

High Density *Actinidia x deliciosa* Production in a Climatically Controlled Environment

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Aztec Nurseries is presently engaged in a seven-year research project for the development of the commercial production of *Actinidia x deliciosa* [syn. *A. chinensis*] (kiwifruit) in a climatically controlled environment (CCE) that creates several challenges.

In an attempt to maximize production versus area due to capitalization cost of a controlled climatic environment, changes must be recognized in almost all aspects of production: The physical structure, plant spacing, plant sex, pollination, fertilization, watering, pruning, and training will all have some variation in the Kiwifruit production compared to open field production.

In recognizing that an average field production modified with a structure above would be insufficient in the lb/ft² to be economically viable, we attempted to change the physical structure from a horizontal to a vertical lateral production. In this process high-tensile strength wire was placed 12 in. apart horizontally on a vertical structure to a height of 8 ft. This was done to reduce the square feet of plant production. Row spacing could then be spaced 4 ft apart compared to the 15 ft in the field, allowing plant production in an area of approximately 40 ft² as opposed to 225 ft² in the field.

It is noted (by the B.C. Ministry of Agriculture and Fisheries and Foods) in the commercial field production that the ratio of planting should be five females to one male, (as more than 90% of female flowers are capable of developing and producing marketable fruit). In the CCE there is no cross-pollination due to insect unavailability, therefore there is no need for male plants in the production area. An increase in production is realized since only fruit bearing plants are used. With no cross-pollination available by insects, artificial pollination is the only available solution.

Pollination problems have occurred in open field production when cool, wet weather comes during flowering, limiting insect activity. In the CCE, artificial or hand pollinating by applying pollen with brushes or using the male flowers directly against the female flowers will produce, which can also maximize seed numbers and enhance fruit size. This works well but is very labour intense. An aqueous solution can be used to spray pollen mechanically. This solution is called Carboxymethyl cellulose gum acacia, better known as CBCA, which is mixed with pollen and applied by spray. This is expensive, but commercially viable.

Vegetative growth develops more rapidly in the CCE process. Fertilization is required approximately one month in advance, compared to the field production although both processes require the same macro- and micronutrients:

N	880 - 1130 kg/ha sulphate of ammonia
P	500 - 630 kg/ha super phosphate
K	190 - 250 kg/ha sulphate of potash

Watering must be more frequent in the CCE due to the higher evaporation rate.

Training is a very important step in forming a plant. In the first years a strong main shoot (trunk) must be formed, having the height no more than 7-1/2 ft.

Having reached that height there must be top pruning from then on to avoid apical dominance. They will create cordons, the new shoots on the main shoot, which should be trained along the wire. From these cordons, secondary cordons should be allowed to be produced (the cordons and secondary cordons are where the fruit will set). To maintain a continuous cordon development, frequent pruning and training is required. As cordons will grow as much as 10 in./day, continuous labour is required to maintain proper form inside the CCE.

In conclusion, the production of *Actinidia × deliciosa* in a climatically controlled environment has many advantages and disadvantages. The physical structure advantage gives more even crops, high production per square foot, and a friendlier working environment. The disadvantages of the CCE is the capital costs, having to cool the environment enough to make the *Actinidia × deliciosa* go into a dormant period during the winter months, costly pollination methods, and labour-intensive pruning and training. Overall, as production seems to be viable, capital cost and labour is high considering the market value for kiwifruit at present. It would appear to be a tight financial situation, unless the capital cost had already been absorbed on previous crops.