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of
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Russet Burbank Potatoes

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A study was conducted to determine the effectiveness of treating potatoes with ionizing irradiation as compared to treating potatoes with the chemical CIPC to prevent the sprouting of the tubers. The study was made under a cooperative agreement between the University of Idaho and the Department of the Army, under the sponsorship of Dr. C. K. Wadsworth, Food Technologist, Irradiated Food Products Division, Food Laboratory, U.S. Army Natick Laboratories, Natick, Massachusetts 01760.

All of the potatoes for this study were grown on the University of Idaho Aberdeen Branch Agricultural Experiment Station during the summer of 1968. Immediately upon harvest, these Russet Burbank potatoes were stored in the Experiment Station's storage cellar.

On December 16, 1968, the AEC portable caesium irradiator was moved to the University of Idaho potato storage and the irradiation of potatoes was begun.

Approximately 360 cwt of "rough graded" potatoes were treated with radioactive irradiation by the portable irradiator and returned to the storage cellar. Another approximately 360 cwt of this same common lot of potatoes were "rough graded" and returned to the storage. On February 20, 1969 these potatoes were transferred to the station's research storage building. On March 4, 1969, this lot of potatoes was treated with CIPC through the air distribution system.

During the week of March 17, the irradiated tubers were moved to an adjacent bin in the potato storage research building so that both lots of potatoes would be subjected to exactly the same storage temperature, humidity and airflow conditions from then on.

On June 16, all of the potatoes from both lots were taken from the potato research building and graded by the crew of the Idaho Potato Growers. The results of the grading of these two lots of potatoes are given in Table 1.

A raw product weight of 36,060 pounds of Russet Burbank tubers which had been treated with CIPC resulted in 23,200 pounds of U.S. No. 1 potatoes; 4,350 pounds of U.S. No. 2 potatoes and 8,500 pounds of tubers classed as culls (rot, undersized, badly damaged, bruised and odd shaped tubers). Stated in percentages, 64.3 percent of the tubers were U.S. No. 1; 12.1 percent were U.S. No. 2's, and 23.6 percent were off-grade or culls.

The comparable lot of irradiated tubers were graded at the same time with the same crew and same handling procedure. Of a total of 33,280 pounds of irradiated tubers, 18,450 pounds graded U.S. No. 1; 4,280 pounds were U.S. No. 2's and 10,630 pounds were classified as culls. This



Research Professor Walter C. Sparks (Right) and Technician Lester Sine examine potatoes as they are removed from the AEC portable caesium irradiator during treatment of Russet Burbank potatoes at the University of Idaho Aberdeen Branch Experiment Station, Aberdeen, Idaho, December 1968.

indicated that only 55.4 percent of the irradiated potatoes were U.S. No. 1 grade, 12.6 percent U.S. No. 2's and 31.9 percent were culls.

The difference between the U.S. No. 1's and the culls shows 27.3 percent increase in cullage and a corresponding reduction in the percentage of U.S. No. 1's in the irradiated potatoes as compared to the CIPC treated tubers. Since these potatoes were, at the time of grading, inspected by the federal-state inspection personnel, the resultant grade could be assumed to be the same. However, other differences showed up in later gradings.

Table 1. Effect of Type of Sprout Inhibitor Treatment on Grade of Dry Russet Burbank Potatoes After Six Months Storage (December 16, 1968, to June 16, 1969.)

Treatment	Total	U.S. No. 1		U.S. No. 2		Culls	
	Pounds	Pounds	%	Pounds	%	Pounds	%
CIPC	36,060	23,200	64.3	4,350	12.1	8,500	23.6
Irradiated	33,280	18,450	55.4	4,200	12.6	10,630	31.9

On July 8, 1969, the potatoes again had to be graded to meet U.S. No. 1 grade standards for shipment out of the state. At this time it was necessary to provide 100 boxes of U.S. No. 1 tubers from each of the two lots. In order to obtain 100 boxes of U.S. No. 1 grade potatoes from the CIPC treated potatoes, 131 boxes of tubers that met grade standards on June 16 had to be graded. This indicated a loss of 24 percent in U.S. No. 1's June 16 to July 8 on the potatoes treated with CIPC. In comparison to this, the irradiated tubers required 143 boxes to provide 100 boxes of U.S. No. 1's. This showed a loss of 30 percent of the tubers from the grading on June 16 to July 8 (table 2).

The final grading and final shipment of these potatoes was accomplished July 18, 1969, and the remainder of the CIPC treated

potatoes, 333 boxes, were graded with a resultant 268 boxes of U.S. No. 1 grade potatoes. This represented a loss of 19.5 percent from the CIPC treated potatoes from June 16 to July 17, 1969. The companion lot of potatoes treated with ionizing irradiation consisting of 226 boxes, produced 158 boxes of U.S. No. 1's after grading. This was a loss of 30 percent from June 16 to July 17, 1969, (table 3).

Samples of each of the lots were saved for examination by Dr. C. K. Wadsworth of the U.S. Army Natick Laboratories. On August 12, 1969, Dr. Wadsworth examined the samples. Of the CIPC treated potatoes, 17.2 percent did not grade U.S. No. 1's. Of the irradiated tubers, 29.7 percent did not grade U.S. No. 1.

Table 2. Effect of Type of Sprout Inhibitor Treatment on Loss in Washed and Graded Russet Burbank Potatoes After 22 Days of Storage (washed June 16, 1969, regraded, July 8, 1969).

Treatment	Graded	U.S. No. 1		Cullage	
	Pounds	Pounds	%	Pounds	%
CIPC	6550	5000	76.3	1550	23.7
Irradiated	7150	5000	69.9	2150	30.1

Table 3. Effect of Type of Sprout Inhibitor Treatment on Loss in Washed and Graded Russet Burbank Potatoes After 31 Days of Storage (washed June 16, 1969, regraded July 17, 1969).

Treatment	Graded	U.S. No. 1		Cullage	
	Pounds	Pounds	%	Pounds	%
CIPC	16650	13400	80.5	3250	19.5
Irradiated	11300	7900	69.9	3400	30.1

These potatoes had been stored from June 16 to August 12. The big reason why these tubers had been culled out was largely because of the rot which had occurred in the tubers from 16 June to 17 July (table 4).

Since these tubers were all from the same field and were all handled by the same equipment and the same crew, the variation in the amount of rot and cullage found between the two lots probably can be attributed to the difference in the sprout prevention treatments the tubers received. These figures indicate that potatoes treated by irradiation suffered a loss of about 30 percent between June 16 and July 17. On the other hand, those treated by the chemical CIPC had only about a 20 percent loss. With the CIPC treated lot, 10.1 percent of the cullage was due to damaged, bruising and malformed potatoes. A total of 7.1 percent was due to rot, giving a total of 17.2 percent total cullage. The irradiated tubers had 10.5 percent bruised and injured tubers, but 19.3 percent rotted, giving a total of 29.3 percent total cullage.

Table 4. Effect of Type of Sprout Inhibitor Treatment on Loss in Washed and Graded Russet Burbank Potatoes After 57 Days of Storage (washed June 16, 1969, regraded August 12, 1969).

Treatment	Graded		Cullage		
	Pounds	Rot		Other	
		Pounds	%	Pounds	%
CIPC	95.7	6.8	7.1	9.7	10.1
Irradiated	96.2	18.5	19.2	10.1	10.5

From these figures, it is seen that if potatoes are to be irradiated, they must be handled very gently and carefully in order to reduce the amount of injury that is caused. Tubers treated with radioactive irradiation do not have the ability to form a wound periderm, thus the rot organisms can enter into the tuber and cause rotting. This problem does not seem to be as serious in potatoes treated with the chemical CIPC sprout inhibitor.

These data and observations on the amount of sprouting and other storage quality aspects indicate that no more sprouting was observed on the chemically treated potatoes than on the irradiated potatoes and much less loss was noted.