

Growing Everbearing Strawberries as Annuals in Alaska

A Technique for High Yields

Introduction

A technique for growing high-yielding, everbearing strawberries with clear polyethylene (plastic) mulch and row covers was developed at the Agricultural and Forestry Experiment Station in Fairbanks. This technique eliminates the long delay from planting to fruiting that occurs with other culture systems and creates opportunities for commercial production and an increased home-garden effort in Alaska.

The production system involves planting nursery plants each season as early as possible through clear polyethylene mulch, using row covers for the early part of the season. Using this technique, harvest begins about July 15 and extends until freeze-up, compared to a production season from about July 10 to July 28 for hardy types of strawberries such as Toklat or Pioneer. This system produces clean fruit that are easy to pick and relatively free from fruit rot. The harvest season can be extended in the fall by using the row covers for frost protection.

Table 1 shows yields obtained at Fairbanks, Alaska, from 1977 to 1984. Quinault (Figure 1) was the highest-yielding variety grown. The average yield for Quinault from 1977 to 1989 was 0.84 lb per square foot. This yield compares to 0.16 lb per square foot from established beds of Toklat strawberries. Hecker (Table 1) produced lower average yields (0.59 lb per square foot) than Quinault under this system, but it is preferred by some because it has firmer fruit that improves its keeping quality.

Production System

A commercial grower should order strawberry plants from nurseries in large quantities in order to keep costs down. Home gardeners can obtain small quantities from local sources and some retail catalogs, but at a much higher cost. When possible, a shipping date should be specified so that plants arrive in late April for planting in mid-May. When the strawberry plants are received from the supplier, hold them until planting time in a manner that will promote vigorous growth after transplanting.

Plants usually arrive from the nursery in bundles of 25. Place bundles upright on 1 to 2 inches of local peat in a plastic tub and cover exposed roots with peat. Approximately 500 plants can be packed into a tub 30 inches square. Keep plants in a greenhouse or heated cold frame with daytime temperatures near 70°F until planting time. This treatment allows plants to get an earlier start and they will be larger and easier to transplant. Plants should be watered periodically to keep them moist. Fertilize with a liquid fertilizer solution (2 tablespoons of 9-45-15 per gallon of water) about 10 days and again one day before transplanting. To minimize transplant shock, harden off plants in a cold frame for five days before transplanting. If possible, plants should not be held in tubs longer than three weeks.

Plots should be fertilized, rototilled and harrowed as early as possible in the spring. Standard practice has been to apply 1,500 pounds per acre of 10-20-20 fertilizer. However, growers should have their soil tested and base their fertilizer rate on Extension recommendations. At the test plots at the Agricultural and Forestry Experiment Station, a double row of drip irrigation tubing is laid above



Figure 1. Quinault strawberries produced by the row-cover system. Heavy fruit load on the plants is seen at the top of the picture.

Table 1. Yields of several everbearing varieties of strawberries grown through a clear polyethylene mulch and with polyethylene row covers at Fairbanks, Alaska.

Variety	Yield (lb/ft ²)							Average fruit weight (oz)
	1977	1978	1979	1980	1981	1983	1984	
Quinault	0.92	1.01	1.29	0.71	0.81	0.68	0.49	0.29
Ozark Beauty	—	0.99	—	—	—	—	—	0.31
Ogallala	—	—	1.15	—	—	—	—	0.23
Superfection	—	—	0.71	—	—	—	—	0.35
Streamliner	—	—	0.25	—	—	—	—	0.35
Hecker	—	—	—	0.84	0.71	0.49	0.33	0.36
Brighton	—	—	—	0.28	—	—	—	0.54
Fern	—	—	—	—	—	—	0.28	0.42
Tillicum	—	—	—	—	—	0.47	0.17	0.24

Yields were based on a bed size of 30 inches by 10 feet containing 30 plants. About 8,712 linear feet of these beds could be grown in an acre.

ground on each bed. If an herbicide will be used, it should be applied prior to laying the plastic mulch and row covers. The new innovations in wave-length selective plastic mulches combine soil warming and weed control characteristics and will reduce reliance on herbicides.

The row-cover system consists of a 4-foot-wide sheet of 1.5-mil clear polyethylene for the mulch and two 3-foot-wide, 1.5-mil clear polyethylene sheets for the side covers. A commercial mulch-laying machine was modified to lay the three sheets in one operation, with the 4-foot-wide sheet laid on the bottom, and one 3-foot sheet even with each edge of the 4-foot sheet. About 6 inches of plastic on each edge must be covered with soil to anchor the sheets, leaving the inner edge of each of the 3-foot sheets free. Wire hoops are then inserted inside, and the side sheets are brought up over the hoops to form a tunnel (Figure 2). Twelve-gauge galvanized construction wire, cut to 6-foot lengths makes ideal hoops. This allows for 1 foot of wire on each end to be inserted in the ground. Commercially available mulch-laying machines can now perform all these tasks. When placed in the beds, the wire makes an arch 30 inches wide and 18 inches high. Placing all hoops at the same height along the row produces a more wind-resistant cover than if the height and width vary significantly. Hoops are placed at 5-foot intervals along the row. Row covers can then be fastened with clothespins at any height on the wire. Side covers are rolled all the way down until the plants are placed in the beds. Then the sides are put up with only a 1- to 2-inch opening at the top for the first two to three weeks (Figure 3).

Mulch trials (Table 2) have indicated that yields are superior when clear plastic mulch and row covers are used. However, if you wish to avoid using herbicides and

reduce hand weeding, you could use black plastic mulch with clear plastic row covers. The yield reduction caused by using black plastic mulch depends upon weather conditions during the growing season. The reduction ranged from 9 percent to 32 percent during this study (Table 2). The wave-length selective mulches should also be considered for weed control.

Transplanted strawberries are placed three rows per bed in a diagonal arrangement so that about 30 plants can be placed in a 10-foot length. Each plant occupies about 1 square foot of space. Plant spacings greater than 1 foot per plant have resulted in decreased yields per unit area. A bulb planter is used to make planting holes (Figure 4). If an herbicide has been used, plant roots are dipped in a 10 percent (by weight) slurry of activated charcoal to reduce injury by contact with herbicide-treated soil. Individual plants are placed in each hole and soil filled in around the plant so that the crown of the strawberry is even with the surface of the soil and the roots adequately covered. Proper positioning of the crown is critical to the plant's survival. After transplanting, plants should be watered both from the top with a hose and water-breaker and from under the plastic mulch with the drip-irrigation system shown in Figure 4.

When the plants begin to flower vigorously, it is necessary to lower the row cover (Figure 5) so that bees and other insects can pollinate the flowers. If the sides are left up a few inches, some protection is provided from the wind and a slightly warmer microclimate is obtained. Removing runner plants throughout the growing season is not necessary.



Figure 2. Young strawberry plants growing in row covers. Row covers are partially open to show 12-gauge wire hoops, clothespin attachments and spacing of plants.



Figure 3. Row covers over strawberries showing raised sides with a small opening left to prevent excessive heat buildup. Sides should be left up until flowering, when a larger opening will be necessary for good insect pollination.

During the growing season, moisture should be supplied through the drip-irrigation system; a small additional amount will be supplied by rain. An overhead sprinkler system could be used with the sides of the row covers down if the rows are level. It is important to keep the soil moist in order to obtain larger plant size and the highest yield. During warm weather, it is necessary to irrigate about once per week.

When plants begin to fruit heavily, they should be fertilized through the irrigation system using a soluble fertilizer. The best fertilizer practice has not been determined for this system. However, a complete soluble fertilizer such as 20-20-20, 9-35-15 or 10-20-10 applied during each irrigation after fruiting starts seems to be a reasonable practice. Either 0.25 lb of the 20-20-20, or 0.50 lb of 9-45-15 or 10-20-10 for every 100 square feet of bed will supply an equivalent amount of nitrogen. If water or fertilizer is inadequate, the fruit size and yield will drop dramatically.

From 1984 to 1986, fertilizer trials were carried out comparing the standard fertilizer practice (1,500 lb per acre of 10-20-20 prior to planting plus soluble fertilizer applied through the irrigation system) with the use of slow release fertilizers (Osmocote and ammonium nitrate + N-serve). The use of the slow release fertilizers did not result in any significant increase in yield.

This mulching system is proposed as an annual production scheme that requires replacing plants each year. However, we have had moderate success in overwintering the Quinault variety.

Surviving plants have started producing about three weeks later with the yield less than half that of newly established beds. Mulching with straw or other material has improved winter survival slightly.

During long periods of wet weather there is a tendency for fruits to develop mold or rot. This has been controlled in test plots with the application of approved fungicides at recommended rates. In recent years, considerable fruit damage has been caused by thrips feeding on strawberry flowers. Thrips can be identified by blowing on strawberry flowers and looking for thin insects about 1/8-inch long moving out onto the petals. Thrips can be controlled by using insecticides registered for strawberries. Be sure to read the label and follow harvest intervals.

Strawberry varieties best adapted to this system need to be relatively insensitive to day length in regard to flower initiation and production. Limited variety trials have been conducted in an effort to find a variety with a comparable yield to Quinault and with superior keeping qualities.

Varieties that have proven unsatisfactory at Fairbanks are Aiko, Benton, Black Beauty, Hood, Ft. Laramie, North-



Figure 4. Holes being made in row cover system using a bulb planter. The black tube centered under the plastic is a drip irrigation hose. In these pictures only one hose is used, but with three rows of strawberries it is desirable to have two lines spaced between the three strawberry rows for more even irrigation. Note the sides rolled down to facilitate planting.



Figure 5. Strawberry beds with sides of row covers partially down so that bees and other insects can pollinate flowers.

Table 2. Yields of Quinault strawberries grown through various mulches with clear polyethylene row covers.

Mulch	Yield (lb/ft ²)		
	1987	1988	1989
Clear Polyethylene	0.76a†	1.03a	1.11a
Black Polyethylene	0.52b	0.94a	0.86b
Black/White Polyethylene*	0.49b	0.70b	0.79b
Black Spray On**0.48b	0.73b	0.69b	
White/Black Polyethylene+	0.43b	0.76b	0.54b
Dupont Landscape Fabric	0.41b	0.70b	0.61b
Yield Reduction, Black vs Clear Mulch	31.7%	8.9%	23.0%

† Numbers in columns with different letters are significantly different (Waller-Duncan K-ratio t-test, P<0.05).

* Polyethylene mulch with one black side and one reflective white side applied with the black side up.

** Liquid black latex mulch sprayed directly on the soil surface where it hardens into a thin asphalt like covering.

+ Polyethylene mulch with one black side and one reflective white side applied with the white side up.

west, Pajaro, Rainier, Sequoia, Shasta, Shuksan and Solano.

In 1990, a three-season variety trial was initiated comparing Quinault with several newer day-neutral varieties (Fern, Irvine, Mrak, Muir, Selva, Tribute, Tristar and Yolo). Preliminary results indicate that Mrak and Tristar are nearly as productive as Quinault and have higher disease resistance and better keeping quality.

The success of this system is due to warmer soil temperatures achieved through use of the plastic mulch and a protected warmer environment within the overhead cover, resulting in a lengthening of the growing season. It is apparent that any technique that enhances these factors

improves strawberry production. This technique has also been used successfully by growers in Southcentral Alaska, where the growing season can be lengthened considerably. It would probably be successful in other Alaska regions as well.

Statements regarding pesticide use are not intended to be interpreted as recommendations. When pest problems occur, contact your district Extension agent for assistance with identification and information on IPM techniques that are suitable for the situation.

If pesticides are used, read all label information and follow all use and safety directions.

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