Previously, we made and used weed discs fashioned from commonly used synthetic weed fabrics. We suspect that there may be other materials that are inexpensive and potentially worthy of similar use. There is a good market for the right product.

Nonchemical alternatives will remain important as long as herbicide use is restricted, and may become even more so should there be similar restrictions in other jurisdictions.

Acknowledgements. This project was supported jointly by Willowbrook Nurseries, Fenwick, Ontario and The National Research Council of Canada, Industrial Research Assistance Program (IRAP).

LITERATURE CITED

Chong, C., B. Hamersma, and D. Ponzo. 1989. In search of the ultimate weed control disc. Hort. Rev. 7(17):8-11.

Mervosh, T.L. 1999. Weed patrol. Amer. Nurseryman 190(5):32-38.

Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA). 1997. Nursery and landscape plant production. Publ. 383. OMAFRA, 1 Stone Road W., Guelph, Ontario, Canada.

Forcing Environment Affects Epicormic Sprout Production from Branch Segments for Vegetative Propagation of Adult Hardwoods

J.W. Van Sambeek
USDA Forest Service, 202 Natural Resources Building, University Missouri Columbia, Columbia, Missouri 65211-7260 U.S.A.

John E. Preece
Department of Plant, Soil And General Agriculture, Southern Illinois University, Carbondale, Illinois 62901-4415 U.S.A.

Successful rooting of cuttings of adult hardwoods often requires that propagules be removed from the more juvenile parts of trees. Latent or dormant axillary buds found in the bark of a tree usually possess some juvenile characteristics because these buds developed when the stem or branches were first formed. In this study we evaluated the effect of different forcing environments on production of epicormic sprouts from latent buds on branch segments taken from adult trees of four hard-to-root hardwoods. In addition, we evaluated whether these sprouts were suitable as softwood or semi-woody cuttings for vegetative propagation.

In the spring of 1997 and 1998, one to four lower branches were removed from each of three phenotypically superior trees of black walnut (*Juglans nigra*), white ash (*Fraxinus americana*), white oak (*Quercus alba*), and northern red oak (*Q. rubra*). Branches were cut into 24 cm long segments ranging from 2.0 to 8.0 cm in diameter. Branch segments were place horizontally in plastic 1040 trays filled with moist perlite and set in one of seven greenhouse forcing environments. Forcing environments include: (1) water daily with 5 cm of water and allow to drain, (2) water daily with 5 cm of water and keep flooded 1 cm deep, (3) mist daily with 10 cm of water in 45 minutes and allow to drain, (4) mist daily with 10 cm of water in 45 minutes and keep flooded 1 cm deep, (5) place inside a humidity tent and water every other day with 5 cm of water, (6) cover trays with humidity domes and water every other day with 5 cm of water, and (7) place on shaded mist bench and mist for 6 seconds every 8 minutes during daylight hours. Due to limited greenhouse space, the forcing experiment had to be replicated over time.

Large differences were found in the number of epicormic sprouts produced per segment among trees within each species even when branch segments were taken from trees of the same age. Overall, white ash, black walnut, white oak, and northen red oak produced 5, 7, 12, and 15 sprouts per m of branch segment, respectively. The most frequently discussed forcing environment in the scientific literature, the water daily treatment, was one of the better treatments for forcing epicormic sprouts on all four hardwood species. Previous studies showed that if the epicormic sprouts were kept dry while watering the perlite, these sprouts could be surface disinfested and used as explants for in vitro culture. Branch segments under the intermittent mist treatment started producing epicormic sprouts later and produced more sprouts over a longer period of time than branch segments within any of the other six forcing environments. Shoots from the intermittent mist treatment made excellent leafy softwood and semi-woody cuttings; however, they may be unsuitable for use as explants for in vitro culture.

Branch segments in the humidity dome treatment also produced more sprouts than the branch segments in the water daily treatment. Because epicormic sprouts of white and northern red oak showed episodic growth, the sprouts inside the humidity dome had to be harvested as softwood cuttings during rapid stem elongation with immature leaves. Branch segments in the humidity tent treatment produced only half as many epicormic sprouts as branch segments in the humidity dome treatment. Presumably, the condensation inside the humidity domes reduced light penetration and kept air temperatures lower than in the humidity tent. Branch segments in the water daily with flooding and mist daily with flooding treatments produced the lowest number of epicormic sprouts. The perlite layer in these two flooded treatments retained high levels of bacteria which may have depleted the amount of oxygen, nitrogen, and carbohydrates available for epicormic sprout growth. An exploratory study with walnut and white oak showed that segments cut from the basal portion of the lower branches produced as many sprouts as segments from along the central stem.

Softwood cuttings from epicormic sprouts 4.0 cm or longer of black walnut and white oak treated with 0.1% to 4.5% IBA in talc and placed under intermittent mist failed to root. Subsequently softwood cuttings of all four species were dipped for 10 to 50 minutes in various dilutions of Dip 'n Grow (1% indole-3-butyric acid and 0.5% napthaleneacetic acid). Over 80% of semi-woody epicormic sprouts from white ash dipped in a 1 : 24 or 1 : 99 dilution of Dip'n Grow rooted and could be transplanted to rootrainers for subsequent field planting. None of the softwood cuttings of black walnut or white oak rooted. Of the few northern red oak cuttings that rooted, all rooting occurred on semi-woody sprouts with full leaf expansion that had not been killed by fungi growing in the vermiculite-perlite rooting medium.

In conclusion, epicormic sprouts can be successfully forced on branch segments cut from adult trees either by periodically watering the perlite medium or by using intermittent mist to maintain a high humidity micro-environment. Epicormic sprouts tended to root best if taken as semi-woody leafy cuttings.