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Tissue Culture Applications To Improve Crops Of Strawberries, Raspberries, And

Blackberries

By Pat Malcolm

When agricultural crops are reproduced by division after several generations, often a decline occurs

in qualities such as vigor, yield, disease resistance, plant and fruit appearance and uniformity of size or shape. This condition of decline is commonly called, "run out."

Strawberry plants have demonstrated this clonal decline (running out) for many years. After growing strawberry plants for five or more years, gardeners became accustomed to dividing a clump of plants that contained the mother plant (oldest plant) in the center and replanting the smaller daughter plants to be used as seed plants the following season. Certain genetic, undesirable changes (mutations) were brought to the surface, as seen in daughter plants; as more and more plants were continuously grown, generation after generation. Some of these corrupting mutations may be visually observed as the plant vigor decelerates (declines); the yield of strawberries is less, and sometimes the berries are misshapen; and finally, the plants become extremely susceptible to diseases caused by virus, bacteria, fungi, insect susceptibility, and nematode victimization. Agricultural researchers advised strawberry growers to discontinue old variety lines and clones and were told to buy new, certified plants that restore the vigor needed to increase yields of future strawberry gardens.

This phenomenon of strawberry decline has been experienced with other agricultural crops such as sweet potato vines, raspberry bushes, blackberry bushes or vines, and banana trees. The problem with banana trees has emerged as the greatest possible catastrophe facing modern agriculture today, since bananas, produced only by plant division and not seed, are the most popular fruit in the world and may face extremely serious setbacks, unless the efforts of scientists from Israel to "clean up" the evolved, accumulated defects by using tissue culture that could cause the commercial banana production to rebound.

Old "run out" clones of agricultural crops have in the last decade been rejuvenated to produce unprecedented yields and to restore confidence in a high quality product. Growers of agricultural, commercial, crop plants can avoid clone decline, "run out," by buying certified plants that have been grown under strict governmental watchdog supervision, under a technique called, "tissue culture." To

"clean up" problems in weakened, flawed clones of raspberry plants, a clump of cells is taken from the growing tip of the plant called the apical meristem. These cells grow rapidly and rarely contain virus or other harmful defects and are placed within a sterile growing medium, where they grow into a clump that develops roots and a growing shoot. This micro-plant is grown into many other mother plants called "nuclear stock mother plants." These mother plants are sent out to be multiplied over and over into certified plants by nursery propagators with a regained vigor, disease-free status and desirable qualities that were once present in the original profitable varieties.

One eclectic segment of agriculture that has been negatively impacted by clonal decline, "run out," is the pick-your-own operation, where berry plants are not replaced often by operators with certified plants. Diseases and pests appear as a greater threat every year. This same phenomenon of disease and pest buildup is well known in home gardens where tomatoes, pepper plants, and many other vegetable plants are abandoned after a few years in favor of new soil locations. The decline of strawberry plants, raspberry plants, and blackberry plants in pick-your-own operations can not always be reversed by simply replanting the site with certified plants, unless the soil is first fumigated and

sterilized. Very little attention has been paid to certify muscadine and scuppernong grape vines to be free of virus, bacteria and fungal infestations in pick-your-own operations. Those grapevines are normally multiplied by various methods other than seed planting.

Recent improvements in offering agricultural plants for certification will ultimately insure the survival of valuable berry crops like blackberry plants, raspberry plants, and strawberry plants. Crops such as banana trees that are grown in tissue culture in Israel for planting in Central America can offer hope that commercial interruption of banana fruit will be avoided. Recent tissue culture advancements have given commercial growers the security of continued profits and quality, sweet potato products to enjoy by growers and consumers.

The application of tissue culture propagation to the future of canna bulb, (rhizome), and commercial production could save growers who are floundering in complaints and indecision to restore a once important agricultural crop with a promise of future profits and a satisfied wholesale and retail customer. This application of tissue culture to future crops of every type that are grown by plant division will determine whether or not those crops will survive and not "run out."

Patrick A. Malcolm, owner of TyTy Nursery, has an M.S. degree in Biochemistry and has cultivated berry plants for over three decades.

<http://www.tytyga.com>

History Of Raspberry Plants

By Pat Malcolm

According to Luther Burbank, who studied and hybridized raspberries and blackberries more than any other horticulturalist, and wrote his classical 8 volume treatise on Small Fruits and Fruit Improvement in

1921; the red raspberry plant was cultivated in Europe for centuries, growing wild from Greece to Spain and to the North from Norway to Sweden.

Red Raspberry, *Rubus idaeus*, is a native berry bush to Turkey and was gathered by the people inhabiting Troy, (Troas, Turkey) from vines growing at the foothills there in the first century B.C.

The Romans spread the seed of raspberries throughout their empire as evidenced by seed of the raspberry vine in archaeological excavations in England that demonstrate that the English were gardeners growing richly with raspberry vines and raspberry bushes.

William Prince established the first plant nursery in the American colonies in 1737 in Flushing, New York, that offered among other things for sale, raspberry plants.

Luther Burbank introduced many raspberry hybrids into American horticulture. He described brambles, raspberries and blackberries, as being the most complex genetic fruits in American fruit research.

Burbank produced a multitude of crosses between the black berry, dewberry, and raspberry that showed every possible combination of both berry qualities in between. One of these raspberries was even white in color and delicious but too soft for commercial production and planting.

Raspberry has been hybridized with various blackberry plants to produce the boysenberry and loganberry. The loganberry was a hybrid cross between the California dewberry and the red raspberry. The 'Phenomenal Berry' was a cross between a dewberry and an arctic raspberry that Burbank hybridized in 1905.

Luther Burbank made hybrid crosses between the strawberry plant and the raspberry plant that resulted in a hybrid bush, completely thornless, but the fruit produced on 2–5 ft canes was not good enough quality to succeed as a commercial raspberry.

The raspberry bush or vine grows up to 3 feet in height, and the berry when picked easily separates completely from the stem, requiring no further cleaning or preparation before eating. Wild raspberries are an important wildlife berry for animals and birds to eat, when they ripen in the summer and fall. Raspberries are best marketed by pick-your-own operations, due to the short shelf life, but the demand for raspberries has increased to a point that the berries are flown in by refrigerated air freight to satisfy to the demand for the raspberry.

The growth habit of raspberries can be described as trailing raspberry vines or as erect, upright canes. Many raspberry cultivars produce a non-bearing cane the first year, that flowers and grows berries during the second season. This non-bearing cane is called a Primocane. Ever bearing raspberry plants can bear two crops per year, one crop in the spring and the second crop in the fall. The ever bearing raspberry bushes can produce a crop the first season in the fall on primocanes. Popular everbearing raspberry bushes and vines are: Heritage red raspberry, Autumn Bliss and Amity red raspberries. The

roots of raspberries are shallow and may require some supplemental watering during dry periods. The raspberries may be harvested by hand or by machine and frequent picking is required every 3–4 days

over a period of several weeks.

The widespread occurrence of red raspberry is a diverse and complex gene pool in the fruit kingdom, growing as erect bushes or as trailing vines, but black raspberry grows only in the erect bush form.

The black raspberry, *Rubus occidentalis*, also known as the wild black raspberries or the black cap raspberry was introduced in America in the 1840s by Nicholas Longworth of Ohio and was a great addition to cultivated fruit to be grown everywhere. The purple cap type raspberry was evolved from the native, U.S. Raspberry *Rubus neglectus*, and was native to New York State. Black raspberries are native only to North America, mainly the Eastern portions excluding the Gulf States. The Black raspberry is also called, wild raspberry, and has been used for centuries to treat pregnant women. The tea made from this wild raspberry was published as a relaxing medication by a famous English medical study in 1941, that also treats morning sickness, birth assistance, uterine irritation and threatened miscarriage. Black raspberries, are grown as backyard garden berries more than commercial berries, because they are less cold hardy, less productive, and more subject to disease damage than the red raspberry.

There are many useful products obtained from raspberries: Ice cream, jam, jelly, black raspberry petits fours, raspberry juice, and of course, fresh raspberry fruits.

Raspberries contain extreme quantities of antioxidants that are touted to fight cancer, intervene with heart disease and offer many other health benefits from the high content of Vitamin A, Vitamin B1, B2, Vitamin C, Niacin, and the mineral, calcium, phosphorus, iron and potassium.

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