Producing Virus-Indexed Liner Plants for Small Fruit Production

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The production of liners for small fruit production has reached a state of sophistication beyond what anyone could have thought of at the beginning of this century Modern propagation is a meld of ancient horticultural techniques developed over the centuries and the very latest in horticultural science and technology. The modern plant propagator is an artist at applying all these elements in the successful propagation of small fruit liners

One could probably state without rebuke that the strawberry plant has been a key factor in the evolution of modern horticultural science and technology. Genetic "fingerprinting" to maintain the identity of cultivars was pioneered mostly using strawberry plants; it is also an aid to plant patent holders (Smith) A lot of what we know about tissue culture today was pioneered using the strawberry. Strawberry plants have always been popular in plant research because of their growth habit and small size Much of the very best and valuable nutrient deficiency studies was done by the late Dr. F.D. Johanson (Johanson, 1980) utilizing hydroponics

Research with strawberries has wide application in the world of horticulture. Modern disease-free and most notably "virus-free" plant propagation techniques were developed for the strawberry plant and this led directly to the development of virus certification programs for a wide variety of plant materials including other small fruits and tree fruits (Maas, 1984).

Plant breeding is the beginning of modern expansion of cultivars Some selecting from the wild still occurs but plant breeders are the real contributing factor in developing new cultivars today. Once a desirable cultivar is made available it becomes the responsibility of the plant propagator to increase numbers of disease-free plants to satisfy public demand. While this demand is being met a lot of feedback between the propagator and grower must take place.

It is common in the small fruits—most notably grapes—for certain clones to produce better quality and/or quantity of fruits than others. The grower is in the best position to note this fact and let the propagator concentrate on producing the best clones based on the needs of the grower. This makes the whole area of propagating small fruit liners exciting because there is room for large production propagators and equally there is room for the small custom propagator Because of the diversity of the total industry, many commercial growers do their own custom propagation as do many hobbyists. Hobbyists and commercial growers differ greatly. The same philosophy behind the old adage that there is nothing better than a "home grown tomato" applies equally to the small fruits

Because a specific small fruit cultivar must be propagated free of disease and be true-to-name, a series of steps are involved to achieve large quantities—all of equal quality. In this overview strawberries will be used as the example and reference to other small fruit species will be made as the discussion progresses.

Plants grown in the open environment are susceptible to a wide range of pests and diseases, so some physical and cultural barriers have to be placed between the plant being propagated and its disease vectors. Safeguards to assure the end product is true-to-name are also needed for a specific cultivar Certification is normally directed as freedom from known viruses and, in most states in the U.S., nurseries are licensed and inspected by their respective states for freedom from pest and disease.

Some states provide fully staffed and funded certification programs whereas other states have no such programs in effect (Stadelbacher, 1980). Some state programs are regarded more highly than others; on the U.S. West Coast, the States of Washington and California are the main strawberry plant producers and their respective certification programs are state of the art and regarded highly worldwide.

To propagate "disease-free", true-to-name plants, one must obtain stock that has been index-tested Such plants can be found by contacting the USDA. Common sources of indexed plants are from UC Davis screenhouses in California; OSU screenhouses in Corvallis, Oregon; USDA; other state programs and from certain private laboratories. One of the very best sources is the National Clonal Germplasm Repository, 33447 Peoria Rd., Corvallis, Oregon. 97333. (Phone (503) 757-4448. Dr. Kim Hummer, Curator; Vonda Peters, Plant Propagator; Donna Gerten, Information Manager)

Indexed strawberry plants from these sources are called nuclear stock and one is lucky to obtain more than a mere handful of stockplants. To protect the nuclear meristem stock from pest and disease problems it must be maintained in an approved screenhouse using wire or plastic cloth no larger than 20×20 mesh The idea is to make the structure aphid-proof and it must have a double entry system to gain access and exit from the screenhouse. There are no specific recommendations for construction other than the minimum mesh screen size The screenhouse constructed for the growing of a foundation block is subject to approval prior to the planting of the nuclear stock inside the house (Department of Food and Agriculture, state of California).

Once the foundation block is established, it can be used for the traditional runner propagation program. Runner propagation is not as rapid as tissue culture and, due to the limited number of nuclear meristem plants available, tissue culture is often used as a direct method of plant propagation This includes material for raspberries and blackberries as well as for strawberries

Virtually every virus-indexed strawberry, blackberry, and raspberry plant grown in the U S. will have come, at some time, from tissue culture (TC). This is because TC has been used to clean-up plant cultivars from known viruses. Increased plant vigor, crown branching, and profuse runnering are additional temporary beneficial growth habits resulting from TC. These altered growth habits are the result of hormones added to the cultural medium which last three to four months after the plants are taken out of the TC. The extra runnering increases the productivity of the increase block (nursery row). A three-fold increase in runner plants is often enjoyed in the increase block (The Grower, 1986). In the case of strawberry plants TC is 3 to 10 times more expensive than runner production—so runner production is still the preferred means of propagation. Tissue culture is being used extensively with blackberry plants because tip

layering propagation is much slower than runner production of strawberry plants Whether the goal is to produce certified strawberry plants or some other small fruit, such as blackberries, raspberries, grapes, or blueberries, the principles are much the same.

While the principles in producing virus-indexed planting stock are similar, procedural differences are present due to the difference in genus, species, etc. of the small fruits. The certification program in Oregon for grapevines uses heat treatment instead of TC for developing virus-free nuclear stock (Registration and Certification of Grape Nursery Stock, Oregon Administration Rules, 1971). A hot water bath, hot enough to kill the virus but not the grape stock, is used; non heat-treated samples of the same clone are maintained to insure the heat treated vines stay true-to-type. These plants are also indexed for viruses to help establish the freedom from virus of the original imported cutting.

In regard to virus certification, commercial growers insist on such stock for all strawberry plantings. Red raspberry and blackberry growers also see the value of virus certification and they are enjoying enhanced yields and longevity of the plantation as a direct result. Recently a virus certification program has been set up for the blueberry industry. The knowledge and expertise gained from all this is branching out to benefit the entire horticultural community as well.

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