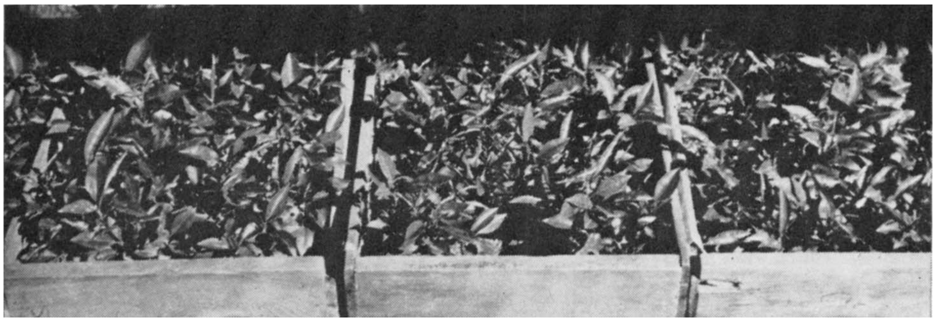


Three of the seven boxes involved in the sweet orange-gibberellin soak trial. Seed in treatment A, on the right, received no soaking prior to planting; B (center) was soaked only in water; and C (left) was soaked in 1 ppm GA_3 for 24 hours prior to planting in May 1966.

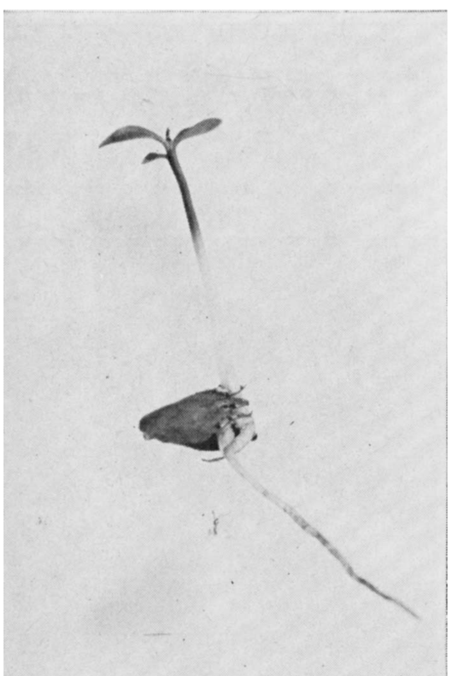
R. M. BURNS · C. W. COGGINS, JR.

Sweet orange germination and growth aided by water and gibberellin seed soak

PER CENT GERMINATION OF SWEET ORANGE SEEDS AFTER PREPLANT SOAKING OF GIBBERELLIN.

Treatment*	Per cent germination			
	6–30	7–20	7–28	8–12
A No Soaking	2	53	60	64
B 0 ppm GA_3 (water-soak)	11	56	66	72
C 1 ppm GA_3	7	56	64	71
D 10 ppm GA_3	14	53	52†	73
E 100 ppm GA_3	8	52	59	71
F 1,000 ppm GA_3	22	76	79	83
G 10,000 ppm GA_3	7	62	70	75

* Each treatment of 200 seeds was soaked for 24 hours (except A) May 25, 1966. The best 170 of each lot was planted May 26, 1966.
† Some variation due to close planting and damping-off.



Sweet orange seedling above was soaked in gibberellin prior to planting and shows good growth in a period of 60 days.

The soaking of sweet orange seeds in water or various concentrations of gibberellic acid for 24 hours prior to planting increased their rate of germination under cool conditions. Larger and more uniform seedlings also followed some of the gibberellic acid seed soak treatments in these tests.

SWEET ORANGE, *Citrus sinensis* (L) Osbeck, has been one of the most popular rootstocks for citrus in California for many years. However, many citrus nurserymen find that this variety is generally slower to germinate than some of the other common rootstocks such as Troyer citrange, *Citrus macrophylla*, and Rough lemon.

The growth regulator, gibberellic acid (GA_3), hastens the germination and seedling growth of a number of plants such as beans, peas, sweet corn, cotton, and Duke avocado.

The stimulating effects of gibberellin seed treatments on seedling emergence have been most apparent in early spring when temperatures would have otherwise been too low for normal performance. Lower than optimum temperatures for germination prevailed in this study.

In this preliminary small-scale trial sweet orange seeds were soaked for 24 hours in 0, 1, 10, 100, 1,000, and 10,000 ppm gibberellic acid. A no-soak treatment was also included.

Selected seeds (170 from each lot of 200 seeds) were planted May 26, 1966 in apple boxes (see photo) filled with a mixture of soil, sand, and mushroom compost. After seeds were placed on the surface of the mixture, they were covered with ⅝ inch of plaster sand and placed in a lathhouse near Oxnard, California where germination and seedling growth occurred.

It was apparent as early as June 30, approximately one month after planting, that the soaking in water hastened germination (see table). The data in the table also suggest that germination was even more rapid when the seeds were soaked in 1,000 ppm GA_3.

While seedling emergence information and growth observations were collected until April 6, 1967, no increase in number of seedlings occurred beyond August 12, 1966. In general, data shown in the table indicate that the rate and percentage of germination were improved by water soak treatments. These data also suggest that 1,000 ppm GA_3 slightly increased the rate and percentage of germination.

Throughout the trial it was observed that the taller seedlings grew from seeds treated with GA_3. Some of these had elongated leaves. After April 6, 1967 the seedlings were placed into the nursery.

The improved rate of germination from the water soak is probably from removal of the naturally occurring germination inhibitors from the seed coat. The improvement from use of 1,000 ppm GA_3, over water alone, was considered an expression of direct action of GA_3 on seed germination, as has been reported for other crops.

Response

Whether the GA_3 response is reliable enough to justify its use in nursery operations cannot be determined from this study, but the results indicate that a water soak, with or without GA_3, should be considered by those interested in the culture of sweet orange seedlings.

Faster rates of germination and slight improvements in the percentage of germination of sweet orange seeds were obtained by soaking seeds for 24 hours in water. A concentration of 1,000 ppm GA_3 added to the soak water appeared to further improve rate and percentage of germination. Eleven months after seeding, slightly larger and more uniform seedlings followed the latter treatment. Further trials must be conducted to determine whether any of these treatments should be used by citrus nurserymen.

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Lettuce emergence as affected by depth of seeding

M. ZAHARA

Seeding lettuce deeper than ½ inch below the soil surface delays plant emergence.

Each year approximately 120,000 acres of lettuce are planted and harvested in California. To insure a reasonable stand of lettuce plants, the normal practice is to use from 0.5 to 1.5 lbs of lettuce seed per acre and then thin to 12 to 14 inches between plants in the row. The depth of seeding varies from 0 to ¾ inch, with about 10 per cent of the seed exposed or uncovered. Two methods of irrigation, furrow and sprinkler, are used to provide the necessary moisture for seed germination and plant emergence. Once the plants have emerged, the usual practice is to furrow-irrigate the crop to maturity.

The depth of seeding has an effect on the rate of emergence and the number of plants that ultimately emerge to produce the stand. In these tests, Great Lakes 118 lettuce seed with 95 per cent germination test was planted in Yolo sandy loam soil in 6-inch pots at ¼-, ½-, ¾-, and 1-inch depths. Twenty seeds per pot, with five pots for each depth or treatment and 4 replications (a total of 20 pots) were seeded for each treatment. Sufficient water was added to supply the necessary moisture in the soil for seed germination and plant growth. The pots were placed on a bench in the greenhouse with 65°F night and 75°F day temperatures. After the first plant emerged, counts were taken every six hours throughout the 10-day emergence period.

The graph indicates emergence with time during the 10-day period. Three days elapsed before any plants emerged. Emergence was high for the ¼- and ½-inch depths, with a delayed or slower rate for the two deeper depths. Five days after seeding the rate of emergence for the ¼-inch depth was significantly higher than for the other three depths. Seven days after seeding the rate of plant emergence for the ¼- and ½-inch depths increased significantly over the two deeper depths. This continued throughout the remaining time of the experiment. At the ¼- and ½-inch depths, 92 per cent of the seed germinated and the plants emerged. At the ¾- and 1-inch depths, 83 per cent of the plants emerged. The mean for emergence was 7 days, with a standard deviation of ± 1.7. Under field conditions the rate of emergence would not be as high as the greenhouse results presented in this article. Seeding lettuce deeper than ½ inch below the soil surface delays plant emergence.

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RATE OF EMERGENCE OF LETTUCE PLANTS.