A SIMPLIFIED ENTRY INTO TISSUE CULTURE PRODUCTION

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(see page 90 — Western Region)

PAUL READ: Would you comment on stock plant manipulation and cultivar differences?

BRUCE BRIGGS: I feel that you should bring the stock plant into a greenhouse and give it the best growing conditions. Do not water the tops so as not to contaminate the new growth. This is the best we have devised to get the plant into the proper condition. In conifers they have taken mature tissue and grafted it onto juvenile understock. After they get that to grow they put it in tissue culture. There is, considerable cultivar differences in rhododendrons. Cytokinins appear to be the factor most influencing success.

DICK JAYNES: Do cuttings from tissue cultured plants propagate more readily than cuttings from older plants?

BRUCE BRIGGS: Yes.

COMMERCIAL APPLICATION OF TISSUE CULTURE IN FRUIT PRODUCTION

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Why are we interested in tissue culture? Our interest is based on the need for virus-free plant material, for the rapid buildup of new cultivars and rootstocks, and as a means for propagation of difficult-to-root plant materials. For many years we have conducted our own heat-treating program to get cultivars virus free. It is a slow process to build up this material once it is clean. Tissue culture will give us the tool to produce sufficient quantities for our needs. Another use will be for the buildup of new cultivars as we find them. At present it takes as long as 5 to 7 years to get into full production with a new cultivar. Rootstocks take as long. The third use is to propagate difficult-to-root plants. An example would be selected strains of Carpathian walnut, such as 'Lake's'.

Our involvement came from discussions with suppliers on the future of the rootstock business and the fact there were many new rootstocks on the horizon and some old ones which had the viruses removed, but development of enough stocks to satisfy the market would be slow.

Tissue culture with its promise of high populations in a short time was very appealing. One of the west coast suppliers suggested we talk with the people at the Oregon Graduate Center located in Beaverton, Oregon. The Center had been working with Weyerhauser Corporation on conifers and was achieving notable success. With this in mind Oregon Rootstock, Willow Drive Nursery, A. McGill & Son, and Stark Bro's. approached the Center offering to underwrite research on woody deciduous materials. They were eager to try. We then selected material for the Center to work with. The list is as follows: 'EMLA 27' apple rootstock, 'Pixy' plum rootstock, 'Antonovka KA 313' apple rootstock, 'Crimson Sentry' maple, 'MAC-9' apple rootstock, 'St. Julien ×' plum rootstock, 'EMLA 7' apple rootstock, 'Lake Carpathian' walnut, 'Stark Jumbo' apple, 'Bradford' pear and 'Kwik Crop' walnut.

The list is predominantly rootstocks as we felt this was our immediate problem area. In less than 6 months successful shoot and root initiation had been achieved on some of the plants and in another 6 months the process had been shortened from 3 steps in the lab to 2 steps for some cultivars. This past spring 100 lot quantities of liners were planted and budded with various cultivars. The Oregon Graduate Center was interested in putting this process into commercial application.

All through the venture the Oregon Center's focus has been on the commercial application of tissue culture. The emphasis has been as simple a process as possible to produce a plant that is acceptable to the nursery trade. As a result of this work the original group of nurseries has now formed a corporation and have built a commercial lab in Oregon. The building is about 1800 square feet in size and consists of a transfer room, a preparation room, two culture rooms, a supply closet and an office. Four people will staff the lab to begin with. The Oregon Graduate Center will act as advisor until the supervisor technician is ready to assume the responsibility for the operation.

Transferring will begin in January, 1980 and we expect the first commercial crop the following summer. Our immediate goal is to produce one million plants per year. The growing cycle is 6 weeks. This is from the beginning of the shoot initiation stage until we transplant it to soil and move it to a mist chamber for hardening off. One of the most critical steps in the process is pre-conditioning before shoot and root initiation. The

material must be pathogen-free. The plant is pre-conditioned on a non-hormonal nutrient medium for 1 to 4 weeks to enhance the response of the tissue to shoot multiplication medium. The explants are transferred to a shoot initiation medium. This medium is a low auxin medium (0.5 to 2.5 μM). Using this method, 50 to 100 shoots per explant are produced. The low auxin content of the various media is to avoid abnormalities in the plant. These abnormalities would be anatomical or genetic and would result in a plant not suitable for planting or budding. Every attempt is being made to tailor the plant for the job intended. The Oregon Graduate Center is adjusting the chemical makeup of the media to do this. The plants grown by the lab will be decided by the corporation as the ones most needed by its members and we will share the success and failures equally.

Preliminary chromosome counts of all the material grown so far indicated a mutation rate of approximate 3%. We do not feel this is critical and in fact find this much in nature especially in the high sunlight areas of the west. However, we are still checking and looking for better ways to ensure the genetic uniformity of the resultant plants produced from tissue culture.

Our knowledge of the nuts and bolts of tissue culture is limited to the belief that this is a promising propagation method that needs to be explored. Rather than attempting to do it on our own, we got together and funded a promising program. We are somewhat behind other labs at the moment but believe our time has been well spent in preparation so we can make this venture a success with a minimum of pitfalls.

Along this line we have helped fund research done at the University of Missouri. Dr. Millikan is heading this project and we have seen his work on 'Kwik Krop' walnut and 'Blushing Golden' apple. We are also helping Dr. Jim Anderson at the University of Arizona and Dr. Wilbur Anderson of the Northwest Washington Research and Extension Unit on his 'Red Delicious' apple project. We hope by helping on projects like these information that otherwise might take years to introduce can be helped along by continuing interest of the commercial nurseries.