*Davidia*, however, are packed closely together within a nut. They germinate simultaneously and this leads to a tight cluster of seedlings competing with one another.

An efficient method of pretreating *Davidia* seeds is by the use of polyethylene plastic bags. A medium of sand and peat moss in equal parts is combined with the nuts and placed in the bags. In proportion, the medium would be three or four times the volume of the seeds. It should be moist but not wet. Binding the top of the bag with a rubber band makes the unit vapor proof for the entire stratification period. With this method any change that takes place within can be observed through the transparent wall of the bag. By using the timing described above, germination should follow.

## BOTTLE BRUSH BUCKEYE (*AESCULUS PARVIFLORA*) AND ITS PROPAGATION

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*Aesculus parviflora*, the bottle brush buckeye, is native to South Carolina, Georgia, Florida, and Alabama, and differs from other members of the horsechestnut family in several ways. It is not a tree but a large shrub that spreads by stoloniferous shoots forming a thicket about 10 ft tall. In the area of Boston, Massachusetts, it flowers in July long after other members of the genus have done so and at a time when there are but few woody plants in flower. It is quite shade tolerant and creates an impressive display when planted at the edge of a field or along a roadside against a background of trees. Other attributes are freedom from insect and disease problems, good yellow autumn color, and the ability to remain free of competing vegetation. Despite its southern origin, Rehder's Manual (1) rates *A. parviflora* as a Zone 4 plant, capable of surviving temperatures to −20°F.

**Flowers and Fruiting.** In July, highly conspicuous upright panicles of flowers develop above the plant on terminal shoots. It is astonishing to see the profusion of pollinating insects that visit to work the flowers. Various kinds of butterflies, bees, bumblebees, and wasps all appear in abundance. Both staminate and hermaphroditic flowers are present and fruit production is relatively sparse.

This year (1987), the fruits were ready for collection by late September. The fruits were loosely attached, the husks were

starting to split, and a few husks on the ground indicated that seeds had been carried away by squirrels.

The seeds are microbiotic and their period of viability is very short; as a result they were processed within two days. Some kept at room temperature without protection shrivelled and became worthless in 16 days. Others put in sealed plastic bags and placed in a 40°F refrigerator underwent partial germination and then decomposed. *Aesculus* seeds contain no endosperm but have very large fleshy cotyledons containing stored food for the initial growth of the seedlings. Seeds of most *Aesculus* species have dormant conditions that must be overcome by a period of cold. Natural dispersal is carried out by squirrels that take the fruits from the trees in autumn, remove the husks, and bury the seeds to a depth of 1½ or 2 in. Winter satisfies the cold requirement, and germination takes place during the warm days of spring.

Seeds of *A. parviflora,* however, ripen in late September and germinate a few days thereafter. In the process of germination the cotyledon petioles elongate and carry the rudimentary plant out through the seed coat. In a few weeks the ample food reserves present in the cotyledon are exhausted by the rapid development of the large, carrot-like root system. Meanwhile the epicotyl has extended to a length of about an inch or less and has become dormant. Squirrels bury the seeds to a depth where the seedlings remain below the surface of the soil and those germinating in autumn are protected thereby surviving the winter. Occasionally the epicotyl fails to remain dormant and continues to develop. Seedlings which do this have shoots above the ground and may be eliminated in the course of natural selection. To test this, I planted a number of seeds in my home garden and covered them with a ½ in. steel hardware cloth to prevent them from being dug up by squirrels. However, in this batch none were precocious and all epicotyls remained below ground. A carefree method of propagating bottle brush buckeye from seeds would be to use this procedure.

**Treatment of Seeds.** On October 3, seeds were planted 1½ in. deep in plastic trays. They were kept in a greenhouse until the seedlings were fully developed and had gone dormant. At this time the food stored in the cotyledons was completely exhausted, and the seed coats were hollow shells. On the 21st of November the dormant seedlings were placed in a cold storage unit where the temperature is maintained at about 36°F. On the 13th of February they were returned to a warm greenhouse where the epicotyls started pushing through the soil in a week's time.

Two hundred and eighteen seedlings developed. Of these, 16% were albino. This is a lethal mutation, as without chlorophyll the plant cannot function, and it dies. As a matter of curiosity I grafted some albino stems on normal plants. The albino part was parasitic on the normal plant. When planted in the nursery they stumbled

along for several years with each part foliating in spring and defoliating in autumn. I wondered if the albinism might be caused by inbreeding. Where these masses of plants spread by sucker growths, the clump could very well be all one clone. I spoke to several plant physiologists about this and asked if this might be true. In their opinions, there was no doubt that it was.

*Aesculus parviflora* var. *serotina*. This variety differs from the species in a number of ways. It grows about twice as tall, flowers during the first half of August while the typical form blossoms in mid-July, and is also more prolific. Two or three seeds are often found in a capsule, while the species usually has one.

*Aesculus parviflora* can be propagated by root cuttings or root suckers can be collected from the bases of existing plants.

## LITERATURE CITED

1. Rehder, Alfred. 1940. *Manual of Cultivated Trees and Shrubs.* The Macmillan Company, New York, N.Y.

# SPENT MUSHROOM COMPOST AND PAPERMILL SLUDGE AS SOIL AMENDMENTS FOR CONTAINERIZED NURSERY CROPS

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**Abstract.** Two sources of mushroom compost were evaluated as soil amendments with bark: (1) unweathered (UMC) in proportions of 25, 50, 75 and 100% by volume, and (2) weathered (WMC) in proportions of 25, 50 and 75%. There was also a 100% bark control treatment. Both red osier dogwood (*Cornus stolonifera* [syn. *C. sericea*]) and forsythia (*Forsythia* × *intermedia* 'Lynwood') grew well in all media. While plant height was little affected by the amount of mushroom compost in the media, top dry weight of the two species was increased in proportion to the amount of both UMC and WMC. Regardless of the media treatment, there was no apparent symptoms of nutrient toxicity or deficiency.

Of four types of papermill sludge (primary, secondary, mixture of primary and secondary from Ontario Paper Co., and a mixture of primary and secondary from Fraser Paper Co.) added at 33% by volume to bark, secondary sludge which has the highest N content provided the best growth of spiraea (*Spiraea* × *bumalda*); however, foliage of plants was dark blue-green in color reflecting high N. Unacceptably poor growth occurred in Fraser-amended media because of low N.

## INTRODUCTION

During the past 20 years, there has been considerable interest in the use of various organic and woody waste by-products in agriculture (4,6,10). The type and availability of these products varies