

PROPAGATION OF MAHONIA AQUIFOLIUM

ROBERT M. BODDY

*Descanso Nurseries
Fort Bragg, California 95437*

Successful vegetative propagation of *Mahonia aquifolium* 'Compacta' depends a great deal upon favorable natural conditions. In Mendocino County, in the Fort Bragg area of the coast of northern California, we apparently have conditions ideally suited for this work. Soil conditions are acid; water is acid; summer temperatures are mild, rarely exceeding 70 degrees, and the annual rainfall is between 40 and 70 inches. These conditions allow cutting wood from field-grown stock plants to "cure" properly, and in the late summer we are able to place our cutting flats under intermittent watering. Ideally, this should be done in late September, though we have made cuttings of *M.a.* 'Compacta' as late as November. The percentage of our rooting varies from 30 to nearly 90, depending more upon mechanical vagaries than upon the ability of the plant to respond consistently to our professional efforts.

While this paper deals primarily with the clone 'Compacta', we grow other mahonias including the species *Mahonia pinnata*. We treat all of the mahonias alike, selecting cutting wood when ripe. Generally we take the 'Compacta' first, then the *M. ×* 'Golden Abundance' and then 'Ken Hartman'. Our experience with rooting 'Golden Abundance' and 'Ken Hartman' has all been at Fort Bragg, but we are not without experience in attempting to root 'Compacta' in other climates, namely the Chino area of Southern California. There, we had no success whatsoever, sticking as many as 10,000 cuttings and rooting only a few hundred. We concluded that the cutting wood we were using was unsatisfactory and there was no way we could economically cause a change. Summer temperatures in the Chino area are in the high 80's, often reaching over 100°F. We felt that the wood was simply too green, as plant growth was nearly continuous. Taking cuttings earlier was not successful because we then ran into difficult high temperature problems while cuttings were in the rooting medium. We used both cold frames and propagating greenhouses.

So while we gradually accumulated data on what mahonia plants will not tolerate, we moved a block of stock plants to Fort Bragg for field planting. We next took cuttings after we had constructed a propagation greenhouse duplicating our southern California facilities. Electric cables were installed in the benches and cooling was by convection. This was later changed to an evaporative type of cooling system. Our medium was the same as we used for rhododendrons: sand and peat. We used the conventional shallow southern California nursery flat as a rooting con-

tainer placed on the heated greenhouse benches under mist. Our first effort was a 100% failure. We stuck nearly 500 cuttings and they were all dead within one month.

We sought advice from mahonia experts and they added bits of information to our growing knowledge of what mahonias do not tolerate. We learned at about this time that no part of the cutting should be torn or ripped away; rather, one should use shears. This was supposed to prevent fungus infection, not necessarily assist rooting. The following year we made another effort to root mahonias. Extreme precautions to prevent fungus infections were observed, and we continued with the same medium, conditions, and facilities. Results were the same. Complete failure. But by a stroke of luck, a passing electric company lineman, making a routine inspection of the power line over our property, observed what we were doing and asked for a few cuttings because he appreciated our compact plants and wanted to root some at his home in town. He took no more than 6 cuttings and put them in his pocket. Fortunately, the person in charge of our operations had the good judgment to ask him if he knew anything that we didn't about rooting mahonias. He said he stuck them in a flat of vermiculite and watered them when he had time and they most often rooted. About 6 months later this same man said he rooted all of his 6 plants. A visit to his place confirmed this, and we started to summarize mentally the things we might be doing wrong, for we knew we were doing nothing correctly.

Immediately, we recalled our southern California experience with heat. Mahonia plants do not stand heat while rooting. We also realized our medium should be changed to vermiculite. The next year, we took our cuttings in late summer when the wood had properly firmed and placed them in flats of vermiculite in our lathhouse. Water was provided by overhead Rainjet sprinklers turned on by hand several times an hour for a week or so, and then later when the flats needed watering. Of nearly 10,000 cuttings, we rooted about 5000. We felt, at last, that rooting could be accomplished. Now, for the last seven years, we have been attempting to refine this procedure but basically we are doing only what the lineman suggested. Because of our unique climate, it is doubtful if all that we report will be successful for those working in areas with a harsher climate. Currently, our procedure at Fort Bragg is as follows:

The rooting medium we use is a coarse #1 vermiculite. This grade may vary with manufacturer. Fine grade is unsatisfactory, and the very coarse material is not apt to be properly expanded or graded. We have constructed well-drained deep 4" flats for rooting and they have proved to be an improvement over the conventional shallower depths. We dip flats in copper naphthenate each

season and are able to use them over and over. Rooting is in a lath-house with minimum shade, on gravel beds under hourly water provided by "Spray Stakes", a time clock, and solenoid valves. No bottom heat is provided. Cuttings taken in late summer are trimmed, sanitized, and stuck 100 cuttings per flat. A hormone, Hormex #8, with Benlate added, is used. Selection of proper wood had always appeared to be more significant than choice of hormones, fungicides, or dwell of the water on newly-stuck cuttings. Prior to sticking, flats are filled with vermiculite, and these are placed under a sprinkler to be thoroughly saturated. Precautions are taken that the vermiculite is of uniform firmness in all flats and no air pockets exist. We do not pack the vermiculite under pressure nor disturb it after it is soaked. We make several thousand cuttings per day with a crew of four. If all goes well, cuttings commence rooting within about one month and may be potted off at this time. In actual practice, we rarely do this, generally delaying making cuttings until nearly too late — sometimes in November. Potting is then delayed until spring. While cuttings are being rooted, we spray with Benlate, and, if required, with Zectran to keep off chewing insects. Prior to taking cuttings, our stock fields are sprayed with lindane for weevil control, Zectran and Sevin for chewing insect control, and with Benlate. These sprays are repeated as required. Weed control is a major problem. Sheep sorrel is the most troublesome weed. We have damaged our stock block several times with herbicides and this has affected rooting. However, the plants are persistent, and come back strong the next season. So do some of the weeds. We fertilize the stock block several times a year with a complete food. Sometimes we believe we fertilize too often, as our plants elongate and become too heavy. We prefer a light cutting, about $\frac{3}{8}$ ". Cuttings may be stored overnight and processed the next morning, but keep in mind that it is cool in Fort Bragg and all evenings, all year, are cold. We use only tip wood of 'Compacta', but have used stem cuttings of 'Golden Abundance' and 'Ken Hartman'.

We have caused occasional damage to our cuttings by injecting too much chlorine into the water supply. Fortunately, on these occasions, most cuttings had already commenced rooting, but a great portion of the cuttings did defoliate. We have learned that a rooted cutting, if it defoliates, will start growth again in the spring. However, it should remain in the cutting flat until new growth commences and be watered and fertilized as required, and then transplanted. If a defoliated cutting is removed and potted off, it generally will perish.

We fertilize all of our cuttings in the flats after they are well-rooted; but this is generally in the spring, and a long growing period is ahead. We would prefer to pot off the cuttings in the fall, but our program of getting started each year with mahonias is im-

precise, and we often find ourselves sticking cuttings as late as November. They root, but we hesitate to pot them off as we lack shelter for the pots. We do plan to construct quonset shelters for the newly-potted cuttings, but will approach this procedure carefully, remembering that mahonias do not do well in unusually warm artificial conditions. It appears the best procedure would be to attempt to pot off the rooted cuttings in the fall, place the liners in a quonset structure without a poly cover but light shade only and then, after they are established and are dormant, place a poly cover over the quonset and force an early cycle of growth.

We pot off the rooted cuttings into 4" pots rather than 2½" because of the large root system. Our customers have complained about this increase in size and price, but we feel that we are offering a better plant. We were required to shear off most of the roots of each cutting in order to squeeze them into the 2½" pots, and then discovered there was really no medium left in the pot in which the plant could establish itself. It was also difficult to water and feed the plants in smaller pots. We also grow rhododendrons, pieris, and ferns, and the growing medium we use for mahonias is the same as for these plants — fir bark, peat moss, and perlite. Our fertilizing program is also the same, though the schedule may vary.

At present, we are growing five mahonia cultivars. Three are of the compact type, and they are all equally more difficult to root than the standards. But in spite of these difficulties, we feel we do make progress each year, as we discover conditions best for the plants. We feel that the production of cutting-grown mahonias is worth the effort for the sake of uniformity and reproduction of truly superior clones which deserve a prominent place in the beautification of our environment.