Effects of Alar and Top Removal on Yield of Fresno Strawberries At Three Digging Dates

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THE PRODUCTION OF early strawberries is an important part of the strawberry industry in Los Angeles and Orange counties. Winter-planted (about November 1) strawberry plants produce earlier fruit but give lower total yield for the season than do summer-planted strawberry plants. In the 1964–65 season, many growers winter-planted the Fresno instead of the Lassen variety for its improved fruit quality.

During the 1964–65 season, the Fresno variety grew very irregularly and many plants died in several of the fields. In the 1965–66 season, not so many plants were killed but irregular growth was observed in many fields.

Previous tests had shown that the later the Fresno plants were dug, the better the subsequent yield. The Fresno has a higher chilling requirement than does the Lassen variety. However, if the plants are left in the ground too long at the high-elevation nurseries in Shasta County, rain or freezing weather makes plant harvesting difficult or impossible.

The purpose of this project was to test the use of a plant growth-retarding regulator on Fresno plants dug at different times in October to see if these plants could be dug earlier and transplant shock reduced. The tops were left on some plants to see if this would help.

A 10- by 10-ft-square block of Fresno strawberry plants was sprayed with 5,000 ppm of an experimental growth-retarding compound, N-dimethyl amino succinamic acid (Alar or B-9), at MacArthur, Shasta County, October 1, 1965. An adjoining 10-by-10-ft-square block of Fresno plants served as a check. One-third each of the sprayed block and of the check was dug on each of the following dates: October 15, 23, and 29. At each digging, half of the plants had the tops cut off immediately after the digging. The other half of the plants had the tops left on. (It is commercial practice to remove the tops before the plants are dug.) Planting was done three days later at the University of California South Coast Field Station, Santa Ana. The plants from each digging date were set in double-row, 40-inch beds with 9-inch plant spacing. This is equal to 34,800 plants per acre. There were four randomized replications down the bed. Sixteen plants were used for each treatment in each replication. The four treatments for each digging date were: Check-cut (tops removed); Check-top (tops left on); Alar-cut (tops removed); and Alar-top (tops left on). Monthly yield totals were recorded for February through June of 1966.

Top removal

The strawberry plants with the tops cut off produced more fruit than those with the tops left on (graph 1). The difference was highly significant at the 1% level and was the most significant difference noted of all of the treatments.

Alar

When the two check treatments are compared with the two Alar treatments, the experiment failed to show a significant difference between treatments.

Digging dates

There was a significant difference at the 5% level between the last digging date mean yield for all treatments and the first and second digging date mean yields for all treatments (table 1). Yields for the last digging date, October 29, 1965, were the highest.

The experiment failed to show a significant difference between the first and second digging date mean yields. Alar treatments accounted for all of the significant differences (see table 1). The weather during October 1965 at MacArthur may account for the difference between the check and Alar treatments when comparing digging dates.

There were two warm weather periods in October 1965 at MacArthur and very little rain. During the second digging, the plants in the test plots looked the same and did not appear to be wilted. The soil appeared to have very little available moisture in it. Nearby, where the tops had been cut off the plants, the digging operation had to be halted, because the ground was too dry, making it impossible to dig the plants. This portion of the field was irrigated so that digging could continue. No water was applied to the test plots. During the third digging, the soil appeared dry, and the Alar-treated plants appeared larger and more developed than the check plants. Because of the dry soil, there was extensive breaking of roots during the third digging so the plants had fewer roots than those of the first and second diggings. The Alar-treated plants seemed to be more drought-resistant, which could account for the differences observed in table 1.

The digging-date results were not consistent with previous years except for similar data from Fresno strawberry plants in 1964 (graph 2). The second digging-date yields are lower than they

TABLE 1. YIELD COMPARISONS FOR STRAWBERRY DIGGING DATES

Treatments	Mean Yields for Treatments and Digging Dates* (Yields in grams per plant)		
	Dug 10/15/65	Dug 10/23/65	Dug 10/29/65
Check—cut	316.1_a	272.7_a	318.9_a
Alar—cut	288.2_{ab}	262.4_b	330.1_a
Alar—top	241.7_b	263.7_{ab}	306.7_a
Check—top	212.5_a	242.3_a	261.2_a
Digging-date means	264.6†	260.3	304.2_a

* Mean yield values (four replications) for three digging dates of each treatment are significantly different at the 5% level when subscript letters a, b, c are different.

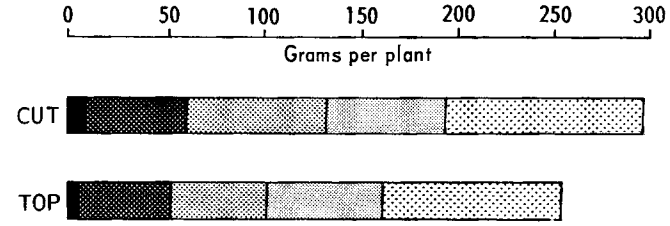
† Each digging date value is a mean of the four treatment means for that date.

TABLE 2. YIELD COMPARISONS FOR STRAWBERRY TREATMENTS

Treatments	Mean Yields for Treatments and Digging Dates* (Yields in grams per plant)			Treatment means
	Dug 10/15/65	Dug 10/23/65	Dug 10/29/65	
check—cut	316.1_a x	272.7_a	318.9_a xy	302.6_a x†
Alar—cut	288.2_a xy	262.4_a	330.1_a x	293.6_{ab} x
Alar—top	241.7_b yz	263.7_a	306.7_a xy	270.7_b xy
Check—top	212.5_b z	242.3_a	261.2_b y	238.7_c yz

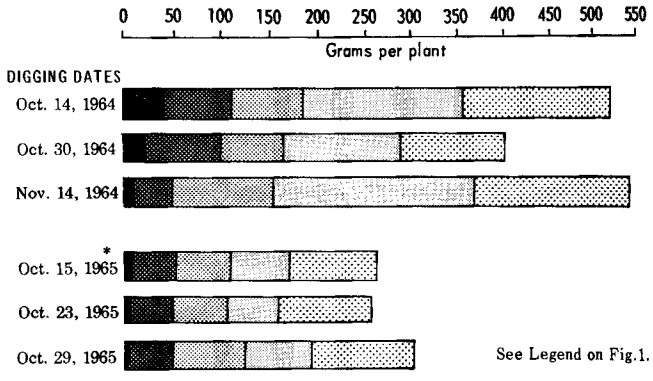
* Mean yield values (four replications) for the four treatments at each digging date are significantly different at 5% level when subscript letters a, b, c are different, and at the 1% level when subscript letters x, y, z are different.

† Each treatment value is a mean of the three digging date treatment means.



LEGEND for Figs. 1, 2 and 4:

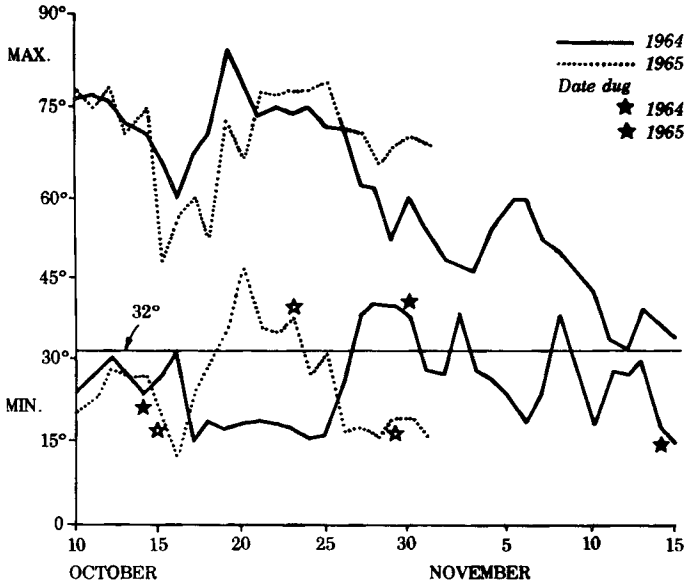
GRAPH 1. CHECK-CUT AND ALAR-CUT VS CHECK-TOP AND ALAR-TOP YIELDS.



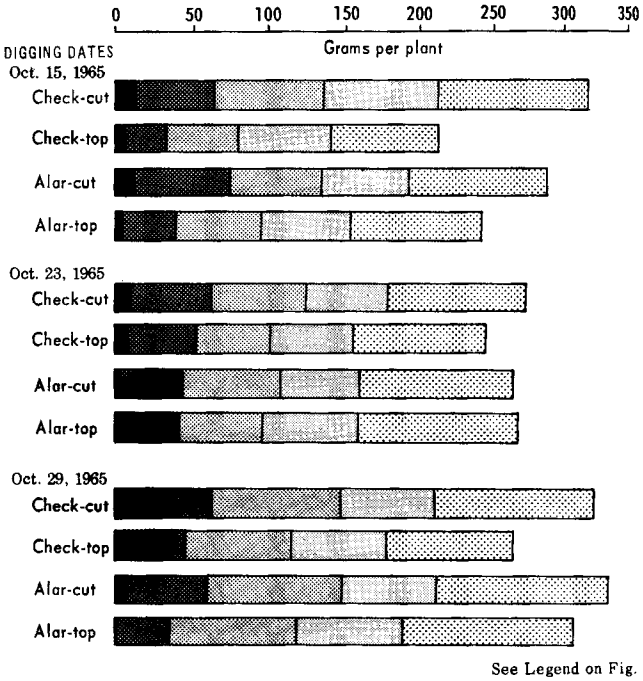
See Legend on Fig.1.

*Yield for plants dug on each date in 1965 is the mean yield for all treatments for that digging date.

GRAPH 2. 1964 AND 1965 YIELDS FOR PLANTS DUG ON THE DATES SHOWN.



GRAPH 3. 1964 AND 1965 MAXIMUM AND MINIMUM TEMPERATURES IN DEGREES FAHRENHEIT.



See Legend on Fig. 1.

GRAPH 4. TREATMENT YIELDS FOR EACH DIGGING DATE.

should be for both years. The maximum and minimum temperatures from a standard weather station close to the strawberry fields at MacArthur are shown in graph 3. There is a good correlation between the minimum temperatures for the five nights prior to the digging date and the yields secured from that date. Even though they occurred at different times of the year, the minimum temperature for five or more nights before the first and third digging dates for both years was *below* 32°F, and the plants dug on these dates gave the highest yields. The minimum temperature for five nights before the second digging date for 1965 and for four nights before the second digging dates for 1964 was *above* 32°F, and the plants dug at these dates gave the lowest yields. There seems to be no correlation between maximum temperatures and the digging-date yields.

Treatments—total yields

There were some significant differences at the 5% and 1% levels in the treatment means for all digging dates (table 2). The check-cut, Alar-cut, and Alar-top means for all digging dates had significantly higher yields at the 5% level than the check-top mean. The check-cut and Alar-cut means for all digging dates had significantly higher yields at the 1% level than the check-top mean. The experiment failed to show a significant difference between the check-cut and Alar-cut mean yields. The check-cut mean yield was significantly higher than the Alar-top mean yield at the 5% level, but not at the 1% level. The experiment failed to show a significant difference between the Alar-cut and Alar-top mean yields.

The highly significant difference between cut and top treatments seems to be mostly accounted for by the check-top treatment.

Treatments—digging date

The results for each treatment for each digging date are shown in table 2 and graph 4. There were some significant differences between treatments at the October 15 and 29 digging dates. The experiment failed to show any significant differences between treatments for the October 23 digging date.

The experiment failed to show any significant difference in yield between the check-cut and the Alar-cut treatments for all three digging dates. Fruit earliness was about the same for these two treatments for the October 15 and 29 digging dates. On the October 23 date, fruit from the Alar-cut treatment was later.

The check-cut and Alar-cut treatments

had significantly higher yields at the 5% level than the Alar-top treatment for the October 15 digging date but failed to show any significant difference for the October 23 and 29 digging dates.

The check-cut and Alar-cut treatments had significantly higher yields at the 1% level than the check-top treatment for the October 15 digging date, and at the 5% level for October 29, but failed to show a significant difference for October 23.

The Alar-top treatment gave significantly higher yields at the 5% level than the check-top for the October 29 digging date, but failed to show any significant difference for the October 15 and 23 digging dates. As far as fruit earliness was concerned, the check-top had the latest fruit for the October 15 digging date, and the Alar-top had the latest fruit for October 23 and 29.

The Alar-top treatment showed the greatest improvement in yields from the October 15 and October 29 digging dates, but still had the latest fruit on October 29. Although it would appear that Alar reduced transplant shock when the tops were left on, this would not be a recommended practice for transplanting strawberry plants from northern California to other parts of the state.

The Alar-cut treatment showed the greatest improvement in yield from the October 23 to 29 digging dates, and had the highest yield and earliest fruit from the October 29 digging. The October 15 and possibly the October 23 digging dates apparently were too soon after the October 1 Alar spray, and resulted in reduced yields. The Alar-cut treatment shows some promise of being helpful on strawberry varieties like the Fresno. More information is needed on dosage and timing and on other strawberry varieties with high chilling requirements.

Alar also appeared to make the Fresno strawberry plants more drought-resistant. The check-top treatment had the poorest yields and definitely would not be a recommended practice.

In general, the later the Fresno strawberry plants are dug in the fall for immediate planting, the better. If there are night temperatures above 32°F, digging of Fresno plants should be stopped until after a series of five nights below 32°F.

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Effects of covering materials and incorporated herbicides on lettuce stands under three irrigation treatments

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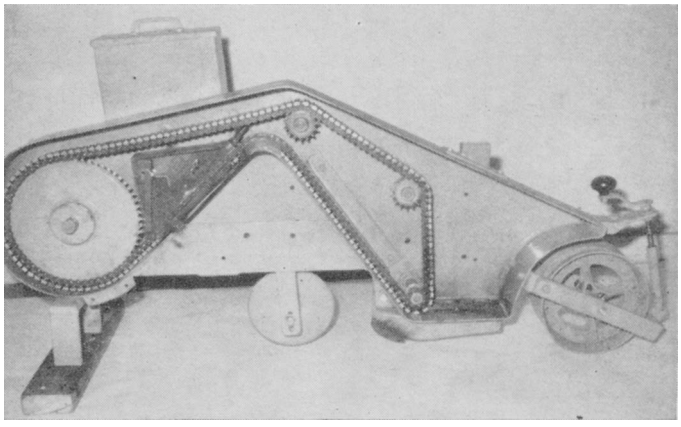
CURRENT CULTURAL PRACTICES in California lettuce require a thinned stand with single plants spaced 12 to 14 inches apart on a 40-inch double-row bed. The ideal situation would be to plant the precise number of seeds to obtain such a stand, but the many hazards to germination, emergence, and plant survival make it impossible to plant consistently to a stand. At present, it appears more practical to precision-plant fewer seeds than are now planted commercially—and then thin to the desired stand with a selective thinner. This is a progress report of work to develop such a planting system. Factors studied were irrigation techniques, chemical weed-control treatments, and the use of covering materials for soil-crust prevention. (Two planters were used, but no effort was made to compare the two machines.)

The Sanderson experimental precision planter and a modified International Harvester (I.H.C. 188) planter were used to plant full-coated lettuce seeds of the G. L. Bellaverde variety under three covering materials (conditioners) that had demonstrated crust alleviation possibilities in previous tests. The beds into which the plantings were made had been rototilled to incorporate three herbicides (for each irrigation test) at recommended commercial rates. Three separate experiments were conducted, based on differing irrigation techniques.

Irrigation patterns

The first technique consisted of furrow application of water until the beds were completely wetted across the top, after which no further irrigation was applied (table 1). The second was a sprinkler



Sanderson precision planter, right, used in the Salinas Valley lettuce tests, has a visible seed supply container (seen to right of large drive wheel on left), a self-cleaning seed belt, turn crank for depth control (knob to right), and a rolling coulter (bottom, center) to aid in opening furrow.