virus spread has been detected in either the greenhouse or the screenhouse plantings during the last two years.

At the end of the growing period the plants are removed from the boxes and placed in cold storage. The following spring some of the plants are planted in the screenhouse and others are set out in field plots so the fruiting performance and vigor of each clone can be evaluated. This testing is being done at Salinas, Watsonville, and Santa Ana by R. S. Bringhurst (Pomology Department, University of California, Davis) and V. Voth (South Coast Field Station, Santa Ana). The remaining plants are available for planting in a foundation nursery—a plot of fumigated land well isolated from all other strawberry plants (photo). Data now available indicate that meristemed plants are superior in vegetative vigor to the noncertified commercial stock known to be carrying viruses. Yield comparisons are not yet available.

### Certification

The foundation nursery is indexed by the California Department of Agriculture Nursery Service. If the foundation nursery meets the requirements of the Regulations for California Certified Strawberry Plants, the plants from the nursery are accepted into the Certification Program for increase and distribution to growers. To date, one meristemed variety, Fresno, has been certified by the California Department of Agriculture to be free of viruses. (A minimum of two years is required from the time a meristem variety is certified until it can be available to growers.)

Commercial strawberry plants are the main source of virus inoculum for infecting clean stock. When varieties are interplanted, viruses spread from infected plants to noninfected plants. With the increasing trend toward the annual planting systems and the introduction of clean stock of all varieties, losses due to virus can be minimized.

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F. K. ALJIBURY · DONALD MAY

# IRRIGATION *and production on the San*

In processed tomatoes production of ripe fruit was significantly affected by irrigation schedules. Within the range of the test treatments, the longer the period between irrigations, the higher the percentage of ripe fruit and of solids. However, there was a highly significant reduction in yield and an increase in the amount of sunburn as the irrigation interval increased from 10 to 15 and 20 days. The 10-day irrigation cycle appeared to be the most suitable practice, yielding the highest tomato tonnage per acre, and consistent with the evapotranspiration and the gypsum block records. Longer irrigation frequencies depressed yield, stressed the tomato plants, and increased the percentage of sunburned fruits. Pre-irrigation is a very important practice in the production of tomatoes on the west side of the San Joaquin Valley.

IRRIGATION IS CONSIDERED to be one of the most important practices affecting tomato production on the west side of the San Joaquin Valley. Previous studies have shown that highest yields were obtained when varieties of processing tomatoes were irrigated when the soil dryness at the 18-inch depth did not exceed 1 bar suction. When such irrigation programs were used higher tonnages of solids per acre were obtained. Since most tomato growers in the San Joaquin Valley irrigate by schedule rather than by instruments, this study was based on schedule and evaluated by the use of soil moisture instruments. The objectives of this study were to evaluate the different irrigation schedules and to determine the effect of these schedules on tomato production.

### Test procedures

Process tomato variety VF-145-21-4 was seeded March 10 in double row beds. The beds were 60 inches apart and 1,200 ft long. The soil was Oxalis silty clay, and was relatively uniform to about 4 ft.

Six irrigation treatments were replicated four times in a randomized block design. The treatments consisted of three irrigating frequencies, at every 10, 15, and 20 days; and two durations of application, 12 and 24 hours to each frequency. The treatments are referred to as short and long -wet, -medium and -dry, respectively.

The water was pumped from the San Luis Canal and siphoned from a head ditch to the field furrows. From October, 1968 to April, 1969 over 14 inches of rain fell in the area and in April the soil profile was wet down to 5 ft. Gypsum blocks were installed at 18-, 30- and 60-inch depths to indicate moisture extraction and depth of water penetration. Thinning was done during the last week of May. Before thinning, the field was sprinkled with 2.4 inches of water and after thinning all the treatments were irrigated with 2.44 inches of furrow irrigated water.

The plots were harvested July 31, 1969 with mechanical harvesters and the crop was graded and weighed the same day.

### Yields

The wet treatments, irrigated either for long or short durations, produced the highest yield (table 1). Although the long duration treatment produced a higher yield than the short duration, the yield difference was not significant.

# SCHEDULES *of* PROCESSED TOMATOES

## *Joaquin Westside*

TABLE 1. EFFECT OF TREATMENTS ON TOMATO YIELD

| Treatments | Yield | |
|---|---|---|
| | tons/acre | |
| Long wet | 33.0** | a |
| Short wet | 31.9** | a |
| Long medium | 27.2 | b |
| Short medium | 26.5 | b |
| Long dry | 29.4 | ab |
| Short dry | 27.4 | b |

It can be assumed that the yield of the wet plots would have been greater had the field been harvested later (table 2, Percent Green Fruit). The grower's practice was similar to that in the dry treatment; therefore, the entire field was harvested on July 31.

TABLE 2. PERCENT GREEN FRUIT AT HARVEST

| Treatments | Green fruit | |
|---|---|---|
| | % | |
| Long wet | 21.90* | c |
| Short wet | 20.15* | c |
| Long medium | 17.22* | bc |
| Short medium | 17.32* | bc |
| Long dry | 13.87 | ab |
| Short dry | 10.72 | a |

The high yield of wet-treatment plots can be attributed to a better fruit set and more vigorous plants. The gypsum block readings at 18-inch depths indicated that the plants in the medium and the dry treatments were stressed. The soil moisture stress occurred in the medium and dry treatments, under both durations although there was a consistent trend of increased yield with the long duration (table 1) The factor limiting water penetration was the low infiltration rate of the soils. The infiltration rate of these soils was less than 0.2 inch per hour. The data showed root activities and moisture extraction down to 5 ft which was the zone of rain moisture penetration. It is apparent that the amount of rain moisture retained in the soil was very important in fulfilling plant moisture needs during the growing season. Deep cracks which appeared in the bottom of the furrows may have aided water penetration during the irrigation season.

TABLE 3. PERCENT SOLIDS

| Treatments | Solids | |
|---|---|---|
| | % | |
| Long wet | 5.50 | c |
| Short wet | 5.85 | bc |
| Long medium | 5.90 | bc |
| Short medium | 6.50* | a |
| Long dry | 6.25* | a |
| Short dry | 6.45* | a |

A similar study conducted on the same ranch and with the same soil type in 1967 showed that the irrigation after thinning never penetrated the profile below 30 inches because of the low rate of water penetration. A similar trend in crop yield and percent solids to that obtained in this study was also reported.

TABLE 4. PERCENT OF SUNBURNED FRUIT

| Treatments | Sunburn | |
|---|---|---|
| | % | |
| Long wet | 1.07* | a |
| Short wet | 1.07* | a |
| Long medium | 1.55 | b |
| Short medium | 1.45 | b |
| Long dry | 1.42 | b |
| Short dry | 1.47 | b |

### Preliminary study

A preliminary study conducted in the same year by W. O. Pruitt and R. J. Miller, Department of Water Science and Engineering, U.C., Davis, and Five Points, California, clearly showed the need for intervals of irrigation closer than 15- or 20-day cycles generally practiced by growers. A similar study conducted at Arvin in the San Joaquin Valley, showed a need for more irrigation than what was provided in the dry treatments of this study (table 5). In the months of May, June, and July, about 22 inches of water was needed to satisfy plant water demands while in the dry treatments, less than 11 inches of irrigation water was added.

TABLE 5. WATER USE AND IRRIGATION REQUIREMENTS OF THE TREATMENTS

| Treatments | Number of Post Thinning Irrigations | Total Inches of Water Used | Tomato production |
|---|---|---|---|
| | | | tons/acre |
| Wet short | 5 | 17.04 | 31.0 |
| Wet long | 5 | 20.01 | 33.9 |
| Medium short | 3 | 12.16 | 26.5 |
| Medium long | 3 | 13.94 | 27.2 |
| Dry short | 2 | 9.72 | 27.4 |
| Dry long | 2 | 10.91 | 29.4 |

* Significant at 5 per cent level.
** Significant at 1 per cent level.
Means followed by common letters are not significantly different.

### Tomato solids

The production of tomato solids in the dry treatment plots was higher than for the wet treatments (table 3). However, because of higher tomato yields production in the wet treatment plots, the total solids per acre was still higher in the wet treatment plots.

The percentage of sunburned fruit was significantly higher in the medium and dry treatments than in the wet plots (table 4). This was another factor contributing to the higher yield in the wet treatment plots.

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