ROOTING ABILITY OF SUGAR MAPLE CUTTINGS DEPENDS ON DATE OF COLLECTION IN EACH REGION

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Efforts to propagate twig cuttings of sugar maple have not been completely successful primarily because of the excessive mortality of the rooted cuttings during the first winter. In previous work (1, 2, 4), cuttings have been collected in late June or early July. By the time cuttings collected during this period have rooted, the growing season is nearly over and, when outplanted, the rooted cuttings go immediately into dormancy. We thought that if root development could be completed earlier, rooted cuttings could be outplanted while growing conditions still were favorable for food accumulation. This should result in increased overwinter survival.

The first question to be answered was how rooting would be affected by earlier collection of the cuttings. Accordingly, in February 1965 a study was begun at the Burlington, Vt., unit of the Northeastern Forest Experiment Station to determine the most favorable collection date for early rooting of sugar maple twig cuttings. Such date was found. The rooting responses in relation to the date of the collection of the cuttings are reported here. Subsequent reports will cover the effects of earlier rooting on overwinter survival.

Methods

During the period Feb. 3 through July 19, 1965, 15 twig cuttings were collected at 2-week intervals from each of six large open-grown sugar maple trees. All cuttings were taken from the outside portion of the mid-crown and the lower crown. The earlier collections were made from twigs that had grown at least 3 inches the previous year. Later, after growth of the current season had begun, collections were made from twigs showing at least 3 inches of new growth. In collections made after leaves had appeared, all leaves except the three or four terminal leaves were removed.

The cuttings were transported in moistened plastic bags to the greenhouse. There they were recut under water to a 3- to 4-inch length, wounded on opposite sides of the basal end by removing a small (1 x i/8 inch) strip of bark, and quickdipped in a 5,000-p.p.m. solution of indolebutyric acid for 2 to 3 seconds. After dipping, the cuttings were individually stuck in 4- by 5-inch perlite-filled perforated polyethylene bags (fig. 1), and then placed in a propagation chamber in the greenhouse.

The propagation chamber (fig. 2) was equipped with a humidity-controlled intermittent mist system. Buried heating cables were used to maintain a temperature of approximately 70 degrees at the bottom of the chamber. Air temperatures were kept between 65 and 70 degrees. A photoperiod of about 18 hours was maintained by means of ten 200-wag. incandescent lamps (approximately 35 foot-candle at leaf level). A weak solution (0.6 percent) of a complete water-soluble fertilizer was supplied to the cuttings twice each week throughout the propagation period.

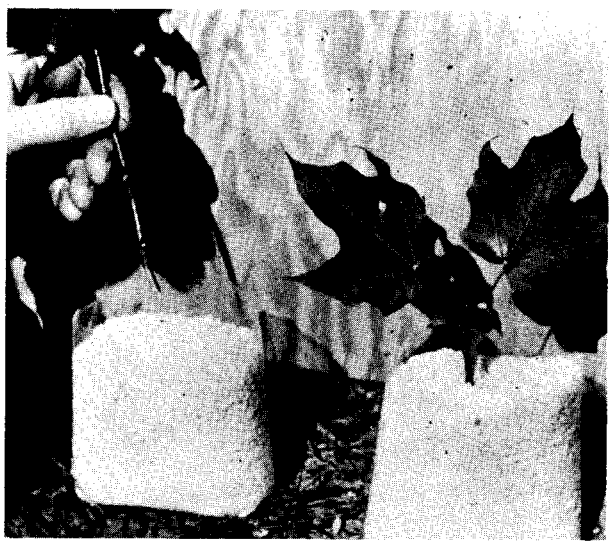

Figure 1.—Cuttings were placed in individual perlite-filled perforated polyethylene bags.

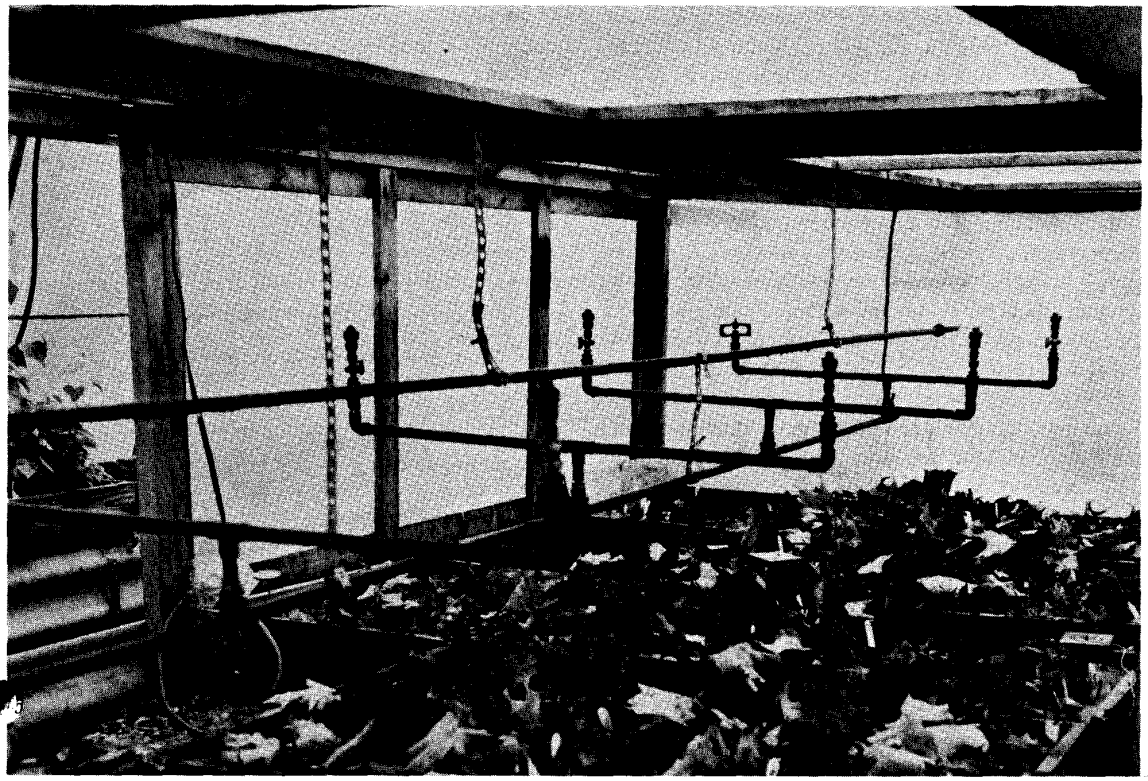

Figure 2.—Greenhouse enclosed propagation chamber, used to minimize variations in environment.

Results

Results from this study showed that the date the cuttings are collected significantly affects root development. No rooting was obtained on any cuttings collected from Feb. 3 through May 10, but 20 percent of those collected 2 weeks later, May 24, produced some roots. Maximum rooting-47.8 percent-was obtained from the June 7 collection. Thereafter, rooting declined to lows of 4.4 percent in the July 6 collection and 5.3 percent in the July 19 collection (table 1) .

The abrupt jump from no rooting in the May 10 and earlier collections to 20-percent rooting in the May 24 collection is especially significant in that it marks the change from old-wood cuttings to greenwood cuttings.

Discussion

If sugar maple twig cuttings are collected in late June and in early July, as they were in previous

TABLE 1.—*Rooting percentages (Sept. 1) by collection dates for sugar maple twig cuttings collected at two-week intervals from Feb. 3 through July 19, 1965*

Date collected	Cuttings forming roots
	Pct.
2–3	0.0
2–15	.0
3–1	.0
3–15	.0
3–29	.0
4–12	.0
4–26	.0
5–10	.0
5–24	20.0
6–7	47.8
6–21	15.6
7–6	4.4
7–19	5.3

investigations, the cuttings will not exhibit maximum root formation. Early June definitely is indicated as the optimum time for collection in the Burlington locality. Root formation and development appear to be related to the physiological condition of the cutting at the time of collection. Cuttings collected before June 1 were immature with respect to leaf development and completion of terminal growth. Cuttings collected after that date had fully expanded leaves and nearly mature terminal buds, as evidenced by brownish bud scales.

It seems probable that the internal factors that influence future growth of the cutting-that is, carbohydrate content, water balance, and the concentration of other growth promoting substances are most favorable for root formation near the time that terminal growth ceases. Snow (3) also noted variability in rooting with respect to the season the cuttings were collected. He suggested that internal balance and the type of carbohydrate reserves were responsible for differences in rooting responses.

Both our study results and other experience indicate that the physiological conditions conducive to maximum root formation are present in the twigs of a tree for only a relatively short period of time. Therefore, the most favorable date for collecting cuttings would vary from region to region, depending on the state of development of the twigs. We do not understand the exact nature of the physiological processes involved, and we are conducting further studies in an attempt to define these relationships more precisely.

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