Cutting Propagation of *Juniperus procumbens* 'Nana'

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IBA at 8000 ppm was shown to produce the best rooting percentage with cuttings of *Juniperus procumbens* 'Nana' in a series of experiments which evaluated IBA, NAA, IBA + NAA combinations, and KIB. The practice of resetting unrooted, callused cuttings at the time of potting rooted cuttings, allowed the majority of the cutting crop to remain in the cutting flats for a shorter period of time without effecting the overall rooting percentage.

INTRODUCTION

Juniperus procumbens (Endl.) 'Nana', the dwarf Japanese garden juniper, is widely grown for use in the landscape. Plants generally form a low mat or mounding ground cover, approximately 1 ft in height and 4 ft in diameter, a size well adapted and readily maintained (with minimal pruning) in home gardens and in containers. Older plants can mound up to 2 ft in height and spread to 10 ft in diameter. Plants also adapt readily to training up a stake to create a cascading effect, as well as traditional bonsai and other trained forms.

The dense, overlapping branching habit and blue green foliage are characteristic of this cultivar. Plants are especially attractive in the spring during the flush of new, bright-green growth. Plants generally perform best in full sun, although some afternoon shade is of benefit in hot, dry areas.

Juniperus procumbens 'Nana' was originally introduced from Japan by the D. Hill Nursery Company in Illinois, during the 1920s.

Juniperus procumbens 'Nana' is commonly propagated by cuttings (generally made during the winter months), although grafting is sometimes used to produce special forms, such as patio trees.

MATERIALS AND METHODS

The experiments contained in this report were conducted over a period of several years, in an attempt to optimize the rooted-cutting yield of this crop. Experiments centered on the effects of selected types and concentrations of rooting hormones, as well as the duration of the auxin treatment and the practice of resetting (resticking) callused, unrooted cuttings.

The rooting hormones utilized were the auxins indole-3-butyric acid (IBA), naphthalene acetic acid (NAA), and combinations of IBA and NAA. The auxins were generally prepared as solutions containing 55% alcohol and 45% water. Some treatments involved the use of the potassium salt of IBA (designated as KIB) or the use of the methylated salt of IBA in a dry talc powder (designated as IBA powder).

Propagation material was collected from 1- and 5-gal container plants during early winter (late Dec. and Jan.). Cuttings were prepared approximately 4 to 5 in. in length, such that the outer tissue on the main stem of the cuttings was brown at the base and green above. Side branchlets on the cuttings were trimmed as

needed so that all cuttings were of an overall uniform size. The bottom branchlet was stripped from the cutting.

Prepared cuttings were washed by immersing them for 5 sec. in a water bath containing 15 ppm chlorine. Cuttings then received a quick basal dip in their respective hormone treatments and were stuck into pasteurized flats of a rooting medium, consisting of 9 coarse perlite : 1 peat moss (v/v). Cutting flats were placed on outdoor heated concrete rooting beds, in full sun, with an average bottom heat temperature of 62F. Intermittent mist was provided during the daytime for 10 sec every 12 to 30 min, depending on weather conditions. Results were evaluated and rooted cuttings were potted 5 to 6 months after sticking the cuttings.

Experiment 1 compared the standard treatment of 3000 ppm IBA (used for a wide assortment of juniper cuttings), with 6000 ppm IBA, 8000 ppm IBA, and 16,000 ppm IBA (the first three in solution form and the latter as a powder).

Experiment 2 re-compared the standard treatment of 3000 ppm IBA with 8000 ppm IBA (the treatment producing the best rooting percentage in Experiment 1) on a larger scale.

Experiment 3 compared the new standard treatment of 8000 ppm IBA with selected hormone treatments containing moderate to high concentrations of NAA, combinations of IBA and NAA, and KIB (all in solution form).

Experiment 4 compared the standard treatment of 8000 ppm IBA with solutions containing 8000 ppm IBA and varying concentrations of NAA.

Experiment 5 examined the effects of the duration of the hormone treatment (the standard quick dip compared with a 15 sec and 30 sec dip).

In the final trial, rooted cuttings were potted after 15 weeks (rather than after the standard 5 to 6 months), with any callused, unrooted cuttings saved to be retreated with the standard hormone treatment and restuck in the perlite/peat medium in flats to allow for further rooting. An earlier potting date for the majority of the rooted cuttings, was desired in order to shorten the production time for the crop and reduce potting mortality, by removing the rooted cuttings from the propagation flats before the root systems became too extensive. The reset cuttings were evaluated and potted after an additional 12 weeks.

RESULTS

Table 1. Experiment 1: Effects of selected IBA treatments on the rooting of *Juniperus procumbens* 'Nana'.

Treatment	Average number rooted per flat ±std. error†	Rooted (%)
3000 ppm IBA	106.0±5.5 a‡	53.1
6000 ppm IBA	94.5±3.5 a	47.3
8000 ppm IBA	113.0±2.9 a	56.5
16,000 ppm IBA powder	110.5±10.0 a	55.3

† 200 cuttings per flat, four flats per treatment.

‡ Means followed by the same letter or letters are not significantly different at the 5% level (Duncan's Multiple Range Test).

Table 2. Experiment 2: Re-evaluation of two selected IBA treatments on the rooting of *Juniperus procumbens* 'Nana'.

Treatment	Average number rooted per flat ±std. error†	Rooted (%)
3000 ppm IBA	91.2±2.6	45.6
8000 ppm IBA	120.0±1.5	60.0

† 200 cuttings per flat, 100 flats per treatment.

Table 3. Experiment 3: Effects of IBA, NAA, and KIB on the rooting of *Juniperus procumbens* 'Nana'.

Treatment	Average number rooted per flat ±std. error†	Rooted (%)
8000 ppm IBA	116.0±8.9 a	58.0
3000 ppm NAA	68.6±7.5 bc	34.3
3000 ppm IBA + 3000 ppm NAA	61.8 ±3.1 bc	30.9
6000 ppm IBA + 6000 ppm NAA	51.2±26.0 bc	25.6
12,000 ppm KIB	47.8±8.5 c	23.9
16,000 ppm KIB	100.4±10.7 a	50.2

† 200 cuttings per flat, five flats per treatment.

Table 4. Experiment 4: Effects of IBA and NAA combinations on the rooting of *Juniperus procumbens* 'Nana'.

Treatment	Average number rooted per flat ±std. error†	Rooted (%)
8000 ppm IBA	106.5±8.8 a	53.2
8000 ppm IBA + 100 ppm NAA	89.0±12.6 ab	44.5
8000 ppm IBA + 500 ppm NAA	93.3±10.2 ab	46.6
8000 ppm IBA + 1000 ppm NAA	110.7±8.7 a	55.4
8000 ppm IBA + 2000 ppm NAA	63.7±8.3 b	31.8

† 200 cuttings per flat, five flats per treatment.

Table 5. Experiment 5: Effects of IBA treatment duration on the rooting of *Juniperus procumbens* 'Nana'

Treatment	Average number rooted per flat ±std. error †	Rooted (%)
8000 ppm IBA, quick dip	106.3±9.5 a	53.1
8000 ppm IBA, 15 sec dip	112.9±20.5 a	56 5
8000 ppm IBA, 30 sec dip	87.6±12.6	43 8

† 200 cuttings per flat, five flats per treatment.

Table 6. Resetting cuttings of *Juniperus procumbens* 'Nana'.

Treatment	Number rooted†	Rooted (%)
Original cuttings after 15 weeks	4686/10,000	46.9
Plus available resets (callus only)	1841/10,000	18.4
Reset cuttings after 12 more weeks	996/1841	54.1
Combined results	5682/10,000	56.8

† 200 cuttings per flat, 8000 ppm IBA.

DISCUSSION

In Experiment 1, 8000 ppm IBA (liquid) and 16,000 IBA (powder) produced slightly higher rooting percentages than the standard (control) treatment of 3000 ppm IBA, although the differences were not significantly different.

Based on these results, 8000 ppm IBA was again compared to 3000 ppm IBA on a larger scale (Experiment 2). In this case, 8000 ppm IBA did produce a significant improvement in rooting, and so became the new standard treatment. (Re-comparison of the 16,000 ppm IBA powder was left for another time, as the use of powders tends to be more costly than the use of liquids.)

In Experiment 3, solutions of NAA, IBA + NAA, and KIB were compared to the standard, in concentrations often used for moderate to difficult-to-root conifers. In this case, the standard treatment continued to produce the best results.

The inclusion of varying concentrations of NAA into the standard formulation of 8000 ppm IBA, again produced no significant improvement in rooting percentage (Experiment 4).

In Experiment 5, extending the duration of the hormone treatment from a quick dip to a 15-sec dip, produced a slightly higher rooting percentage. However, the difference was not statistically significant; neither did the slight increase warrant the additional labor required.

Finally, the evaluation of the re-setting (resticking) of callused, unrooted cuttings after 15 weeks (at which time all rooted cuttings were potted), produced a rooted

cutting yield equivalent to that normally obtained when rooted cuttings are potted after approximately 6 months. This earlier potting procedure features the advantages of reducing the production time on a major portion of the crop, as well as reducing the transplant loss sometimes experienced with rooted cuttings which have remained in the cutting flats for an extended period of time.

Presently, we are using a commercial formulation of 16,000 ppm IBA powder (which was evaluated in Experiment 1), as crystalline IBA is no longer available to us for formulation of our own IBA solutions. The re-setting of unrooted, callused cuttings after 15 weeks also continues as our standard practice, yielding good results.

Vegetative Propagation of *Gevuina avellana* Mol.

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INTRODUCTION

Gevuina avellana Mol. belongs to the Protaceae, and is related to *Macadamia,* producing similar nuts with edible kernels. This plant is a source of cosmetic oils and the timber is used for joinery and turning. Several common names are used for the plant, including Chilean nut and Chile hazel. The latter gives rise to the mistaken belief that the plant belongs to the genus *Corylus. Gevuina avellana* grows to form an attractive native tree in the Valdivian forest in Chile. It is known in Great Britain as an ornamental and is grown in the milder areas of Cornwall and Devon.

Our research shows that this plant has been grown in New Zealand since the 1940s, although poor types with small nuts have meant that it has only been grown as an ornamental. Tolerance of frost to -8C makes *G. avellana* hardier than *Macadamia,* thus making it of interest as a potential new crop for New Zealand. Roasted nuts are sold in Chile at prices of about NZ$7 per kg (Crop & Food Research, 1993, Halloy et al. 1993).

We have introduced several new accessions of *Gevuina* into New Zealand from South America. These are being screened for hardiness and will be compared with plants grown from trees already in the country. Once plants attain fruiting size, the quality and size of nuts can be compared. To provide plants for trials, and to be able to grow plants once an elite cultivar has been selected, trials were conducted to assess the feasibility of propagating *Gevuina* by stem and leaf-bud cuttings.

MATERIALS AND METHODS

Propagation trials were carried out in a twin-skin polycarbonate-covered greenhouse at Invermay Agricultural Centre, Mosgiel. Thermostatically controlled heating cables embedded in sand provided a mean basal cutting temperature of 22C. Air temperature was maintained at a minimum of 18C. Misting was controlled by an electronic leaf sensor. No artificial lighting was supplied.