the media studied including Anderson's medium, where limited rooting (8 of 34 explants of all clones tested) was achieved with no BA and IBA in the 1-2 mg/liter range. Good rooting (10 of 13 explants of all clones tested) was obtained in the greenhouse by placing unrooted Stage I shoots, 5 mm or more in height, into pasteurized sand under intermittent mist (30 sec every 15 min during daylight hours) after dusting them with commercial rooting powder containing 0.1% IBA. Shoots developed vigorous root systems after 2-4 weeks. Rooted plants from tissue culture or from sand were planted in standard soil mixture and placed on the greenhouse bench for establishment, virus testing, increase, and maintenance.

Following the 8 week heat treatment period, the establishment stage in vitro for heat-treated shoot apices of red raspberry requires an average of 6-8 weeks, and up to several months for some cultivars. Rooting occurs in 2-6 weeks. Greenhouse establishment and propagation of daughter clones in sufficient numbers for field trails takes 3-5 months. Dormancy requirements would need to be met before subsequent outdoor planting. The entire process, including 2 years of field observation, could take a minimum of 3 years and more realistically, 4. If in vitro micropropagation were used to increase heat-treated shoot apices that were found to remain true to horticultural type, evaluation and commercial release could possibly be achieved in 3 years.

During these studies it became apparent that variations in Anderson's medium might be of value if a particular red raspberry cultivar responded poorly to the standard procedures just described for Stage I regeneration. Some useful variations in our own laboratory included a) increasing major salts to ½ the M&S (11) level; b) increasing major M&S salts to the 1 x level, changing NH₄NO₃ to 400 mg/liter, KNO₃ to 480 mg/liter, and omitting KH₂PO₄; and c) combining each of the above medium variations with BA: IBA ratios (mg/liter) of 2:0.5; 1:1; and 0.5:1. Other factors influencing successful regeneration included seasonal periodicity of plant regeneration capacity (in our experience and as noted in the literature (16) shoot apices coming out of the heat chamber in the spring seemed to do best), and etiolation.

### Literature Cited


### In Vitro Propagation of Grevillea rosmarinifolia

J. Ben-Jaacov and Edna Dax

Division of Ornamentals, Agricultural Research Organization, The Volcani Center, Bet Dagan, Israel

Additional index words. tissue culture, Proteaceae

Abstract. Shoot segments of Grevillea rosmarinifolia A. Cunn. placed on solid half- strength Murashige and Skoog (MS) medium containing 0.5 mg/liter 6-benzylamino purine (BA) proliferated and formed shoots which were subcultured and rooted on paper bridges in Murashige and Skoog medium containing 0.1 mg/liter α-naphthaleneacetic acid (NAA).  

Vegetative shoots, 10 cm long, of Gre­villea rosmarinifolia, Proteaceae, were obtained from 1-year-old plants grown in the greenhouse. Shoots were washed in water with detergent, rinsed in distilled water, and surface sterilized for 15 min in 3.7% sodium hypohlorite solution. After 3 successive rinses in sterile distilled water, the top 2 cm of the shoots, which were very soft, were discarded and the remaining portion of each shoot was cut into 1 cm segments containing 2-4 leaves each and transferred aseptically into 100 x 25 mm glass culture tubes, each containing 10 ml half-strength MS (4), salt medium containing MS vitamin mixture (4), 100 mg/liter myo-inositol, 2% sucrose, 0.8% Bactosarc (Difco), and 0.5 mg/liter BA. The tubes were placed in a growth room at 25°C, with fluorescent light of 5 kxl for 16 hr daily. Each node produced a shoot within 1 month and these shoots were transferred for further proliferation in the same medium under the same environmental conditions. After an additional month, each terminal shoot (1 cm) produced 5 or 6 new lateral shoots; these, in turn, were again subcultured for further proliferation (Fig 1).

Rooting was obtained by subculturing 1 cm terminal shoots into a liquid medium with the shoots supported by paper bridges. The medium was similar to the
The in vitro propagation method described may be used to study proteoid roots require a well aerated environment (1).

The fact that rooting was better on the well-aerated paper bridges agrees with the widely accepted notion that proteoid roots are induced to root on medium consisting of MS high mineral salts, myo-inositol, and thiamine-HCl diluted to 1/16 to 1/2 strength and supplemented with full strength sucrose and agar. Shoots were induced to root on medium consisting of MS high mineral salts, myo-inositol, thiamine-HCl, and pyridoxine-HCl, 0.1 mg/liter NAA was added. The culture tubes were held at 20°C. About 85% of the shoots rooted within 1 month (Fig. 2).

Successful tissue cultures have been reported for many members of the genus *Rubus* involving callus cultures (2, 3, 4, 5, 9, 13), shoot tip growth and/or axillary bud proliferation (1, 4, 7, 8, 11, 12, 13), parthenocarpic fruit development (6, 15), and root development (1, 4, 7, 8, 11, 13). Despite these studies, no good system for the rapid proliferation of the trailing blackberry has been developed. This paper discusses a system for the propagation of 3 trailing blackberry cultivars.

Shoot tips of 'Thornless Boysenberry', 'Thornless Youngberry', and virus-free 'Thornless Evergreen' trailing blackberries were obtained from greenhouse grown plants at the University of Illinois. These tips (about 1-2 cm in length) were stripped of expanded leaves and disinfected in 0.5% sodium hypochlorite (10% Clorox) with 0.1% Triton X-100 for 10 min followed by two 5-min rinses in sterile distilled water. The explants were aseptically transferred to shoot proliferation medium which consisted of modified MS medium (10) = MS high mineral salts, Staba vitamins4, myo-inositol, thiamine-HCl, and pyridoxine-HCl, 0.1 mg/liter, ascorbic acid (50 mg/liter), sucrose (30 g/liter) and agar (10 g/liter).

Rapid proliferation of axillary buds of 'Thornless Boysenberry' and 'Thornless Youngberry' (*Rubus* sp.) in tissue culture has been achieved on a modified Murashige and Skoog (MS) medium containing 6-benzylaminopurine (BA) and α-naphthaleneacetic acid (NAA). shoots were induced to root on medium consisting of MS high mineral salts, myo-inositol, and thiamine-HCl diluted to 1/16 to 1/2 strength and supplemented with full strength sucrose and agar. Rooted plants have been successfully moved to soil and grown in the greenhouse.