IMPROVING MINITUBER PRODUCTION AT THE STATE FARM

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Certified seed potato production typically begins with minitubers produced in greenhouses or screenhouses from disease-free tissue-culture stocks. In Wisconsin, about three quarters of the annual certified seed acreage is planted with seed stocks that originated at the Lelah Starks Elite Foundation Seed Potato Farm in Rhinelander. This facility, known locally as the "State Farm", is operated by the Wisconsin Seed Potato Certification Program in the Department of Plant Pathology at the University of Wisconsin-Madison.

Minituber production at the "State Farm" takes place in up to four unheated screenhouses during the normal potato production months of May through August. These screenhouses are planted with pots into which are placed delicate potato plantlets and microtubers that are generated in the certification program's Madison tissue culture facilities. We typically produce over twenty thousand plantlets and microtubers in Madison each year. Production of tissue culture propagules like plantlets and microtubers is costly because it is technically sophisticated and labor intensive, so efficient utilization of this material in the screenhouses is an important goal of our Program. The operating costs of our Program are paid predominantly with funds generated by seed sales to certified seed growers in our Program, so we are always interested in ways to increase the value of our products by reducing costs and improving quality.

One of the obvious ways to reduce or at least control the rise in costs in any farm operation such as ours is to increase productivity per unit of input. In 1992 I was funded by the Wisconsin Potato Industry Board to do some research on the use of growth regulators in the screenhouses at the State Farm to increase minituber production. During these studies, I noticed that minituber yields per plant responded markedly to wider pot spacing and/or staking. By spreading the pots further apart and tying the plants to vertical stakes it was possible to produce in a single pot as much as 2 to 4 times the weight of minitubers as we typically got at our standard pot spacing. These observations led me to propose a series of experiments to determine optimum pot spacing where the limiting factor was predominantly the amount of screenhouse space we had available. In other words, the goal was to find out combinations of pot spacing and plant support that maximized minituber production per square foot of greenhouse space. A brief synopsis of the results from this series of experiments follows.

In 1994 plantlets of Snowden were grown in 2-gallon pots (standard pot size in WSPCP program) and in larger (approx. 5 gallon) "squat pots" (same depth as the 2-gallon pots) with and without plant support. Horticultural trellis netting was used to support plants as they grew. Within each trellised or non-trellised block, pot size and spacing was varied to provide combinations of plant densities from "low" (2 plants/10 ft²) to "high" (18 plants/10 ft²). Snowden produced more yield and nearly as many planting units of minitubers with 6 to 8 5-gallon pots set out shoulder-to-shoulder as with 18 2-gallon pots growing shoulder-to-shoulder (our standard practice). These results were repeated in 1995 experiments with both Snowden and Atlantic. Trellising increased yields of Snowden at all planting densities when it was grown in large pots, but trellising over small pots lost its effectiveness as planting density increased. Yields of Atlantic were increased by trellising at all planting densities in both large and small pots. These responses of Atlantic to trellising and pot size were repeated in 1996. The first experiment with Goldrush in 1996 indicates that responses of this variety probably will be similar to Snowden and Atlantic.

From these results we were able to conclude the following. Although slightly more greenhouse space may be required to produce minitubers in trellised, large pots compared to our standard configuration, the potential for significant labor and cost savings with the big-pot approach is great. The data strongly support the cost-effective nature of using big pots and some form of plant support because it appears we will be able to plant our screenhouses with many fewer tissue-culture propagules in many fewer pots, while still continuing to produce the minituber crop we need to plant the following year's field acreage.