The Effect of Sudangrass Straw and Poly-Foam Mulches when used as Winter Protectants on the Growth and Yield of Redcoat Strawberries[1]

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Strawberries are commonly mulched with grain straw or hay in northern regions as insulation to preserve soil heat and prevent exposure to ambient cold air during cold weather (1, 3, 5). Mulch is applied in early to mid November before air temperatures drop to 15°F but normally after two or three hard frosts (2, 3). This delay is essential to permit full winter acclimation before mulching and thereby prevent winter cold injury which can occur if crown temperatures drop to 15 to 20°F depending on the stage of acclimation at time of exposure (2). Protection is thus provided in early winter in lieu of adequate snow cover which may not occur before damage results, during the winters when snow cover is inadequate, and in the spring when partial snow melt can leave plants unprotected. The date of bloom can also be delayed to avoid frost or enhanced to encourage early maturity by regulating the time of mulch removal (4).

Although mulching is a useful cultural technique (2), several problems need consideration. First, the availability and quality of straw or hay for mulch may vary from year to year (5). Secondly, the presence of weed seeds in the mulch can cause an enormous weed control problem in subsequent growing seasons (6). Finally, the application of mulch requires labor and equipment; and the time interval available for application is often restricted by weather, manpower, and acreage (3). Thus, a synthetic mulch, such as expanded poly-foam (PF), might be a suitable alternative, if the application and removal process could be mechanized and the PF reused so that the cost of material could be amortized over several seasons.

The purpose of this investigation was to evaluate the effectiveness of sudangrass straw and PF mulch on the growth and yield of Redcoat strawberries.

Materials and Methods

At the University of Minnesota Horticulture Research Center, 2-year old Redcoat strawberries were mulched on November 10, 1978 with:

1. Sudangrass straw (4 inches deep)
2. White PF, ¼ inch thickness (2 lb. density/ft.^{3})
3. White PF, ¼ inch (1 lb./ft.^{3})
4. Black PF, ¼ inch (2 lb./ft.^{3})
5. White PF, ⅛ inch (1 lb./ft.^{3})
6. No mulch (normal snow cover)

The mulches were placed over a single row of strawberries in strips 40 × 96 inches and stapled along the edges with 8 inch wire soil staples. A randomized complete block design with four replications was used.

Max.-min. thermometers were placed under the mulch (at the soil surface) in one replicate of each treatment and at the soil surface and 4 foot height in the no mulch treatment. All mulches were removed on April 17, 1979.

Data collected included temperature (maximum and minimum), bloom dates, winter and spring frost injury and fruit yield.

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Results and Discussion

The PF mulches maintained highest temperatures when compared to no mulch; and temperatures in some treatments were equivalent to straw mulch (Table 1). The ¼ inch black PF was the most effective PF treatment, maintaining a 21°F minimum and a maximum temperature which was 21° cooler than the warmest white PF mulch (Table 1). It is evident that the black pigment prevented the temperature increase which occurred in the non-pigmented PF treatments.

The strawberry plants under the white PF treatments bloomed considerably earlier than those in the straw mulched, no mulch or black PF treatments (Table 2). Also, spring frost damage (black flower pistils) was greatest in the early flowering plots. Those plants which were mulched with ¼ inch (1 lb.) white PF mulch had the lowest winter survival, the greatest frost injury to flowers and the lowest fruit yields. We were not able to determine why the ¼ inch white (1 lb.) PF was an apparently poorer mulch than the thinner material of the same density.

Table 1. The effect of several mulches on air temperatures with Redcoat strawberries.[1]

Mulches	Temp (°F) Max	Min
Straw mulch (4 inches)	77	14
⅛ inch white PF (1 lb.)	89	17
¼ inch white PF (1 lb.)	89	9
¼ inch white PF (2 lb.)	95	18
¼ inch black PF (2 lb.)	74	21
No mulch		
At soil level (under snow cover)	74	1
4 feet above soil level	84	−29

[1]November 10, 1978 through April 17, 1979

Discussion

Although the white PF mulches provided protection which was equivalent to the straw mulch, their use resulted in early plant growth in the spring due to higher than normal temperatures under the mulch. Therefore, this mulch must be removed early in the spring to avoid plant injury. Plants growing under the black PF did not initiate excessively early spring growth and escaped early spring frost injury.

Black PF mulch could be used as a substitute for sudangrass straw as a winter protectant for strawberries.

Table 2. Effect of five mulches on the performance of Redcoat strawberries.

Mulches	Strawberry yield (lb/acre)	Plants flowering May 24, 1979 (%)	Frost injured flowers[1] May 24, 1979 (%)	Strawberry plant survival[2] May 24, 1979
Straw mulch	12800	5	0	5.0
⅛ inch white (1 lb.)	12200	60	3	4.7
¼ inch white (1 lb.)	8100	51	13	3.4
¼ inch white (2 lb.)	10350	77	5	4.7
¼ inch black (2 lb.)	11700	6	0	4.7
No mulch	9800	17	0	5.0

[1]Frost injured flowers with black pistils.
[2]Plant Survival: 1 = 100% plants dead
2 = 25%
3 = 10%
4 = 5%
5 = all alive

The feasibility of application depends upon: (1) availability, (2) effectiveness,, and (3) alternative costs. Currently, the use of straw is less expensive.

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Sweet Ann and Utah Giant Sweet Cherries Introduced

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Two new sweet cherry varieties, Sweet Ann and Utah Giant, were named and released by Utah State Agricultural Experiment Station in 1981. These varieties were developed by Dr. B. N. Wadley a former member of the Department of Plant Pathology at Utah State University and retired U.S.D.A. scientist.

Sweet Ann is a medium-sized, yellow, sweet cherry with a pleasing blush covering one-half of each fruit. The fruit is firm and has an excellent flavor and a small pit. It is slightly sweeter and more firm than Royal Ann and its blush is a brighter red. Bud inoculations of trees grown on Mahaleb rootstock proved that Sweet Ann is highly resistant to western-X disease. Sweet Ann trees have not become infected with western-X disease either in inoculation studies or under natural orchard conditions.

Bloom and maturity occur in Sweet Ann at about the same time as in Bing. Trees regularly set a heavy crop of fruit with many fruits to a cluster. It is a good pollinizer for Bing and Lambert but is self-sterile. Sweet Ann appears to be somewhat resistant to spring frosts since it has set fruit when Bing and Lambert have been damaged. It is also winter hardy. Temperatures dropped to —29°C (—20°F) in the winter of 1978-79 during December and again in January. There was no damage observed on Sweet Ann trees and they set a heavy crop. Tree shape is similar to that of Bing.

High summer temperatures frequently cause up to 40 percent doubling in Bing cherries grown in northern Utah orchards and 80 percent in southern Utah. In contrast, doubles have not been observed in Sweet Ann nor has fruit splitting been a problem in this new variety despite heavy rains in some years during the fruit ripening period.

Where western-X occurs, Sweet Ann would make a good replacement for the highly susceptible Royal Ann variety. The new cherry's medium size, light color, firmness, and per-

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