

Vegetative Propagation of Holly By Grafting

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The current popularity of the several species of *Ilex* that thrive in the United States may be due to improvement in the general run of available stock as a result of vegetative propagation of selected clones, or, on the other hand, perhaps the reverse is true—that vegetative propagation of superior strains has become more general due to public demand for better stock. Whichever came first, there has been a noticeable improvement in the quality of nursery grown hollies.

In some areas wild trees of *Ilex opaca* are still collected to be refurbished in the nursery into attractive specimens through care, cultivation and fertilizing. The practice is dying out, however, due in part to the natural variableness of the species, but more especially because such trees, when sold by the nurseryman, do not receive the care necessary to maintain the compact form and deep green foliage, and without it they revert to typical sparse berried trees with leaves jaundiced yellow or reddish purple.

A few nurserymen still grow their stock from seed, waiting from five to ten years to learn whether they have a preponderance of staminate or pistillate trees, and equally as long to find out whether the form, foliage and fruiting qualities of the block of *Ilex opaca* are good, fair or poor.

In general seedling American hollies whether nursery grown or wildlings are not very attractive. Yet they respond so quickly to beauty treatments of humus and fertilizers high in nitrogen and potash, that a fence row runt can be transformed into a beauty queen in a very few years and so long as she is continued on the high life diet her beauty remains. But if cuttings or cions are taken from such a pepped up holly, the resulting plants, if given normal treatment, resemble the runt instead of the reigning queen.

In contrast, if a holly growing under adverse conditions has good color of leaf and berry, the vegetatively produced offspring will also have superior qualities under varied growing conditions. Too often we have been misled by the superior qualities of a holly growing under optimum conditions, into believing such qualities are inherent rather than environmental. Careful examination of existing conditions and the past record should be had before deciding on the value of a particular specimen as a stock plant or for ornamental use.

The methods of reproducing the inherent qualities of the parent plant are several: by soil layering, air layering, cutting and grafting.

Mound and branch layering are useful methods of limited application in the nursery trade. However the owner of a bush type holly who wishes to produce additional ones on a small scale may find either method desirable since no special equipment is needed and care during the rooting process is unnecessary. An adequate root system is slow to develop, usually requiring two growing seasons before the layer can be severed from the parent plant, but the size of the resulting plants compensates for the protracted period required to produce them.

Air layering or marcottage as it was formerly practiced, was a long and exacting process. The tedious daily maintenance of the moisture

content of the sphagnum moss or other material in which the stem was encased, limited its application to tropical and semi-tropical areas and the glass house. With gas pervious and water impervious plastic film now available, maintaining the moisture content of the moss is simple, depending upon properly encasing the ball of moss and correctly binding the film at top and bottom. Air layering has been successful on 14 species and 60 horticultural varieties of red berried persistent leafed hollies. Well branched attractive plants from 12 to 30 inches in length can be produced in from 10 to 14 weeks. On most strains of *Ilex opaca*, *Ilex aquifolium* and *Ilex cornuta* a good root system develops more rapidly on layers made in June and early July than on those applied in April and May.

In earlier days especially in the British Isles and in parts of Europe where gardeners were thoroughly trained and the skills of plant propagation were highly regarded, the ability to reproduce plant life by grafting was a necessity. Today with greater control of environmental conditions and with the use of root inducing hormones, reproduction by cuttings can be carried on by anyone who has simple equipment. Though grafting of hollies is an art employed by only a few, its merits are such in the reproduction of horticultural varieties that it should be more widely employed. Not only is it a sure way of producing strong growing, sturdy hollies, but because of the choice of stock on which to graft, a large, active root system can be selected which will cause the plant to develop rapidly. Grafted hollies, once the union is made, require less care than rooted cuttings. Grafting may be done successfully over a long period of time. In the greenhouse it may be carried on in mid-winter when other work is less pressing.

Criticism of grafted plants is sometimes voiced, because of poor union between cion and stock or because the latter produces suckers. But these are not valid objections to grafting, rather they are indicative of faulty technique. Grafting, the text book tells us, is the technique of inserting a part of one plant into another, so it will grow and produce its kind.

Each proficient holly propagator develops his own method of grafting; there is no right and no wrong way to graft hollies—only successful and unsuccessful ones, the latter invariably the result of poor workmanship.

Ideally the stock and cion should be of the same species, for thus they are entirely compatible. But necessity at times forces the use of various combinations within the genus. In general a union will result, though it is frequently weak. It is especially unwise to use a fast growing stock to which a slower cion is joined, because the tendency of the stock to out-grow the cion is too great. *Ilex aquifolium* for instance, can be grafted on *opaca* stock if need be, but to reverse the relationship is to court trouble, since *aquifolium* grows more rapidly than *opaca*. The first specimen of *Ilex platyphylla* found growing in New York was actually a stock plant on which an *Ilex aquifolium integrifolia* cion had been grafted twenty or thirty years before. When identified, suckers from the stock had developed into a twenty-two foot tree which overtowered the cion by more than ten feet.

Many holly propagators use the side graft, a modification of the veneer graft in which the inch long incision in the stock is made only slightly off the perpendicular. The base of the cion is shaped to fit the incision with both cambiums meeting. The graft is tied with paraffined cotton twine and plunged into peat moss in a greenhouse grafting box. If

the potted stock is in active growth when the graft is made, callusing will start quickly. After callusing is well under way, ventilation should be given daily, lengthening the period each week until the grafts are hardened. In six or seven weeks they may be lifted from the grafting box and placed on the bench.

Recent tests in which the graft is coated with lanolin to stimulate rapid callusing and to protect the union from drying out have produced gratifying results. When lanolin is used there is no necessity for covering the union with peat moss. In both of these methods the top of the stock is not touched until after ventilation has been given for two weeks. At that time, one half the part above the union is removed. The remainder is cut off shortly before the grafts are shifted to the bench.

A modified saddle graft in which the stock is not cut until after the union heals has produced excellent results.

Bench grafting has been successful using the whip or tongue graft when the stock and cion are the same size. These are also carried in the grafting box through callusing and gradual hardening. With wax applied over a lanolin application, such grafts have been successful when placed directly on the bench.

If the stock is in proper growing condition, grafting may be done from September to March in the greenhouse. Field grafting has not been practiced except locally in the deep south. Patch budding is occasionally carried on in July and August, especially to produce a staminate branch on a pistillate tree. Although such an operation is practical, the tree should be examined periodically to maintain a proper balance between the male and female parts. Sometimes a cleft graft is put on one branch of an isolated pistillate tree using staminate cions to improve pollination.

While only *Ilex opaca* has been mentioned in this discussion, the comments apply equally to *Ilex aquifolium*, the *altaclarensis* hybrid group, the native species *vomitaria* and *cassine* and to the oriental species *cornuta*, *pedunculosa* and *pernyi*. It is fortunate that the genus *Ilex* lends itself so readily to vegetative propagation because with its tendency to seed and bud mutation, the new horticultural varieties which so frequently appear, can thus be perpetuated.

PRESIDENT WELLS: Well, gentlemen, do we have any questions?

MR. FILLMORE: I would like to comment on the use of lanolin. I used it quite a few years ago. Like yourself, I think in certain instances it exerts a beneficial effect. It gets more callusing and certainly provides protection for long use.

MR. FRED J. NISBET (Musser Forests, Indiana, Pa.): Is that lanolin purified or raw?

MR. MATTOON: I get it in the drug store in a large can. It must have been slightly purified.

PRESIDENT WELLS: Any other questions? Well, Mr. Mattoon is going to be here, and incidentally, I would like to pass the word along that we would like all the speakers on the program here for the round-up clinic which will follow our next speaker.

Of all the people on the program this afternoon, Roger Pease is the one man I know nothing about at all. I met him once or twice and we have had very pleasant talks on plant propagation. He comes from the University of West Virginia, which is the limit of my knowledge. Maybe that is a rather terrible thing for a person in my position to say, but it is the truth. I think, nevertheless, we are going to have some good information from him, and without more ado I would give you Roger Pease on "Propagation of Holly Cuttings." Mr. Pease:

MR. ROGER W. PEASE: When Ed Scanlon wrote to me about this talk, he said, "Try to make it 15 minutes." It is rather difficult to cover rooting and growing holly in 15 minutes, but even though I shouldn't waste time, I would like to make a short peroration.

I remember long ago, when I was an undergraduate, one of the wisest men, and certainly the best teacher, I ever sat under, called me up after class one day and said something to this effect: One of the strangest characteristics of man is his eternal search after *the* truth or *the* cause. Those were the words he used—*the* cause. He went on from there. When you are dealing with living things, there is never *the* cause. There are many, many causes, some of which you can mention, many of which only God knows.

Now I think that is applicable whether we are propagating plant materials or being doctors.

I think it is especially applicable in scientific pursuits. When we conduct research or an experiment, we try to isolate and control all of the environmental factors except one. There is, therefore, an unconscious tendency to think of that one factor as *the* cause. In the "forties," growth-inducing substances—auxin or hormones—appeared to be *the* cause for rooting many plants. Right now I am guilty about fog nozzles. I have to watch myself to prevent thinking that they are *the* trick.

So in preparing this paper I have jotted down 21 environmental factors which I believe have to do with rooting holly. There may be 150 others. No two of us would put down the same 21.

When six years ago I started to root and grow holly in a manner suitable for a small producer or farmer, I did some reading, listed 21 factors, and tried to supply all of them as well as my facilities and knowledge allowed.

As I improved rooting conditions, the importance of factors varied. Juvenility is an instance. Mr. O'Rourke reported last year from a pamphlet by F. E. Gardner, who had obtained 100 per cent rooting of soft wood cuttings from one year old trees, 60 per cent from two year old trees, and 47 per cent from 3 year old trees. With trees older than 3 years he had reported no success. This year I placed in my cold frame 25 cuttings of American Holly from trees ranging from over 100 years old to 2 years old. The percentages of results for the old trees were: 100, 100, 96, 96, 84. Cuttings from the juvenile trees all rooted 100 per cent. Juvenility was a factor, but it was what I called "masked." My other conditions were desirable enough to make juvenility become relatively unimportant.