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Effect of Temperature on Packaged Hop Quality

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NORTHWEST CROPS & SOILS PROGRAM

Effect of Temperature on Packaged Hop Quality

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UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITIES

EFFECT OF CLIMATE ON PACKAGED HOP QUALITY

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As the hop industry continues to expand in the Northeast, research is needed into best practices for processing and storing hops. While there are established systems for hop storage on large scale farms in the Pacific Northwest, there is a shortage of information on the systems being employed by growers in the Northeast. Many hop growers are choosing to vacuum-seal their hops in plastic bags. The goal of this project was to determine the effect of temperature on storage quality of dried, vacuum-sealed hops.

MATERIALS AND METHODS

Treatments were 3 temperatures with sample date as a co-variate. The Nugget hops used for this study were harvested in early September, dried to 8% moisture, and frozen in bulk vacuum-sealed bags for 7 months. Quality was measured shortly after the time of harvest. The bulk hops were divided into 21 separate samples before the start date. On 26-Mar 2014, 7 samples were moved into a dark storage area maintained at room temperature, 7 samples were placed in a refrigerator, and 7 samples were left in the freezer. Two data loggers were left in each location to record temperature. Temperature was taken by each logger six times per day from 29-Mar to 20-Jun. The data loggers in the freezer failed due to the low temperature and recorded for less than a day. It is assumed that the freezer stayed at 0.2º F. Samples were kept in each location for a total of 12 weeks. Once every two weeks, a sample from each treatment was analyzed for quality. Quality was tested by measuring alpha and beta acids in our lab using spectrophotometry as per the American Society of Brewing Chemists (ASBC) Method of Analysis entitled Hops 6a. Hop Storage Index (HSI) was also measured using the ASBC Method of Analysis detailed in Hops 12. HSI measures the potential loss of alpha acid over time; a lower number means less potential for loss.

RESULTS

Table 1. Alpha acids, beta acids, and Hop Storage Index (HSI) for Nugget hops, Burlington, VT 2014.

Alpha acids %	Beta acids %	HSI
15.2	4.9	.23

Quality measurement of the Nugget hops shortly after harvest is shown in Table 1. The average temperatures for each location are shown in Table 2. Although the chest freezer data loggers failed, it is assumed that the freezer maintained a temperature of 0.2º F.

Table 2. Average temperature by treatment, Burlington, VT 2014.

Location	Average Temperature ºF
Room temperature	72.4
Refrigerator	37.1
Chest freezer	0.2

After 12 weeks of storage, the alpha and beta acids had degraded much further when stored at room temperature than samples stored in the refrigerator and freezer (Table 3). It is clear that storing samples at freezing results in the most stable storage especially over the long term. It is important to remember that these hops had already been stored for 6 months (in the freezer) prior to the experiment.

Table 3. Alpha acids, beta acids, and HSI by treatment, Burlington, VT 2014.

Temperature ºF	Alpha acids %		Beta acids %		HSI	
0.2	**12.16**	a	**9.64**	a	**0.211**	b
37.1	11.73	b	9.21	b	0.215	b
72.4	9.80	c	7.63	c	0.358	a

Treatments indicated in **bold** had the top observed performance.
Treatments with the same letter to did not perform significantly different from each other.

Alpha acid degradation occurred the most quickly across the 12 weeks when stored at room temperature (Figure 1). However, the degradation increased exponentially when room temperature storage exceeded 2 weeks. From this research, it is clear that short term storage at temperatures below 40º F would lead to the least degradation of hop quality. For long term storage, hops should likely be maintained at temperatures close to freezing.

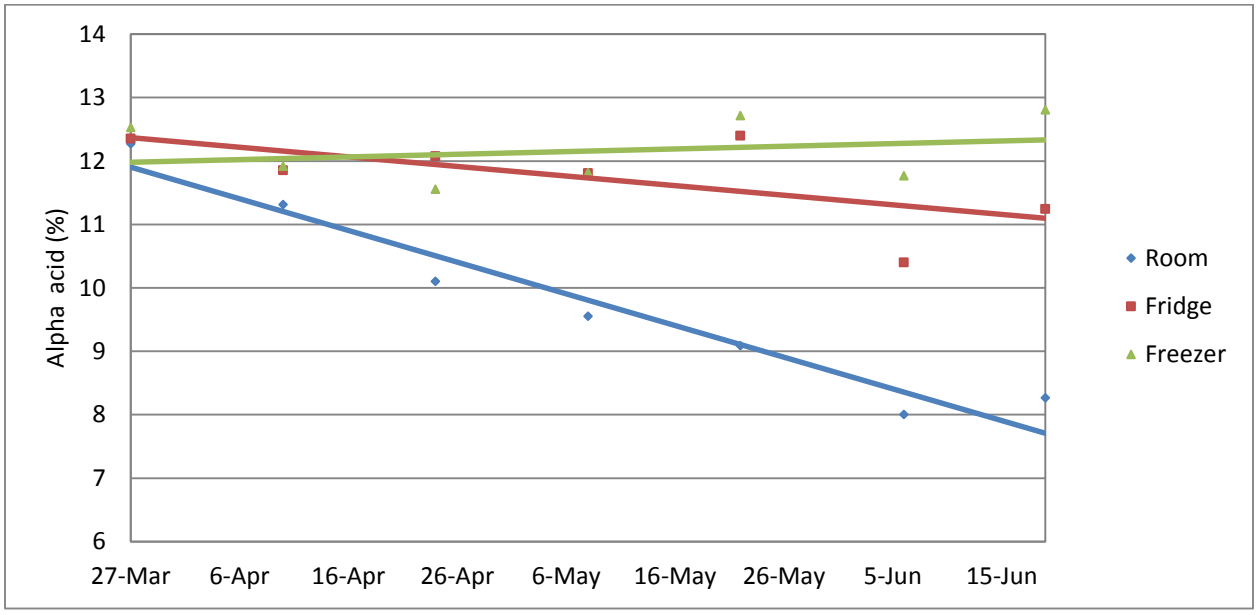

Figure 1: Degradation of alpha acids in hops stored at 3 temperatures across a 12 week period, Burlington, VT 2014.

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