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*INFLUENCE OF HORMONES AND QUATERNARIES ON THE STORAGE OF ONIONS
AT THREE DIFFERENT TEMPERATURES*

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Texas is a major producer of dry onions. In good years, there usually is a break in market prices due largely to the perishability of the crop. Prices and seasonal distribution could be improved greatly if we knew better methods of storage and had better storage facilities. Accordingly, a preliminary investigation was made in 1950 on the influence of hormones and quaternaries on the storage of Crystal Wax onions at different temperatures.

Materials and Methods

U. S. No. 1 grade Crystal Wax onions were obtained from a local wholesale dealer April 14, 1950 and brought to the Fruit and Vegetable Processing Laboratory for treatment.

Three onions were used for each treatment. The onions were dipped into large beakers containing 1100 mls. of the following concentrations of hormones and quaternary ammonium compounds. Hormones used were: (1) 2,4,5-T in concentrations of 25, 50, 100 and 200 p.p.m.; (2) 2,4-D in concentrations of 10, 20, 40 and 80 p.p.m.; (3) parachlorophenoxyacetic acid in concentrations of 25, 50, 100 and 200 p.p.m.; (4) a-naphthaleneacetic acid in concentrations of 500, 1000, 2000 and 4000 p.p.m.; (5) triidobenzoic acid in concentrations of 50, 100, 200 and 400 p.p.m.; (6) water; (7) wetting agent, 0.1 percent Vatsol (also used in treatments 1 through 5); and (8) dry -- no treatment.

"Quats" used were: (1) Hyamine 1622; (2) Hyamine 2389; (3) Triton X-100; (4) Roccal; (5) Rulon's Ruco; (6) water; and (7) dry -- no treatment. The concentrations of "quats" used were 50, 100, 150, 200, 250 and 300 p.p.m.

The onions were immersed in the concentrations of each treatment, agitated slowly for one minute and drained. They were dried under a fan and packaged in well ventilated cartons.

Three cartons of each treatment were prepared. After being weighed, they were placed in storage at three different temperatures: 86-100°, 40-44° and 34° F. The relative humidity in the room temperature (86-100° F.) storage was 50 percent, in the 40-44° F. room it was 88 percent and in the 34° F. room it was 92 percent.

At intervals of 11, 33, 50, 87 and 136 days, the onions were weighed and examined for breakdown, discoloration, sprouting or any other defect which would render them unmarketable.

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Results

There was no significant difference in loss of weight of marketable onions regardless of hormone or quaternary treatment with the exception of 2,4,5-T at 34° F. The loss in marketable onions decreased successively at this temperature as the concentration of 2,4,5-T was increased. The significant point of the results of the treatments was that a decrease in storage temperature was accompanied by a decrease in the loss of marketable onions.

Since there was little or no significant difference in treatment or concentration of either hormones or quaternaries, the data in Tables 1, 2, 3 and 4 are a composite of the effect of temperature on storage.

Table 1 shows that during the storage period of 136 days there was a continuous loss in weight at all three storage temperatures. This loss increased directly with an increase in storage temperature. The total loss in weight was 9 times as great at room temperature than at 34° F.

Table 1. Percent loss in weight after indicated storage

Temperature	Days				
	11	33	50	87	136
Room (86-100° F.)	5.15	8.86	15.86	39.88	75.43
40-44° F.	1.66	2.68	6.33	9.11	14.96
34° F.	1.41	3.00	4.33	6.12	8.55

Table 2 shows the percent loss of marketable onions after storage of 136 days at the indicated temperatures. The marketable onions stored at room temperature were decidedly dry and brittle. They were considered unmarketable and were discarded because of dry or wet rot or excessive sprouting. Only one onion showed evidence of sprouting.

Onions stored at 40-44° F. were chalky in color and somewhat brittle on the outer leaf scales. They developed a large number of sprouts during storage. Neck rot and sooty mold developed at this temperature but the decrease in marketable onions was influenced more by sprouting than by breakdown. Sprouting developed earlier in the hormone-treated onions, but at the end of 136 days there seemed to be no significant difference in the distribution of the sprouts between hormone and quaternary treatments.

Onions stored at 34° F. retained their initial clear, crisp, crystalline appearance during the 136-day storage period. There was no evidence of any type of breakdown or development of sprouts. There was a 39 percent greater loss from all causes at 40-44° F., and 80 percent greater loss at room temperature than at 34° F.

Table 2. Loss in marketable onions after 136 days storage (weight basis)

Temperature	Percent
Room (86-100° F.)	88.16
40-44° F.	47.60
34° F.	8.55

To determine the influence of temperature and length of storage on subsequent holding at temperatures of 75-80° F., the onions were removed from storage and weighed after 5 and 10 days. Table 3 shows that, as would be expected, subsequent loss in weight was least in the onions stored at room temperature. The greatest loss occurred in the 40-44° F. treatment, while the 34° F. treatment was about half-way between the other two groups. No explanation is offered for this reversal in trend.

Table 3. Percent loss in weight of onions stored 136 days at the indicated temperature following indicated days storage at 75-80° F.

Temperature	Days	
	5	10
Room (86-100° F.)	0.87	1.79
40-44° F.	4.87	6.55
34° F.	3.53	4.94

Table 4 shows the overall loss in marketable weight from the beginning of the storage period and includes a subsequent 10-day holding period at 75-80° F. There was a loss in weight of 13 percent at 34° F., whereas 51 and 88 percent were lost at 40-44° F. and room temperature, respectively. The 51 percent loss at 40-44° F. makes this storage temperature prohibitive from an economic standpoint.

Table 4. Percent total loss after removal from storage to holding temperature of 75-80° F.

Temperature	Days	
	5	10
Room (86-100° F.)	88.25	88.36
40-44° F.	50.15	51.03
34° F.	11.73	13.02

Summary and Conclusions

The results of this preliminary trial indicate:

1. There was no significant influence of hormones or quaternaries, with the possible exception of 2,4,5-T concentrations at 34° F. storage temperature.

2. Temperature is indicated as the decisive factor in onion storage.

3. At room temperature (86-100° F.), the loss occurred primarily from dry and wet breakdown.

4. At 40-44° F., the loss was primarily the result of excessive sprouting, with breakdown at a minimum.

5. At 34° F., the loss was due to a decrease in moisture content. There was no breakdown or sprouting.

It is concluded from the preliminary work reported here that onions keep best in storage when a temperature of 34° F. is maintained.