Gibberellin on White Potatoes

applied to freshly harvested, resting potato tubers, or used in preharvest foliar sprays, gibberellin promotes sprouting

Lawrence Rappaport, Herman Timm, and Laverne F. Lippert

Year-round production of potatoes in California frequently necessitates the use of resting tubers as planting stock. However, resting tubers normally do not sprout for 1–4 months after harvest—depending on varietal characteristics—despite exposure to optimal environmental conditions.

Investigations on the effects of gibberellin on sprouting of resting potatoes and on the resulting plant growth were initiated with a preliminary laboratory experiment wherein match sticks—previously soaked in gibberellin and inserted into resting potatoes—hastened sprouting by four weeks.

In subsequent investigations White Rose and Russet Burbank tubers were immersed in solutions containing no gibberellin—the control—and 25, 50, 500, or 2,000 ppm—parts per million—of gibberellin. After immersion the tubers were held in open flats at controlled temperatures of 50°, 59°, or 77°F. Under these conditions gibberellin accelerated sprouting by 2–3 weeks. Sprouts appeared at almost all eyes of tubers dipped in the 25, 50, or 500 ppm solutions, indicating that apical dominance was reduced. However, tubers immersed in a solution containing 2,000 ppm of gibberellin sprouted only at an apical eye. Root development at the base of new sprouts was delayed four months on tubers which were previously dipped in a solution containing 500 ppm of gibberellin.

In other experiments it was found that the duration of immersion—five minutes, 1½ hours, or six hours—did not significantly influence the rate or nature of sprouting.

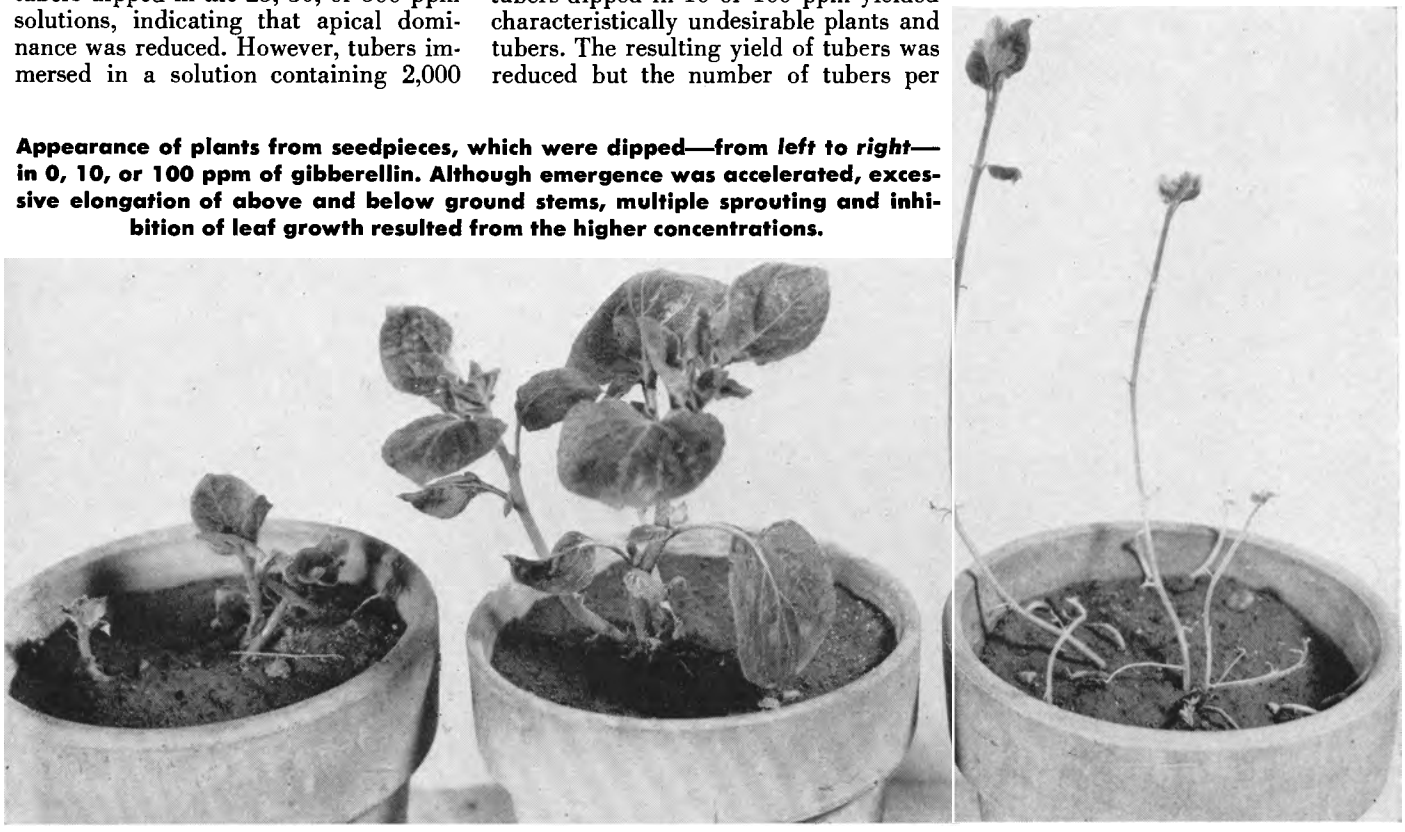
In field studies, tuber dip treatments resulted in an even more pronounced stimulation of sprouting than had been observed previously under controlled laboratory conditions. However, in early field experiments concentrations as low as 10 ppm were found to be detrimental to plant growth and subsequent tuber development. These responses were characterized by severe yellowing and rolling of the early developing leaves, spindly growth of stems, increased numbers of stems per hill, and misshapen tubers appended to elongated underground stems. This was especially evident in a replicated field experiment at Shafter, where tubers dipped in 10 or 100 ppm yielded characteristically undesirable plants and tubers. The resulting yield of tubers was reduced but the number of tubers per hill was increased. The undesirable foliar effects were also observed at Davis where tuber samples from these treatments were sprouted in pots.

Foliar Sprays of Gibberellin on White Rose Potatoes

Emergence 60 days after replanting of White Rose potatoes from plants sprayed four weeks, two weeks, or one week before harvest. Plants were sprayed at Bakersfield; tubers harvested June 13, 1957, and replanted at Tulelake on June 17

Gibberellin sprays		Emergence 60 days after replanting
No. of weeks before harvest	ppm	%
	0	16.7
	10	33.3
4	50	56.7
	100	80.0
	500	80.0
	0	0.0
	10	23.3
2	50	33.3
	100	66.7
	500	63.3
	0	6.7
	10	16.7
1	50	26.7
	100	30.0
	500	70.0

Appearance of plants from seedpieces, which were dipped—from *left* to *right*—in 0, 10, or 100 ppm of gibberellin. Although emergence was accelerated, excessive elongation of above and below ground stems, multiple sprouting and inhibition of leaf growth resulted from the higher concentrations.



Further experiments in the field demonstrated that lower concentrations—0.5–5.0 ppm—were effective in curtailing the rest period without causing any important leaf modification. However, some elongation of underground stems occurred. The promotion of sprouting and subsequent plant growth from freshly harvested White Rose potato tubers treated with 0, 1, 5, and 25 ppm of gibberellin and then grown in the field are shown in the lower graph on this page. The rate of sprouting was comparable in Pontiac, Kennebec, and Russet Burbank potato varieties.

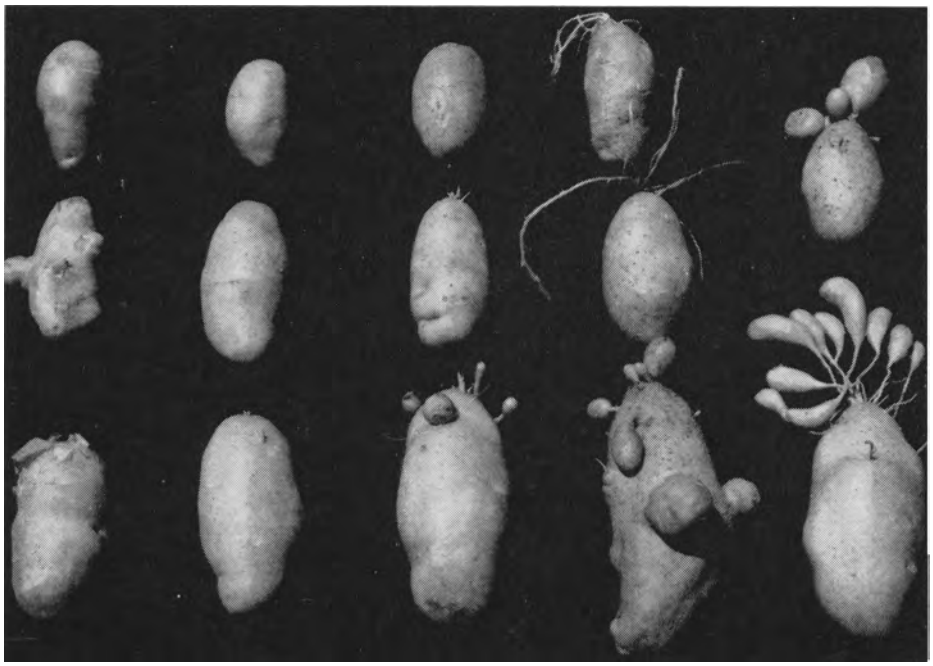
The possibility that gibberellin might overcome chemical dormancy induced by maleic hydrazide—MH-40—was investigated with White Rose and Russet Burbank potatoes. Thirty tubers of each variety from plants sprayed—in the field, four weeks before harvest—with a solution containing 6,000 ppm of maleic hydrazide were held at 50°F for three months without producing visible sprouts. The tubers were dipped for five minutes in water or in a solution containing 500 ppm of gibberellin, then planted in a soil bench in a greenhouse controlled at 65°–70°F. Six weeks later only three tubers from plants which received maleic hydrazide sprays had sprouted irrespective of treatment with gibberellin.

The effects of gibberellin on sprout growth of potatoes from plants treated with lower concentrations of maleic hydrazide bear further investigation.

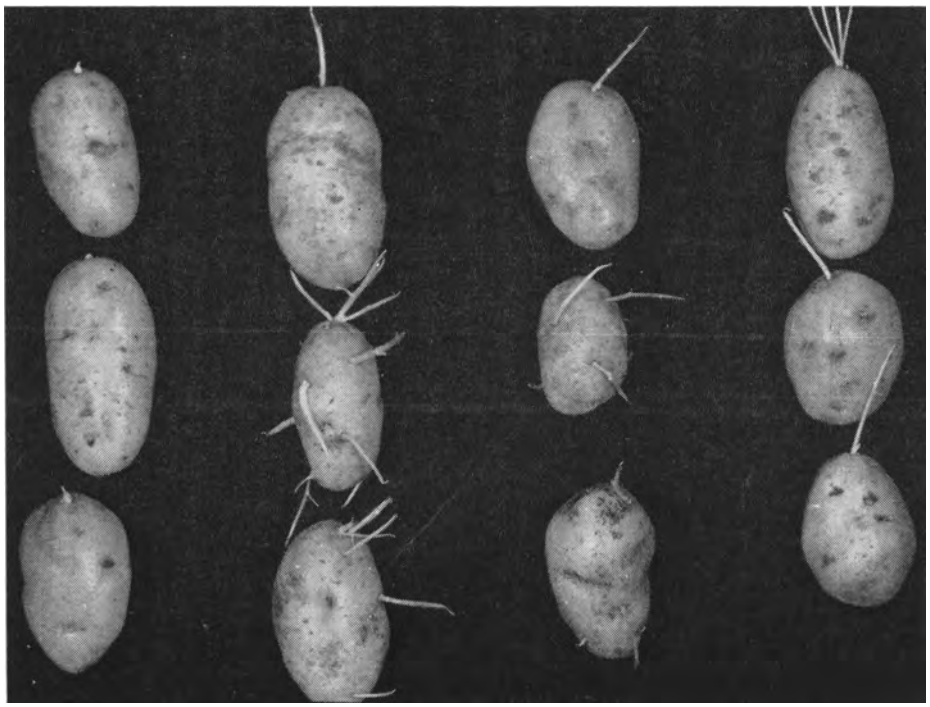
The effectiveness of preharvest foliar sprays of gibberellin in shortening the rest period of the immature, growing tubers was investigated with a spring crop of White Rose potato plants. Plants were sprayed to run-off four weeks, two weeks, or one week before harvest with solutions containing 0, 10, 50, 100, and 500 ppm of gibberellin. The tubers were harvested 111 days after planting. Ex-

Concluded on page 14

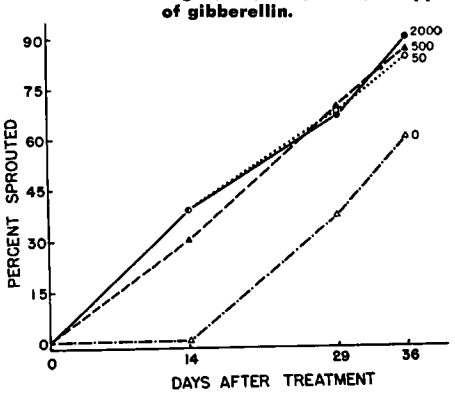
Appearance of tubers from plants which received foliar sprays of gibberellin four weeks before harvest. *Left to right:* 0, 10, 50, 100, and 500 ppm. Notice the sprouting and subsequent tuber growth on tubers from the higher spray concentrations.



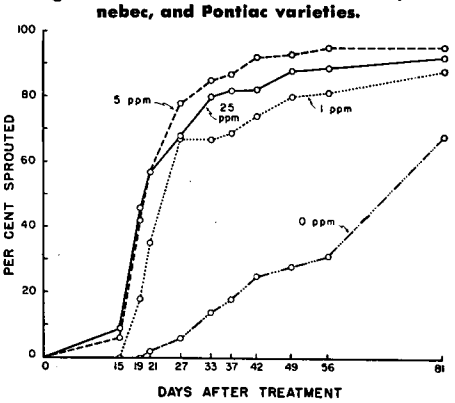
Appearance of White Rose potatoes eight weeks after they were immersed in solutions containing—from *left to right*—0, 50, 500, or 2,000 ppm of gibberellin. Stored at 59°F. Notice the branched habit and the greater number of sprouts in the 50 as compared with the 2,000 ppm treatment.



The percentage of White Rose potatoes sprouted at 59°F as influenced by a five-minute dip in solutions containing 0, 50, 500, or 2,000 ppm of gibberellin.



Percentage of tubers sprouted after freshly harvested White Rose potato seedpieces were dipped in solutions containing 0, 1, 5, or 25 ppm of gibberellin and planted on August 9, 1957, in a replicated field trial at Davis. Comparable emergence resulted in the Russet Burbank, Kennebec, and Pontiac varieties.



CREDIT

Continued from preceding page

offered any kind of credit, none, with one exception, offered full credit. The exception was in Fresno where 86% of the stores with 7–14 employees which offered credit had full credit.

To be continued

Marilyn Dunsing is Assistant Professor of Home Economics, University of California, Davis.

Jessie V. Coles is Professor of Family Economics, University of California, Berkeley.

PARITY

Continued from page 2

be gained from such regulation. The parity standard is intended to define prices that are fair to producers and consumers.

However, the argument has been advanced that the present parity index is unrepresentative of production and cost conditions for specialty crops and a more representative index would give greater weight to wages of hired labor and perhaps certain other inputs which bulk relatively large in specialty crop-production cost. Since the wages subindex stands at a higher level than any other, any increase of its weight will raise the over-all parity index. The amount of the increase would depend upon how offsetting decreases of weight are distributed among the other subindexes.

While certain types of special-purpose revision of the parity index for specialty crops could result in parity-price increases of perhaps 10%–20%, the prospects of obtaining such revision are remote. The contention that revision should be made appears to rest on the premise that the parity index should accurately represent production expenses of individual commodities or groups of commodities. A cost-of-production parity index would logically have to take into account decreases in cost as a result of increasing efficiency which might offset gains from other modifications.

A market control program that is effective in smoothing out short-run price fluctuations about a basic price level or in preventing disastrously low prices in unusual seasons may benefit both producers and consumers. It can stand without recourse either to the parity goal or the parity limitation. Prudently administered, with proper attention to consumer interests on the one hand and long-run supply responses on the other, marketing orders might conceivably function better without objective standards of any kind. But it is hardly conceivable that consumer safeguards could or should be eliminated from the law. Despite the deficiencies of the parity standard, it is better than none. Any proposal to eliminate the parity limitation, therefore, might reasonably be accompanied by a proposal for a substitute standard.

A bill under Congressional examination would provide, in the interest of producers and consumers, an orderly flow or disposition thereof to and among the available market outlets throughout the normal marketing season to avoid unreasonable fluctuations in supplies and prices.

Passage of this or a similar amendment which does not mention parity, would complete the process of sterilizing the parity limitation by providing an alternative and more flexible set of criteria. Nevertheless, administrative standards would still be required to replace the legislative parity standard.

H. Ray Woltman is Associate Specialist in Agricultural Economics, University of California, Berkeley.

POTATOES

Continued from page 5

amination of the tubers at harvest revealed that gibberellin applied to the foliage as late as one week before harvest markedly stimulated sprouting. In comparison, tubers from untreated plants showed little or no sprouting activity.

When the tubers harvested from sprayed plants were cut and planted as seedpieces, the rate of emergence of new plants was accelerated. Most rapid emergence resulted from the earliest application and the highest concentration. similar results were obtained with a summer crop of White Rose potatoes at Davis. Although foliar sprays are reasonably effective in shortening the rest period, high concentrations of gibberellin are required and therefore the method probably has limited practical value.

Immersing resting potatoes for five minutes in a gibberellin solution—from 0.5 to 25.0 ppm—will consistently curtail the rest period and promote sprout growth. However, the commercial significance of these findings must be determined.

The influence of gibberellin on yield and on the processing quality of the resulting tubers is being investigated under a variety of environmental conditions and locations. The effect of the chemical on sprout emergence and plant growth from nonresting potatoes needs to be investigated.

Lawrence Rappaport is Junior Olericulturist in Vegetable Crops, University of California, Davis.

Herman Timm is Junior Olericulturist in Vegetable Crops, University of California, Davis.

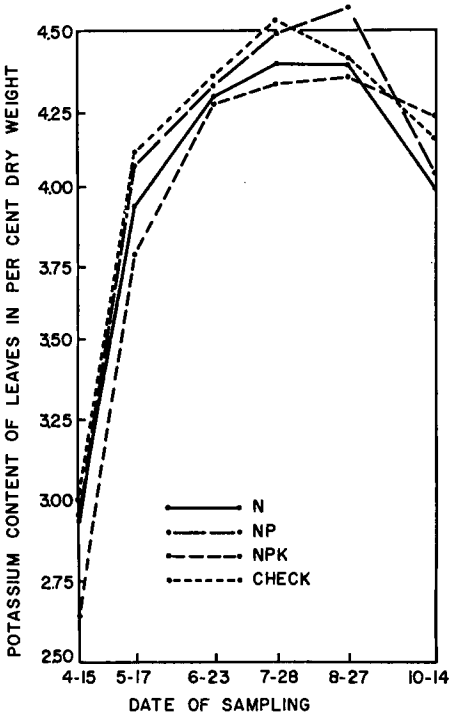
Laverne F. Lippert is Research Assistant in Vegetable Crops, University of California, Davis.

PLUMS

Continued from page 10

sium, the variability of the plots is such that it can not be considered significant. The shape of the seasonal curves—an initial rise rather than a drop—is like that of the apricot rather than like the prune. The potassium values tend to be high.

Potassium content of Santa Rosa Plum leaves, Orchard A, 1956.
N—nitrogen
NP—nitrogen and phosphorus
NPK—nitrogen, phosphorus, and potassium



Potassium content of Santa Rosa Plum leaves, Orchard B, 1956.