Researchers Develop New Propagation Technique For Trees, Shrubs

ITHACA, N.Y. — Cornell University researchers have developed a new technique that makes it possible to propagate many kinds of plants and shrubs that cannot be reproduced with existing methods.

"As a result of our technique, many more types of plants with superior characteristics could become available to consumers," said Nina L. Bassuk, an associate professor of horticultural physiology in the New York State College of Agriculture and Life Sciences at Cornell. She developed the new technique with graduate student Brian K. Maynard.

Plants are now propagated in several ways. Many types of plants can be grown from seed, but seed-produced plants differ genetically from parent plants. Grafting is another widely used method. Many kinds of dwarf apple trees that now are replacing old, standard trees have been developed through this method.

"Grafting is something similar to an organ transplant," Bassuk said. "One problem with this method is that the stock plant sometimes rejects the graft. In addition, grafting is time-consuming and labor-intensive work, requiring high levels of skill."

Still another practice used for plant propagation involves the rooting of cuttings. Plants produced in this way are genetically identical to parent plants. This method, however, is ineffectual when it comes to propagating some of the plant species which are extremely difficult to root such as oaks, maples, pines and hornbeams.

"There are almost countless plant materials in the wild that are desirable for propagation, but it's nearly impossible to reproduce many of them with existing methods," Bassuk said.

To solve the problem, Cornell researchers tried a new approach. First, a stock plant is grown in the dark by covering the plant with shade cloth. Growing plants in such a way for a period of time is known as etiolation. Seedlings or only some branches of full-grown plants can be made to produce etiolated shoots to be used as cuttings for propagation.

"Plants grown without light produce shoots which, for reasons not well understood, develop roots much more readily than those from light-grown plants," Bassuk said.

New shoots from plants grown in the dark grow to about two to three inches long in a few weeks. At this stage, Cornell researchers take another innovative step. They band the base of the shoot with Velcro, a self-adhesive material made of tiny nylon hooks and eyes.

The plant then is allowed to receive light by removing the shade cloth gradually over a period of one week. Meanwhile, the bandage stays on the shoot for four weeks, keeping the light from reaching the banded portion of the shoot while the top portion of the shoot and its leaves turn green.

As a result, only the banded area remains pale or white for lack of chlorophyll. The shoot then is cut off just below the banded area and is potted for rooting. The banded area then develops a full root system in two to four weeks.

Cornell researchers also found that some plants did not need to be grown in the dark. The banding treatment alone, or blanching, as Bassuk calls it, was effective in coaxing those shoots to develop roots.

Using this blanching technique alone and the combination of etiolation and the banding method, Cornell researchers succeeded in propagating more than 20 plant species and varieties that have the reputation of being almost impossible to reproduce by any other means.

Among plants thus cloned in Cornell trials are paperbark maple, sugar maple, paper birch, several cultivars of European hornbeam, Chinese chestnut, pin oak, English oak, red oak, several lilac varieties, Norway maple, Bradford pear, mugo pine, white pine, Scotch pine, Japanese black pine and Chinese fringe tree.

One advantage of using Velcro for banding is that a plant hormone that promotes root formation can be applied to Velcro before the shoot is banded, Bassuk said. This makes the rooting zone, or the banded area, get off to a fast start.

"Some of Velcro's tiny hooks puncture the tender skin of the shoot, thus enabling the hormone to get into the tissue easily," Bassuk said. "As a result, the banded area often sends out small roots even while the shoot is still attached to the parent plant."

The idea of banding shoots grown in the absence of light has been tried before. Using black plastic electrical tapes as banding materials did not work well because removing the tape often tore the skin of the succulent shoot.

"We found that Velcro works best because it is easy to apply and remove without causing injury to the stem," Bassuk said. "Besides, root-promoting hormones can be applied to the band before the shoot is banded."

In most of Cornell experiments, the combination of etiolation and the Velcro banding resulted in the greatest plant response, Bassuk said.

She pointed out that the technique can be used at any time of the year, outdoors or indoors, to propagate plants with superior characteristics in terms of form, color and resistance to disease and insect pests, among others.

"Our technique works on a whole range of plant species, not just a few," Bassuk said. "That's why it's so exciting."

Because some plants respond well to the blanching treatment alone, Cornell researchers now are trying the method on a wider range of plant species in efforts to make the whole procedure even more simple.

They hope to identify species that work best with the combination of etiolation and banding treatments or with the blanching method alone. In addition, research is continuing to understand physiological factors that make the Cornell technique a highly effective plant propagation method.