HERMAN TIMM · W. J. FLOCKER

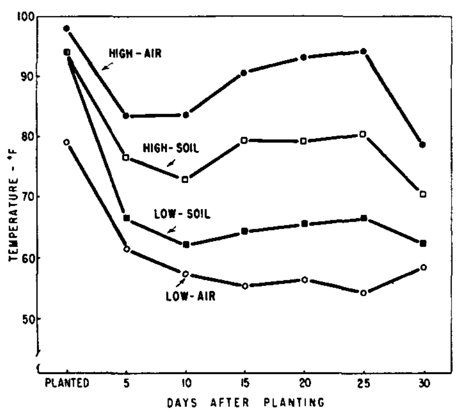
Soil Compaction Limits Potato Stand Establishment During Hot Weather

PLANTING A POTATO CROP during high temperatures in July and August is a hazardous undertaking in the San Joaquin Valley. Potato seed piece survival seems to be dependent on favorable soil and air temperatures. However, it is not uncommon to find marked differences in seed piece survival and stand of plantings made between adjacent fields with similar handling and climatic conditions.

Improved stands have sometimes resulted from changes in methods of handling potato seed pieces, including: planting deeper than normal in a cooler zone of the soil; irrigating before and after planting to cool the soil; and planting during the cooler part of the night and early morning. But improvements have not been consistent at all planting sites. In contrast, potato tubers remaining in the soil from an earlier spring harvest sprouted well after irrigation with no apparent survival problem.

Two preliminary studies were made to evaluate the possible effect of soil temperature and changes in the physical condition of the soil on potato seed piece performance. White Rose seed pieces, well

HIGH AND LOW TEMPERATURES OF SOIL AND AIR



Average high-low air and soil temperatures recorded up to 30 days after planting. Air temperature recorded 3 inches above soil, and soil temperature recorded at seed piece level, 6 inches.

suberized, were placed 20 to a flat, covered with vermiculite, and moistened. Two flats were placed in each constant temperature room at 41, 50, 59, 68, 77, and 86°F. After two weeks in the dark it was observed that all seed pieces were sound and healthy.

Temperature effects

Marked differences in sprouting and stem growth were noted with each 9-degree increase in temperature. In a previous test, sprout development was inhibited in seed pieces held at temperatures above 90°F. Blackheart developed rapidly with eventual seed piece breakdown above 95°F. At these high temperatures, respiration of internal tissue apparently utilized oxygen at a greater rate than was possible for external oxygen to penetrate the tissue. The change to anaerobic conditions hastened the death of cells, and soft rot organisms quickly attacked, with resultant rapid decay of the seed piece.

Soil deterioration

In 1961 a planting of White Rose potatoes was made at the Agricultural Experiment Station, U.C., Davis. The soil, Yolo sandy loam, had been compacted in early spring by driving heavy equipment repeatedly over wet soil until an undesirable structural change in the soil was achieved. The three degrees of compaction were rated severe, moderately severe, and light.

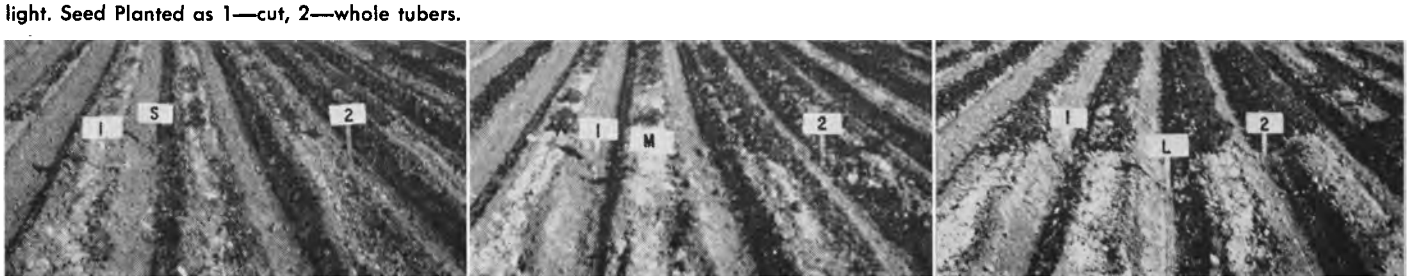
Abnormally cool weather during late July and August delayed planting until relatively higher air temperatures returned. White Rose seed pieces were machine planted and fertilized on September 12 at 3:00 p.m., at an air temperature of 94°F. The site was immediately furrow-irrigated. Stand survival and plant vigor

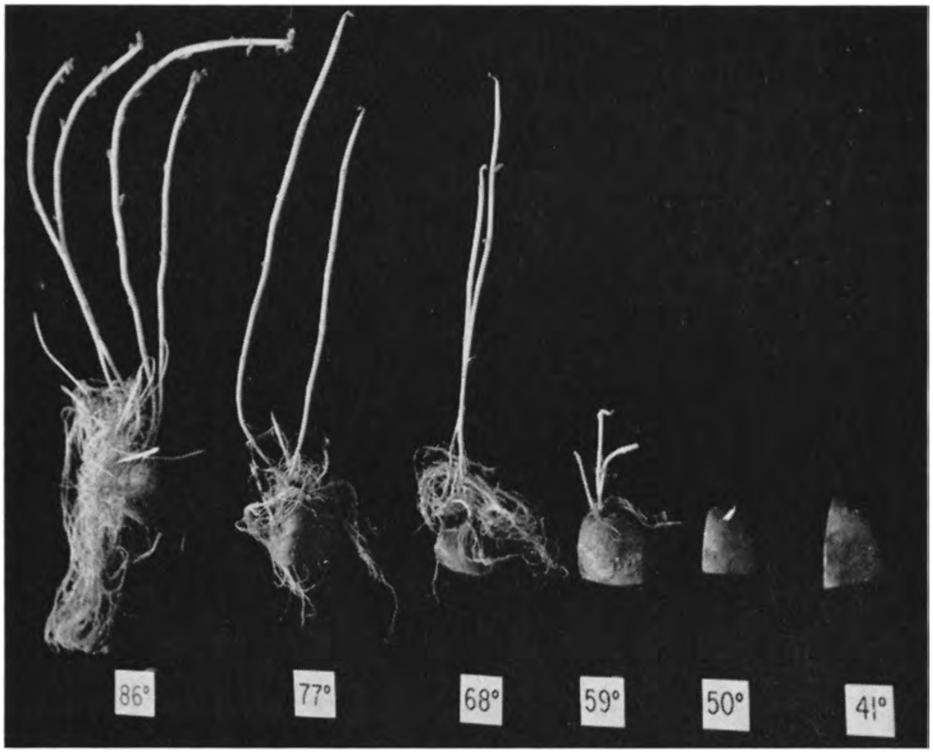
PERCENT STAND OF POTATO PLANTS 34 DAYS AFTER PLANTING SEED AS AFFECTED BY SOIL COMPACTION AND SEED TREATMENT*

Compaction Treatment	GA treated (5 ppm)		Untreated		
	Cut	Whole	Cut	Whole	Mean
Severe	40.0	80.0	23.3	95.0	59.6
Moderately severe	33.3	71.7	47.7	96.7	62.3
Light	83.3	100.0	79.0	98.3	90.0
Mean	52.2	83.9	50.0	96.7	

* New seed—harvested June 10, held in common storage at 65 to 85°F until September 12.

Comparison of potato plant stands as affected by soil compaction and seed condition. Soil compaction: S—severe; M—moderately severe; L—light. Seed Planted as 1—cut, 2—whole tubers.





Differences in sprouting and stem growth of cut White Rose potatoes as affected by constant temperature (°F.). Seed pieces held in moist vermiculite in the dark at various temperatures for two weeks.

comparisons were made between whole and cut, and gibberellic acid treated (5-minute immersion in 5 ppm G.A.) and untreated seed.

From the time of emergence until 34 days after planting, it was evident that soil compaction adversely affected survival and vigor of plants from cut seed more than whole seed. Gibberellic acid treatment did not enhance the survival of seed pieces, or stand. It had been previously found that hastening of sprouting and growth due to gibberellic acid is most pronounced with resting seed, or under cool growing conditions. Neither condition existed in this study. Soil temperature at seed piece depth remained below 90°F for the 34-day period of observation following irrigation.

These results suggest that potato seed pieces and plants can grow well at temperatures below 90°F, provided soil aeration is not limited by compaction. Although changes in seed piece handling may be made, the physical condition of the soil is also critical in obtaining a high percent of seed survival. The degree of soil compaction induced during harvest of previous crops may well affect the success of the potato plantings made in hot weather. Studies are being continued to evaluate changes in soil aeration due to alteration in the physical condition of soils and how potato seed survival may be improved with plantings made during hot weather.

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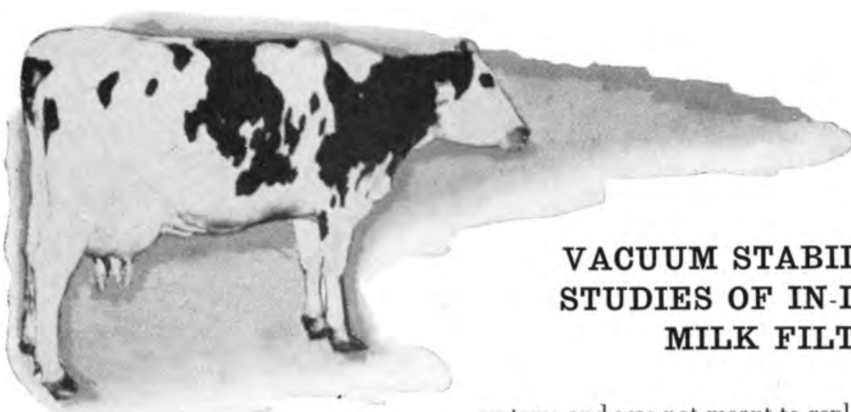

VACUUM STABILITY STUDIES OF IN-LINE MILK FILTERS

VACUUM STABILITY TESTS on the new in-line milk filters now available to dairymen indicate that the filters will not reduce milking vacuum in barns with an adequate vacuum system. However, if the vacuum pump is unable to maintain a steady vacuum at the teat cup (less than 2-inch variation), the addition of an in-line filter would aggravate this deficiency.

The in-line milk filter was designed mainly as a management tool to help detect abnormal milk in pipeline milking systems and was not meant to replace the regular gravity filter. It also provides a measure of the thoroughness of the cow-washing operation. The transparent, plastic unit fits on the end of the milk hose at the milk valve. The replaceable filter pads are $4\frac{9}{16}$ inches in diameter.

Since the milk hose serves the dual function of conveying milk and of applying a sub-atmospheric pressure to the teat orifice, any obstruction could upset the desired vacuum conditions in the teat cup, resulting in vacuum instability. Unstable vacuum is recognized to be a major cause of teat irritation.

These tests were made to determine whether the in-line filter could adversely affect milking vacuum at the teat cup. By means of a by-pass arrangement, it was possible to cause milk to flow through the filter or around the filter. Changes in the milking vacuum level were recorded on a roll chart with a vacuum recording instrument. The findings indicated that:

1. The filter reduces the vacuum by 1 to $1\frac{1}{2}$ inches of mercury at full milk flow.
2. A normal accumulation of sediment (other than mastitic milk) has virtually no effect on milk flow or vacuum stability. In these tests, one filter was used on from four to as many as 42 cows. At no time did the vacuum loss exceed 2 inches although the manufacturer recommends changing the filter after eight to ten cows.

—F. F. Smith, Farm Advisor, Los Angeles County; and G. W. Perlmutter, Fieldman, Los Angeles Mutual Dairymen. *Johnson & Johnson's Rapid-Flo Filter Holder was used for these tests.*