without a reduction in herd size, would increase total income over variable costs (cash flow). Changing to 3X milking (column 2) increases cash flow with an increase in both income and variable costs. Changing to 3X and reducing herd size at the same time (column 3) does not change total milk output and therefore has little impact on income, but it does reduce costs and thus increases cash flow more than does a change to 3X on its own. These two options illustrate the likely implications of culling and/or 3X milking without any effects of the current diversion program. With the diversion program in place, a reduction in herd size on its own (column 4) leads to a fairly substantial increase in cash flow. If the herd is changed to 3X and 27 percent (15 plus 12 percent) of the animals are culled (column 5), total milk production drops by 12 percent, income drops by less than 2 percent because of the diversion payment and the sale of surplus animals, and costs are reduced by approximately 20 percent. This strategy leads to the greatest increase in cash flow of nearly 80 percent over the existing situation.

Nonvariable costs (such as cost of capital) are not included in these estimates. These costs vary considerably from dairy to dairy; before any switch to 3X milking is considered, they would have to be calculated and entered into the evaluation.

Conclusion

With the changes occurring in the milk marketing systems, dairy operators more than ever have to be concerned about watching their cash flow situation. The examples given here show that there is the potential to increase cash flow by increasing intensity of management, either by more stringent culling or by changing to 3X milking, or both. Even if a move to 3X milking is not feasible for individual dairy operators within the constraints of the diversion program, 3X milking may be worth considering when the diversion program is terminated in 1985.

While 3X milking appears to be a viable management strategy, switching to it should not be done without recognizing that it will probably place greater stress on a herd and may magnify existing health or management problems. These are perhaps the major reasons why 3X milking has not been adopted more widely to date. The potential additional stress to a herd has not been adequately evaluated, but it is likely that health maintenance expenses would increase. In addition, lower weight gains of cows on 3X mean that feeding during the dry period will require careful attention to ensure good body condition at calving.

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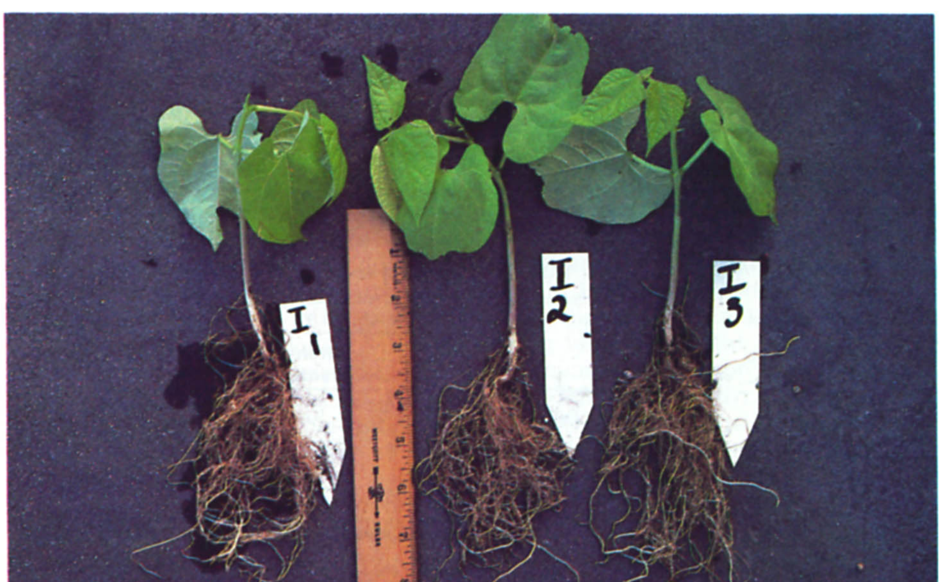
Effect of vitamin B_1 on vegetable transplants

It didn't help in these tests

Demetrios G. Kontaxis □ David Cox

Thiamine hydrochloride, vitamin B_1, is widely advertised and sold as a material that will stimulate root development, ensure success in planting and transplanting, and reduce transplant shock of vegetables, ornamentals, and trees.

Studies conducted by other researchers on the use of thiamine in ornamentals and other crops have been reported over the past several years. W. J. Robbins reported in 1922 that thiamine hydrochloride was "beneficial for the growth of isolated corn roots," and P. R. White (1934) and James Bonner (1937) concluded that the material benefited *in vitro* growth of tomato and pea roots, respectively.



Kentucky Wonder pole bean treated with vitamin B_1 (#1) showed no improvement over untreated control (#2) or #3, treated with B_1 plus minerals.

Physocarpus (ninebark) cuttings treated with thiamine, however, did not root significantly better than nontreated cuttings, according to a report in 1945 by N. H. Grace, and he concluded that thiamine had "no overall effect on any of the rooting responses." Other researchers have found that vitamin B_1 did not significantly increase growth of Valencia citrus planted, bare or balled roots, in good soil (Parker and co-workers, reporting in the Proceedings of the American Society of Horticultural Science in 1941). Roses treated with vitamin B_1 failed to produce larger flowers or longer stems, and chrysanthemums did not benefit from its use (Laurie & Kiplinger, 1941, reporting in the same journal). Snapdragons treated with a vitamin B_1 "root stimulator" containing, in addition to vitamin B_1, alpha naphthalene acetic acid and a 3-10-3 fertilizer, grew larger than nontreated plants but not larger than plants treated with fertilizer alone in a 1982 study by UC Farm Advisor Gary Hickman and co-workers.

We found no published reports on the effect of thiamine on vegetables outside the laboratory, however, and decided to study the interaction of vegetables and vitamin B_1 in a lathhouse and a greenhouse at Diablo Valley College, Pleasant Hill, California, during 1983 and 1984.

The 1983 tests

A commercial preparation containing 0.20 percent thiamine hydrochloride (B_1) was used in our tests.

In the first test, tomato, green pepper, squash, and watermelon seedlings were grown in 3-inch-square plastic pots for 19 days and then uprooted. About one-fourth of each plant's root system was removed and the plants were replanted in their original pots on April 18, 1983. The soil mix prepared by the greenhouse personnel contained one-third sludge, one-third fir shavings, and one-third perlite. After replanting, the soil in half of the test pots was soaked with a solution containing one teaspoonful of 0.20 percent thiamine hydrochloride (B_1) in one gallon of water. The other half of the test pots were not treated and served as controls. The soil in the treated pots again received the same B_1 solution 11 days later. There were two plants (pots) per treatment per replication. Treatments were randomized and replicated four times.

All plants were visually evaluated for vigor, size, and color 29 days after the first treatment. Plant heights were measured (table 1).

On June 24, seeds of snapbean (Romano Bush), sweet corn (Marcross Hybrid), squash (Zucchini), and watermelon (Striped Klondike) were planted in 3-inch-square plastic pots. After 19 days, the seedlings were removed from their pots. About one-fourth of each seedling's root system was removed, and seedlings were replanted into their original pots, in the same soil mix. Immediately after replanting, and six days later, the soil was treated with B_1 in the same way as in the first test. There were two plants (pots) per replication, or eight plants per treatment. The treatments were randomized and replicated four times. Eighteen days after the first application, the plants were visually evaluated for vigor, height, color, and root development.

The 1984 test

Kentucky Wonder pole bean and Golden Bantam sweet corn cultivars were planted and treated with either 0.20 percent thiamine hydrochloride solution (B_1) or with B_1 Plus (0.01 percent thiamine hydrochloride plus 0.12 percent each of iron, manganese, and zinc minerals). The soil mix was one-third sludge, one-third fir shavings, and one-third perlite.

Seed was planted on January 20, and the seedlings were uprooted and replanted on January 31. Immediately after replanting, the soil was drenched with B_1 or B_1 Plus. A second treatment was given on February 7. In this test, there were six plants per replication and five randomized replications, or a total of 30 plants per treatment.

The plants were visually evaluated for vigor, size, and color on February 17 — 18 days after the first treatment. The height of the plants was measured and the weight of roots and tops were taken (table 2).

Golden Bantam sweet corn showed no effects of treatment with B_1 (#4) when compared with nontreated plant (#5) or one treated with B_1 plus minerals. Researchers believe that reported benefits should be attributed to fertilizers in some commercial preparations, not to vitamin B_1.

Results

During the 1983 or 1984 tests, all of the transplants successfully reestablished themselves. No discernible differences in color or vigor among treatments were observed.

We concluded from these tests that thiamine hydrochloride, alone or in combination with iron, manganese, and zinc, as applied here, did not benefit development of the plants tested. It has been reported that preparations of thiamine hydrochloride containing fertilizers improve plant development. This improvement should be attributed to the fertilizers, not to vitamin B_1.

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TABLE 1. Effect of thiamine hydrochloride on plant development*

Plant	Height† Treated	Height† Nontreated
	cm	*cm*
Tomato (Pearson)	21.0	21.8
Pepper (Yolo)	12.7	11.9
Squash (Italian)	8.6	8.9
Watermelon (Klondike)	7.9	6.6

*Average of eight plants per treatment

†Data were statistically not significant (analysis of variance; all F values nonsignificant).

TABLE 2. Reaction of seedlings to B_1 and B_1 Plus*

Plant	Height† Treated B_1	Height† Treated B_1 Plus	Height† Non-treated	Weight† Treated B_1	Weight† Treated B_1 Plus	Weight† Non-treated
	cm			*grams*		
Pole bean (Kentucky Wonder)	6.29	6.24	6.62	8.72	8.72	8.92
Sweet corn (Golden Bantam)	2.50	2.05	2.20	2.36	2.10	1.85

*Vitamin B_1, thiamine hydrochloride; B_1 Plus, thiamine hydrochloride plus iron, manganese, and zinc.

†Average of 30 plants. Data were statistically not significant (analysis of variance; all F values nonsignificant).