Timing Methods Used in Propagation Practices

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INTRODUCTION

Midwest Groundcovers is a wholesale plant nursery that grows and sells landscape plants to customers in the Chicagoland area as well as the entire midwest region of the United States. We have nurseries near St. Charles, Illinois and Glenn, Michigan consisting of approximately 320 acres of land, 2000 hoop houses, and 70 heated greenhouses. The St. Charles nursery is primarily container production and the Glenn Farm nursery is primarily field production of groundcovers and perennials. Over 500 taxa of plants are produced for sale in container sizes ranging from 2-inch flats to 5-gal pots. These crops include groundcovers, shrubs, evergreens, roses, perennials, grasses, and vines. The 1997 production schedule included 15 million cuttings, 6.5 million plants in flats, and 2.5 million plants in pots. Space for producing container material at St. Charles has been pretty much entirely developed. At Glenn Farm, production space for both the container crops and field crops is currently being expanded. However, even with expansion, space is still at a premium. Planning, scheduling, and timing are crucial in every step of every process that we use to produce plants.

PRODUCTION SCHEDULING

The production scheduling process that we use starts with setting projected sales for each plant and size. From these goals production personnel determine the quantities of each size of each plant to produce and the timing of production in order to meet these goals. Our job is to make sure that we have these crops ready for sale in the quantities requested, with the qualities desired at exactly the right time and then to exceed our customers expectations. The methods we use for producing what is needed and when to do it are constantly being reviewed with the objective being continuous improvement. Timing is critical to continuous improvement.

The next step is to start at the end of the production cycle (being sold!) for the largest size produced of each plant and work backwards through the different stages required. This includes the time for top and root development, any pruning requirements, and any over wintering time involved in the final ready date for that crop.

THE CALENDAR YEAR

In the propagation department there are generally two different types of timing used: (1) the calendar year, and (2) the phenological year. Our calendar year schedule incorporates a type of rolling calendar. Everything that needs to happen gets written down in the time period that it should happen. Some processes or jobs occur on a monthly or weekly basis throughout the year and are written into the calendar for every time that they should be done. Other jobs might be done only in a specific month, such as October, and are written down only for October. Beginning to cover houses for the upcoming winter is an example of an October-only job.

At the end of each month we review what happened or didn't happen, what went well, and what didn't go so well. If something needs to be dealt with immediately, or needs to be moved to a different calendar time because it didn't work where we had it, then we can make those adjustments. This works very well for keeping people on track with the tasks that are supposed to be accomplished. Especially for those jobs that are done so seldom that people can easily forget about them until it's too late. An example would be ordering shade compound in early February so that you have it to put on the greenhouses in early March before plants get burned. When we're finished with the previous months' review we also go through an early-warning review for the upcoming month.

THE PHENOLOGICAL YEAR OR MOTHER NATURE'S CALENDAR

The second type of timing process that we use in propagation is much more seasonal in nature and based more on phenology than the first. This is Mother Natures' calendar. Because we are an "outdoor" nursery the actual propagation of plants is much more dependent on this than the calendar year. We have a limited time available to stick cuttings, for roots to develop, and, if necessary, to get plantlets established in the next container size before winter sets in.

Usually we can count on a normal seasonal progression of growth during the year. However, there are years when everything is delayed because of a late spring. There are also years when everything is ready much earlier in the year than anticipated. Spring 1997 for us was about two weeks behind Spring 1996. Spring 1996 was 7 to 10 days behind the spring of 1995.

Some plants have a very large window of opportunity in which to take cuttings and root them successfully. With these plants a delayed spring really isn't too difficult to work around. *Pachysandra terminalis* 'Green Carpet' is one of these. We can stick them at almost any time of the year and be successful at it. It may not be practical but, we could still do it if we had to.

Some plants have more of a medium-sized window for successful rooting. Still others seem to have a very narrow window of opportunity. And some seem to have no window at all and may be more easily propagated in another way (grafting, root cuttings, layering, etc.). These last two groups are the ones that I'm most interested in learning when to propagate. They are the ones that eat up the most profits proportionally.

One of the timing methods we are investigating for propagating difficult-to-root plants is based on phenological events occurring in other plants. These indicator plants may be able to "tell" us when the difficult plants are at their peak for rooting success.

When I started at Midwest Groundcovers as the pest management foreman the most valuable tool I had (and still use) for knowing when certain insect pests were at their most vulnerable stage(s) was the book *Coincide* by D. A. Orton and T. Green. Until this book was printed most recommendations that I saw for applying insecticides were based on the calendar year and the historical average date that an insects' vulnerable stage would appear. These calendar-based recommendations haven't been much help in years that spring arrived earlier or later than normal.

Coincide matches the development of an insect pests' vulnerable stages to accumulated heat degree days and to easily observable phenological events (like flowering or seed fall) occurring on certain indicator plants. For example, European

alder leaf miner damage to *Alnus glutinosa* from the hatching larvae begins at about the same time that *Spiraea ×vanhouttei* blooms and *Euonymus* scale crawlers hatch at the same time that *Catalpa speciosa* begins blooming. For the 10 years that I've been paying attention to this phenomenon, when this catalpa tree bloomed the scale crawlers hatched within a couple of days. Without fail, regardless of how late or early the spring was. Whether it was 16 May or 15 June, both the bloom and hatch occurred at virtually the same time. What a great system for timing the application of pesticides and being sure that your time and money are well spent!

When I became the propagation manager in 1994 I was aware that certain plants were best propagated at certain times. I was also very aware that I had a lot to learn about all of the crops that we propagated. One of the difficulties I've had in learning has been to interpret and adapt how another person "knows" when cuttings are ready to stick. In 1995 responsibilities for the Michigan nursery were added to my job description. This meant working with a wider range of crops in two different climates.

At some point during these last three years it struck me that a lot of what I had heard and read about propagating sounded very much like the calendar-based recommendations for insect control. Both were based on the normal, average time for success in that particular area. Examples include: "We stick them at the end of May"; "Finish the sticking by the 4th of July"; and "Collect and immediately sow the seed 50 days after pollination". I knew what they were talking about and when they were talking about doing it. The problem was, I couldn't really determine when that actually was in "plant-time" if they were in some other climate. Because of this we are collecting temperature and phenological event data with the idea that we may find a few indicator plants that will help tell us when to propagate some of those narrow-windowed plants more successfully on a routine basis.

Some additional applications or benefits from this may include:

1) Reduced need for rooting hormones and the regulations that come with them.

2) Propagation of "clean" stock plants from plants infested with scale insects by taking cuttings after the plant has flushed but before the crawlers have hatched. I know of at least one propagator doing this now for *Cotoneaster acutifolius*.

3) Determination of the most successful time of seed collection, processing, and sowing to avoid complicated dormancy and sporadic or lengthy germination times.

4) Information exchange with other propagators. Telling me to take the cuttings when *Hydrangea arborescens* 'Grandiflora' blooms says a lot more to me than "mid-July", especially if I'm in Chicago and you're in Denmark, or New Zealand and you say mid-January!

I know, of course, that there are other factors besides accumulated degree days that influence plant growth and development. Fertilization, pruning, type of climate, accumulation of and type of light, and growth regulators are just a few. However, I also know that there are other factors that affect insect growth and development and yet using indicator plants to control some of the worst insect pests certainly works. So at this time I can't see any reason why this won't work to some degree or another in propagation and plant production.

Now I have a request. If anyone out there is using or trying to use propagation by indicator plants or accumulated degree days in some form or another I would like to hear about what you're trying it with and how it's coming along.

Two good sources for learning how to measure accumulated degree days, set up

your own indicator plant data base and more on the pros and cons of accumulated heat degree days are found in Orton and Green (1989) and Delahaut (1996).

LITERATURE CITED

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Applied Grafting in the Production of Ornamental Trees

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BACKGROUND

The firm started in Spring 1980 as a part-time nursery on a rented area, without starting capital. Today we produce about 20,000 shade and ornamental trees and about 10,000 lilacs. We employ 4 to 5 persons all year round. It has from the start been our goal to produce trees of high quality with due respect to the environment.

TREE QUALITY

The quality of the trees is characterized by three parameters: (1) biological quality, which determines the vitality of the trees, (2) aesthetical quality, which decides its ability to accomplish a certain purpose and finally, (3) trade quality, which describes a standard level. There is no doubt about biological quality. Aesthetical quality and standard can in certain cases go against each other.

A high quality tree can be defined as having a strong and well developed root, a strong stem base, and a strait stem. The crown must consist of branches equally distributed around a central axis. Among several biological qualities we consider the energy level of the tree, the amount of energy which can be mobilized, as the most important single factor for a successful transplantation.

GRAFTING

In order to accomplish our quality goal, we start with the rootstock and the scion. Rootstocks are mostly purchased as 1/0 or 2/0 plants with well developed and branched roots. Poorly growing plants are not used. Scions are taken from 2-year-old trees in good growth. Only the lowest 1/2 to 2/3 part of the scionwood is used, which includes the most energy rich and most mature part of the scion. The grafting technique is the conventional whip graft. The grafts are made in January to March, stored in a cold store, and planted directly in the field in May.

Grafting materials used are rubber strips and commercial grafting wax, but these materials are considered less important. It is necessary to handle the plants under cold and humid conditions and to avoid unnecessary wounding. A strong union is assured by grafting so that the cambial layers fit together on both sides, downwards and preferably also on the top. The scion is cut, so a little piece is left for binding just above the top bud.