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Fruit breeders consider how to protect varieties

Plant breeder encourages Washington State's tree fruit industry to begin considering plant protection options for future new varieties.

By Geraldine Warner

As Washington State's fruit industry becomes involved in tree fruit breeding programs, such as the one initiated by Washington State University (WSU), the issue of plant patents will become more troubling, warns an Indiana tree fruit breeder.

It is no surprise that the development of new fruit varieties is extremely competitive, said Dr. Jules Janick, horticulturist for Purdue University. When new cultivars are introduced in the marketplace, the early innovators have a great competitive edge because, until demand is satisfied, the new product commands high prices.

He sees complex patent problems brewing for all tree fruit growers--foreign and domestic. In the race to find the best variety of apple, peach, cherry, or whatever, countries and states must consider how to protect their genetic material.

He encouraged members of the Pacific Northwest Fruit Tester's Association to plan ahead for the day when a new variety is released from Washington State University's Tree Fruit Research and Extension Center in Wenatchee.

Plant breeders must receive some return for their years of efforts, said Janick, or their programs will not sustain themselves. In the past, most systematic breeding programs have been funded by public agencies, and improved cultivars were available to all. The early adopters and the seed and nursery companies were the immediate beneficiaries of new, publicly bred varieties. Individual growers traditionally did no plant breeding and would locate new seedlings from public breeding agencies or private nurseries.

Breeders' rights

The U.S. Plant Patent Act of 1930 enforced the concept that a new cultivar was part of intellectual property rights and that the rights of the originators of certain vegetatively propagated materials should be protected. Uncultivated plants were excluded, and only vegetative propagation was protected.

According to Janick, the concept of breeders' rights for seed-propagated crops was established in the United States by the Plant Variety Protection Act of 1970, which included all crop species. A decision in 1980 by the U.S. Supreme Court, which granted patent protection for a genetically engineered bacteria used in cleaning up oil spills, affirmed that organisms produced by human ingenuity could be protected by regular

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patent. But while the establishment of breeders' rights has had significant impact upon plant breeding programs in the United States, it carries no legal force outside the country.

International protection of new cultivars is based on the treaty of the Paris Convention of 1961, which established an International Union for the Protection of New Varieties of Plants, but not all nations are signatory, he said.

As private nurseries responded to the 1930 act by buying patent rights and vigorously defending them, and seed companies invested in seed research programs after the 1970 law, land-grant universities began to de-emphasize breeding programs, Janick said. Instead, basic research stressed biotechnology, which was supported handsomely by public granting agencies.

Royalties

Public institutions, private breeders, and grower groups have now become intensely interested in controlling breeding rights, especially in areas like California, where the industry is large and concentrated. Free release by public institutions is disappearing.

State agricultural experiment stations and universities have been patenting their work and receiving royalties for many years to help support their research and breeding programs. Typically, public entities control their new varieties by patent or breeder's rights and license them to nurseries or public or private seed companies, with royalties reverting to the institution. According to Janick, the University of California receives about \$2 million annually from the sale of strawberries.

Janick said new patent trends have emerged in California involving licenses to growers or organizations with various degrees of exclusivity in order to limit production and maintain high prices. Recognizing that the financial gain would be greater if the rewards or royalties come from the sale of the product, rather than the sale of the propagule or seed, produce marketing companies like Driscoll Strawberry Associates, of Watsonville, California, began licensing the germplasm. Driscoll owns the germplasm and also controls the distribution or marketing of the crop.

"The rationale is that if a new successful fruit variety had a price benefit of \$5 to \$10 per box, a \$1 per box royalty will make economic sense to the producer," he said. "By considering royalties on the product, returns from a successful cultivar to the breeder could be 10 to 20 times that from open licensing with royalties accruing only from the sale of plants." This system, however, only works if exclusive or semi-exclusive licensing is permitted.

A number of successful marketing systems have been implemented, whereby new, patented varieties, such as seedless watermelons, raspberries, red peppers, stone fruit, and table grapes, are controlled by marketing associations attempting to create a monopoly in the marketplace. In addition to Driscoll, Sun World International and Superior Farming Company--both growing and marketing entities--have also attempted to keep new

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varieties developed by their own breeding companies to themselves, earning profits on the sale of the product rather than the distribution of seed, trees, or vines.

Per box royalty

Janick explained that another California entity, Emerald Leaf, sublicenses foreign varieties to growers, limiting production and collecting royalties on fruit sales. Emerald Leaf is licensing the Australian Marroo Seedless black table grape in California, limiting plantings to 5,000 acres. There is a charge to the grower, based upon each cutting, plus a royalty per box. An additional marketing/research/legal fund fee per box is to be assessed for the first five years.

"If the variety is unique, and you don't want it to be overproduced, Washington may want to consider this type of patenting/licensing arrangement in its own breeding program," he said. He foresees an increase in such arrangements in the future as patenting of new varieties continues to become more creative.

Many questions in the patenting arena need to be addressed, said Janick, and an important one is the balancing of cooperation and competition. In the past, there was cordial cooperation between plant breeders, both nationally and internationally. "If all the parties get greedy, the sharing may stop," he stated, as competition and protectionism increases.

Because breeding is expensive and requires long-term commitments, cooperation among all involved is vital, he added. Somehow, he believes, a procedure achieving balance between cooperation among federal agencies, universities, grower/shippers and nurserymen, and at the same time, promoting competition between breeders, must be identified and established.

British Columbia and New Zealand have begun restricting distribution of varieties in foreign countries in efforts to protect their own domestic competition, said Janick. Canada's federal breeding program at Summerland, British Columbia, is reassessing the distribution policy for its new selections. British Columbia fruit growers established a for-profit company, the Okanagan Plant Improvement Company (PICO), which is dedicated to the commercial development of fruit varieties, with the goal of enhancing grower returns and ensuring the viability of the fruit industry. Many crosses by the apple breeding program are being held very closely, he stated.

In New Zealand, HortResearch has contracts with the New Zealand Apple and Pear Marketing Board, and their aim will be to confine new releases to the New Zealand industry, Janick said.

Ownership of sports

Other patent questions under debate include ownership of sports or mutations.

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"The question of who owns sports needs to be legally resolved," Janick said. "It is his variety, but your mutation. I see this as a real problem with sports."

Although some of the genetic variations that lead to sports may be considered trivial to a geneticist, they can be extremely valuable commercially. There are more than 100 genetic sports of Delicious apple that have been described, said Janick. Many of the red sports of Gala apple have recently swept the market, rendering the standard Gala less valuable.

"A good case can be made that the benefits of sports should be shared by the original introducers," he stated.

Another question is the ownership of improved germplasm. The debate has moved into the political and legal arenas with patents and patent-like rights, but he noted that not all countries respect patent rights. In some cases, germplasm is stored in repositories or gene banks, and he added that countries such as China and Cameroon are not letting their germplasm out.

In the future, countries originating the new variety or breeding technology may implement strategies to enjoy monopolies for a reasonable length of time. He explained that the world expansion of kiwifruit and Gala apples by New Zealand looked for a while like a promising strategy that worked to increase consumer demand. However, as global production increased, prices dropped perilously for New Zealand kiwifruit growers. Royalties on the sale of Gala trees are returned to New Zealand, but as the Northwest apple industry improves storage of Galas, New Zealand imports may be even further reduced.

How long?

Washington may want to protect new varieties coming out of its breeding program for a certain period, said Janick, but how long is a reasonable length of time?

"I suspect it may be possible to regenerate plants from fruit by new tissue culture techniques," he said. "If this is true, it will be easy to steal cultivars very early."

Although it will be years before a new variety comes out of WSU's apple breeding program and is commercially available, Dr. Bruce Barritt, program coordinator, said he is already thinking about the issue of patenting and watching the various trends.

"A lot of things in patent rights are probably going to change in the next five to ten years," said Barritt, "but any new varieties that come out of our program probably will be patented."

The industry will also be watching developments, particularly the Washington Tree Fruit Research Commission, said Barritt, as the commission has put money up front to support WSU's breeding program.

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Return money

"The breeding program needs patents to protect its investment and help return money back to support the program," said Barritt. New techniques will allow the research to turn out new varieties much faster than traditional breeding programs, he said. Financial support from the state is limited and will be decreasing, he added. An amount similar to California's \$2 million in annual strawberry royalties would go a long way in sustaining the apple breeding program.

Washington's apple industry will be watching the efforts to limit plantings of new varieties by countries such as New Zealand, noted Barritt.

What is the future for fruit breeding and new variety patenting? It is in a state of flux, said Janick, who believes that all those involved in plant breeding and new variety testing programs should begin to discuss some of these issues.

Although public breeding is still in force, as evidenced by the University of California's successful state breeding program, support from state and federal budgets is generally in decline. Most state-supported breeding programs cannot survive on royalties alone, he said, and many universities and agricultural experiment stations are becoming fatigued with supporting traditional breeding programs.

Down sides

There are some down sides to the newer marketing systems attempting to limit production and control distribution, he said.

"This kind of monopoly is dependent upon legal protection, and litigation is often ruinously expensive and will require deep pockets," he said. Additionally, the new techniques for varietal identification based on DNA and protecting fingerprinting will be very important.

He said it is unclear how the system of cultivar control will operate between exporting, competing countries. While new germplasm can be restricted, it cannot be contained in the long term.

"Clearly, the best way to control germplasm is by international agreements, but this has been a problem in agriculture, even though the system operates in manufacturing or pharmaceuticals," Janick explained.

Strong research programs may be the most important key for the future. "It may well be that the best way to keep the competitive edge will be for national horticultural groups to invest in strong research programs so the country gains the advantage of being early innovators," said Janick. "However, the research program needs to be attuned to the marketplace, as well as science. It will demand strong cooperation between scientists, growers, and marketers."