's growth characteristics.

Authors who addressed the topic of longevity indicate that it is short-lived (Ford 1983, Green 1934) or at most, medium-lived at 150 years (Hightshoe 1978). However, T. Davis Sydnor believes that Ostrya is extremely short-lived (10 - 15 years), especially when grown in lawn situations where root competition by grasses hampers the growth of the tree (Sydnor 1983). This latter observation is in contrast with Young's that "Ostrya is able to invade grassy areas in advance of other species ... (Young 1933) but the difference here might be one of soil compaction in lawn situations as opposed to grassy field soils where compaction is less a problem.

Ostr a virginiana is regarded by most authors as a tough and durable Zone 4 (Arnold Arboretum, -10° to -20° F) tree that is highly resistant

to wind, snow and ice damage. Similarly, most authors indicate that the tree has few, if any, insect or disease problems. Sydnor (1983) reports that the two-lined chestnut borer can be a serious and even lethal pest on Ostrya. Pirone (1978) also indicates that the two-lined chestnut borer is found on Ostrya along with birch lacebug, melon aphid, pitted ambrosia beetle, and the cottony cushion and latania scales -- none of which are considered serious. Francis Holmes (1983) of the Shade Tree Laboratories writes that the lab rarely diagnoses problems on Ostrya "even those listed for the species in the Index of Plant Diseases. Sapsuckers were indicated by at least two authors (Anon. 1965, Werthner 1935) as the only frequent pests on Ostrya. The relative lack of major insect and disease problems contributes to our opinion that Ostrya is a relatively maintenance-free tree worthy of further in-depth study.

Of all the aspects of Ostrya, those that concern the root system are the least understood and opinions about them are the most variable. While one describes the root system as being shallow and fiberous (Anon. 1965), others indicate that Ostrya has a deep tap root with deeply penetrating lateral roots (Green 1934, Hightshoe 1978). In general, root systems can be variable depending on the density of the soil in which they are growing. A porous, well drained soil will allow for the development of a deeper root system than will a heavy clay soil. Because there seems to be no cinsistency in the literature between observations about the root system and preferred soil type of this species, it may be best to say that Ostrya's root system is variable, depending on the soil texture, and that controlled experiments should be performed on Ostrya to determine which soils will support its growth.

Yet another disputed aspect of Ostrya's growth requirements is that of soil moisture. Many assessments of Ostrya's soil moisture requirements indicate that it prefers and grows naturally in dry, gravelly soils (Dirr 1978, Elias 1980, Green 1934, Kammerer 1953, Werthner 1935). Still more observers report that Ostrya is not particular what soil it grows in and tolerates moist and dry conditions with equal facility (Anon. 1965, Braun 1961, Chadwick 1980, Hamilton 1974,,Hightshoe 1978, Whitcomb 1975). Also, Kammerer (1953) considers Ostrya to be drought resistant and Hightshoe (1978) points out that Ostrya is intolerant of flooding and is sensitive to soil compaction. Several accounts cite leaf scorching as being a problem (Flemer 1980, Ford 1983, Koller, 1983, Sydnor 1983). It is not stated in any of the records consulted for this paper whether moisture requirements differ for open grown trees as opposed to partially shaded trees. Although most observations seem to indicate that Ostrya is tolerant of or prefers dry conditions, it is well to keep in mind the location and exposure of the planting site. A drought-stressed tree under a forest canopy is less likely to show signs of that stress as soon as a drought-stressed tree growing on a city tree lawn in full sun. Because of the diversity of opinions in the literature concerning soil and moisture requirements, more detailed and controlled investigation is needed to determine the range of soil types and moisture regimes that are suitable for Ostrya.

When its soil requirements are better understood, perhaps the question of the best methods of transplanting Ostrya can be answered. The literature is fairly consistent in its opinion that Ostrya is difficult to transplant and slow to reestablish (Barnes 1983, Chadwick 1980, Chapin 1975, Dirr 1978, Ford 1983, Hendricks 1980, Hightshoe 1978, Karnmerer 1953, Whitcomb 1975). It is also recommended by many to move the plant balled and burlapped in early spring rather than bare root (Dirr 1978, Hendricks 1980, Hightshoe 1978). Ford (1983) reports that eight 6 to 8 foot trees were spring planted in the Shade Tree Evaluation Plot in Wooster, Ohio. After 12 years, 3 of the 8 are alive but in poor condition. Perhaps the condition and success of the trees may have been better if the trees were planted balled and burlapped instead of bare root. Hamilton (1974) believes that Ostrya should be moved with soil around it to perpetuate the mychorrhizal relationship the tree depends upon. There are a few observers who report that Ostrya is fairly easy to transplant when the tree is young (Anon. 1965, Hamilton 1974, Losely 1983) and that the reestablishment of these is comparable to Cornus florida and decidely better than Quercus sp. in the nursery (Losely 1983). Much success has been reported by Pellett (1981) with his system for container growing species with difficult root systems. The system combines the use of bottomless containers and continual root pruning and is said to cut production time, increase growth rate in container, and reduce loss due to transplant shock.

The propagation method most described and recommended for Ostrya was from seed (Dirr 1978, Hamilton 1974, Hendricks 1980, Schopmeyer 1974, Whitcomb 1975). There have been no reports of successful grafting or vegetative propagation techniques for this species. Seeds should be collected while still slightly green to greenish-brown. If possible, seeds should be sown immediately in prepared seed beds as high germination percentages have been reported from this technique. If storage and/or shipping of the seed is necessary, stratification of the seeds will be necessary to overcome the internal dormancy before sowing. Stratifying seed in alternating warm/cold/warm moist sand for approximately 230 days is recommended (Schopmeyer 1974) but this has resulted in relatively low germination rates of between 27 and 65 percent.

Only three observers reported any experience with the variability of Ostrya seedlings. Hendricks (1980) and Collins (1983) indicate that there is sufficient variability of seedlings from which to make selections. However, Losely (1983), who purchases seedlings from various sources finds "few significant differences between seedlings." Because Losely buys seedlings rather than produces them, the seedlings he gets may be selected for uniformity by the producer before shipping.

The recommended nursery practice for the production of Ostrya is to line out 12 to 15 inch bare root and root-pruned seedlings into fine sand loam with a pH of 5 to 5.5. Losely (1983) reports a 90% transplant success with this process. He sells his trees balled and burlapped between 1½ and 3½ inches in caliper. He reports that a 12 to 15 inch, 3/8 inch caliper seedling will reach 1½ inch caliper size in 6 years --

fertilizing once annually with a 3-1-1 fertilizer. He also reports no production problems and rates the culture of Ostrya as "easy", although he sometimes has difficulty finding seedling sources.

Most of the growers who reported experience with Ostrya indicated that their experience was very limited. Some of the reasons for limited experience and for not growing the tree on a larger scale were:

1. The plant is not well known.
2. It is not a spectacular plant for flower or fall color. Other plants can provide the same landscape effect.
2: There is a very limited market for the plant.
5. It is difficult to propagate.
6. It is difficult to transplant.
7. It is very slow to recover and grow.

This list of "disadvantages" seems formidable indeed but as with almost all opinions about this species, pro or con, there are inconsistencies and opinions obviously based on very limited observation. A lack of clear, consistent, and reliable information exists in the literature reqardinq the characteristics of this tree, requirements for its growth, and its relative desirability.

The question should be asked, "Why consider this species for genetic improvement?" The answer lies in those few traits that most, if not all, observers agreed upon; namely, that the tree stays small in stature, it is hardy and durable, it is not a messy tree, it has a fine texture, and it seems to be relatively free of pest problems and requires little maintenance.

If respected members of the nursery profession, horticulturists, arboreta, and professors of horticulture cannot seem to agree on the relative merits and shortcomings (not to mention basic characteristics) of a particular species, there must be a reason. We feel the reason is lack of investigation.

There is no cause to believe that Ostyra virginiana is the "perfect city tree" -- no tree wi 11 ever be. But is our contention that Ostrya has enough good qualities that justify more study on a controlled basis to determine how those qualities may be improved to make the best contribution in improving the urban forest.

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