tense illumination, much stronger nitrite solutions (2.0%) must be employed for protection during the lighting period. This concentration of nitrite accelerates oxidation of sulfhydryl groups present.

Whereas added nitrite protects the cured meat pigment from oxidation in the presence of protein sulfhydryl groups, it accelerates oxidation in their absence. This is true in meats such as bologna, which originally gave a negative nitroprusside test, as well as in meats in which the free sulfhydryl groups have been removed by exposure to high concentrations of nitrite for several days or to iodoacetic acid for a few minutes. Under these conditions, nitrite causes greater fading than the limiting value produced by long exposure to light or by treatment with an oxidizing agent (ferricyanide). This is interpreted to mean that the nitrite attacks the porphyrin ring as well as oxidizing the heme iron.

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SWEET POTATO DEHYDRATION

Effects of Conditions of Storage of Raw Materials on Chemical Properties of Dehydrated Products

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The changes in chemical composition of raw sweet potatoes during storage at 50°, 60°, and 70° to 75° F. and the properties of the derived dehydrated products indicate that a storage temperature of 60° F. is superior for maintenance of raw materials. The sugar content of sweet potatoes stored at 50° F. increased more than that of potatoes stored at 60° or 70° to 75° F. The shrinkage (loss in fresh weight) of materials stored at 70° to 75° F. is much greater than that of materials stored at 50° and 60° F. Sweet potatoes of the Unit I Porto Rico variety stored at 60° F. for not more than 4 to 6 months yield dehydrated products having a bright yellow-orange color, a carotene content of 225 to 250 p.p.m., an ascorbic acid content of 35 to 40 mg. per 100 grams, and a rehydration of about 100%.

Sweet potatoes are grown in more than 22 states and are one of the leading vegetable crops in the United States, with a production in 1953 of about 30,000,000 bushels, concentrated principally in the lower Atlantic and south central states (*24*). Sweet potatoes are an acceptable and nutritious food having a carotene content of 4 to 7 mg. %, an ascorbic acid content of 17 to 33 mg. %, and a high caloric value (*7*).

During World War II large quantities of dehydrated foods were procured and used by the Armed Services. Dehydrated sweet potatoes made an important contribution to this supply. However, in 1946 commercial production of dehydrated sweet potatoes for food ceased, because of termination of procurement by the Armed Services and the lack of interest in the product by the civilian market.

In 1951 interest in the possible reactivation of the sweet potato dehydration industry developed. The lack of scientific data to guide in drafting specifications and activating the industry was indicated by the Quartermaster Food and Container Institute for the Armed Forces. One phase of the problem was to determine the effects of temperature and time of storage of sweet potatoes on their properties and on the properties of derived dehydrated products. Changes in the properties of sweet potatoes during storage under different conditions have been reported by numerous investigators (*1, 4–6, 8, 11–15, 17, 19, 20, 22, 23, 26, 27*). Wagley investigated the effect of storage of sweet potatoes in relation to canning and observed that changes in chemical composition resulted in loss of texture, development of off-flavors and from the canner's standpoint, economic losses (*25*). Hopkins and Phillips reported that, after harvesting, a marked and regular change in the amount of sugars in sweet potatoes occurs (*10*). When the potatoes were cured and then stored at different constant temperatures, the content of sugars increased at 50° and 55° F. but decreased at 60°, 65°, and 70° F., indicating that a critical temperature range exists for the storage of sweet potatoes.

The purpose of this investigation was, therefore, to extend these studies and to determine the effects of storage of raw materials on their shrinkage, moisture, and contents of carotene, ascorbic acid, and sugars; on the color, contents of carotene and ascorbic acid, and rehydration characteristics of derived dehyrated products; and on the losses of raw materials during processing.

Methods

Moisture. A 2-gram ground sample, passing through 20-mesh screen but held on 40-mesh screen, was weighed into tared, dry, aluminum weighing dishes (approximately 2 inches in diameter and 3/4 inch in depth) with tightly fitting covers. The dishes, with cocked lids,

Table I. Analyses of Samples of Unit I Porto Rico Sweet Potatoes Harvested and Stored during 1952–53 Season

Storage of Raw Materials, Months	Shrinkage (Loss in Fresh Wt.), %	Dry Wt. (Fresh Wt. at Sampling), %	Carotene (Dry Basis), P.P.M.	Ascorbic Acid (Dry Basis), Mg./100 G.	Sugars (Dry Basis), %
0 days (fresh)	..	29	224	71	15
10 days (cured) 50° F.	2	30	...	70	16
1	3	31	230	50	22
2	3	28	252	53	31
3	4	29	235	52	31
4	4	29	206	40	37
5	4	26	225	24	38
6	6	27	240	32	42
7	8	31	185	15	45
60° F.					
1	7	28	264	64	19
2	8	29	253	77	21
3	10	30	228	73	20
4	10	30	189	55	22
5	10	29	196	63	22
6	12	29	229	67	24
7	13	29	225	56	27
70–75° F.					
1	13	31	203	59	18
2	10	28	233	61	18
3	13	29	208	64	18
4	14	29	199	67	22
5	17	31	151	56	23
6	19	29	179	59	23
70–75° F. for 2 months, then 60° F.					
1	10	31	233	62	21
2	11	29	227	59	17
3	10	29	190	57	22
4	13	31	193	54	24
5	14	30	211	55	25

Table II. Effect of Conditions of Storage of Raw Materials Harvested in 1952 on Properties of Freshly Dehydrated Sweet Potatoes

Storage of Raw Materials, Months	Moisture, %	Carotene (Dry Basis), P.P.M.	Ascorbic Acid (Dry Basis), Mg./100 G.	Extractable Color		Rehydration (Drained Wt./Solids)
				390 mμ	420 mμ	
0 days (fresh)	6.6	203	45	0.115	0.050	3.76
10 days (cured) 50° F.	6.1	229	..	0.237	0.115	3.66
1	5.7	217	..	0.141	0.073	4.00
2	6.2	260	33	0.561	0.278	3.89
3	4.6	218	43	0.345	0.175	3.87
4	6.4	224	41	0.277	0.160	4.12
5	8.4	252	32	0.590	0.295	4.04
6	5.5	243	31	0.605	0.325	4.63
7	6.7	297	30	0.620	0.310	4.18
60° F.						
1	6.0	226	..	0.285	0.145	3.74
2	5.9	264	30	0.228	0.115	3.81
3	4.8	206	42	0.205	0.107	3.96
4	6.6	182	41	0.275	0.150	3.98
5	7.6	226	31	0.355	0.180	4.07
6	5.3	260	30	0.400	0.220	4.09
7	6.4	267	29	0.395	0.200	3.98
70–75° F.						
1	5.7	252	..	0.323	0.163	3.78
2	5.8	254	24	0.258	0.129	3.83
3	3.9	205	36	0.345	0.180	3.91
4	6.4	187	40	0.237	0.130	4.29
5	6.6	197	35	0.345	0.177	4.02
6	5.2	171	31	0.345	0.180	4.09
70–75° F. for 2 months, then 60° F.						
1	4.8	175	35	0.237	0.125	4.00
2	6.1	204	39	0.312	0.166	3.93
3	7.4	218	33	0.312	0.162	3.91
4	5.3	181	35	0.305	0.160	3.96
5	6.1	203	30	0.315	0.152	3.93

were placed in a vacuum oven, and the samples were dried for 6 hours at 70° C. at a pressure of less than 100 mm. The dishes were covered and allowed to cool in a desiccator before weighing. The percentage of moisture in the original sample was calculated (*78*).

Ascorbic Acid. The visual titration method based on the reduction of 2,6-dichlorophenolindophenol by an acid solution of ascorbic acid was used (*3*). A 50-gram sample of dehydrated sweet potatoes was steeped under nitrogen for 15 minutes in a blender with 100 grams of 3% metaphosphoric acid. Then 150 grams of 6% metaphosphoric acid were added, and the mixture was blended until a homogeneous slurry was obtained. Thirty grams of the slurry were quantitatively transferred to a 100-ml. volumetric flask. Twenty milliliters of acetone were added to eliminate the effect of sulfite used during dehydration. Then the sample was diluted to 100 ml. with 3% metaphosphoric acid. The solution was clarified by centrifugation, and an aliquot titrated with 0.025% 2,6-dichlorophenolindophenol solution to a pink end point which persisted for 15 seconds. The dye solution was standardized each day by titrating against a freshly prepared ascorbic acid standard. In analyzing raw sweet potatoes, the initial slurry was composed of 150 grams of sample and 150 grams of 6% metaphosphoric acid. The content of ascorbic acid was reported as milligrams per 100 grams.

Carotene. The carotene was extracted from 2 grams of ground dehydrated sweet potatoes (or 5 grams of raw sweet potatoes) which had been saturated with water at 60° to 70° C., by means of 150 ml. of a foaming mixture, containing about 4 volumes of alcohol and 3 volumes of petroleum ether, in a blender for about 5 minutes. The residue was allowed to settle, and the supernatant liquid was decanted. Sufficient water was added to the liquid to adjust the concentration of alcohol to about 80%, and after the layers separated the alcohol was drawn off. The residue and alcohol solution were successively extracted with three additional 30-ml. portions of petroleum ether. Then all of the alcohol was removed from the petroleum ether solution by washing six to seven times with 100-ml. portions of water. The petroleum ether solution was concentrated to about 30 ml. by vacuum. A column of calcium diphosphate (about 9 cm. in length and 2.2 cm. in diameter with a small quantity of anhydrous sodium sulfate on top) was saturated with petroleum ether; then the solution containing the pigments was drawn through the column, followed by a wash of petroleum ether. The filtrate, containing the carotene which was separated from the other pigments on the column, was added to a volumetric flask

and brought to volume. The concentration of carotene—i.e., absorbance of the solution at 436 mμ—was determined and reported as parts per million of β-carotene in the original sample (*2*).

Sulfite. The sulfite content of the dehydrated product was determined by the method of Mosier and Williams as modified by Thompson and Toy (*21*). The sulfur dioxide was liberated from a 25-gram sample of product, ground to pass through a 20-mesh screen, by refluxing it with hydrochloric acid in an atmosphere of nitrogen. The sulfur dioxide was collected in 3% hydrogen peroxide solution, adjusted to pH 4 by means of 0.1*N* sodium hydroxide, and the resulting solution was titrated with 0.01*N* sodium hydroxide to pH 6. The sulfite was reported as parts per million.

Peroxidase Activity. A 15-gram sample of diced, blanched sweet potatoes was boiled in 150 ml. of distilled water for 5 minutes and then cooled to about 80° F. Gum guaiac in alcoholic solution (1.5 ml. of 2.5%) and hydrogen peroxide (1.5 ml. of 1%) were added to the sample. Five milliliters of gum guaiac solution and 5 ml. of hydrogen peroxide solution were added to a 50-gram, unboiled sample. The mixtures were allowed to stand for 15 minutes, and any blue coloration in the liquid of the 50-gram sample in excess of that of the boiled control indicated the presence of peroxidase (*18*).

Dehydration Test. About 50 pounds of sweet potatoes per dehydration test were washed, heated in water for 30 to 40 minutes at 130° to 135° F., and then dumped into a rotary lye peeler. The peeling conditions were as follows: lye concentration, 20 to 22%; temperature, 210° to 220° F.; time, 6 minutes. From the peeler the sweet potatoes were dropped into a rotary, spray water washer, where the lye and peelings were removed in 1 to 1.5 minutes. The peeled and washed potatoes were moved to a trimmer who manually cut off the ends and scar tissue. The potatoes were diced to 3/8-inch cubes directly onto the drying trays, until loaded to 1.5 pounds per square foot, and then blanched for 6 minutes in flowing atmospheric steam to a negative peroxidase test. The blanched potatoes were sulfited by spraying them for 2 minutes with a solution containing 2.1 parts of sodium sulfite and 0.7 part of sodium bisulfite per 1000 parts of water. The sweet potatoes were dehydrated in a cabinet dryer with approximately the following cycle: (1) 200° F. (dry bulb), 120° F. (wet bulb), for 3 hours; (2) 160° F. (dry bulb), 100° F. (wet bulb), for 1.5 hours, yielding a product having a moisture content of about 5%. The dehydration conditions outlined are typical of those yielding a satisfactory product. The products were stored in sealed, standard enamel cans in an atmosphere of nitrogen.

Table III. Effect of Conditions of Storage of Raw Materials and of Dehydrated Products

Storage of Raw Materials, Months	Storage Conditions of Dehydrated Products: −10° F. 9 weeks	−10° F. 18 weeks	−10° F. 27 weeks	75° F. 9 weeks	75° F. 18 weeks	75° F. 27 weeks	100° F. 9 weeks	100° F. 18 weeks	100° F. 27 weeks
Effect on Extractable Colors[a]									
0 days (fresh)	0.12	0.12	0.13	0.14	0.15	0.15	0.15	0.15	0.18
10 days (cured)	0.25	0.24	0.24	0.24	0.24	0.27	0.27	0.29	0.31
50° F.									
1	0.13	0.13	0.12	0.14	0.15	0.16	0.17	0.18	0.18
2	0.52	0.54	0.56	0.57	0.63	0.72	0.62	0.70	0.77
3	0.34	0.34	0.36	0.33	0.36	0.40	0.39	0.42	0.44
4	0.38	0.42	0.39	0.41	0.48	0.56	0.44	0.54	0.62
5	0.47	0.70	0.68	0.56	0.81	0.84	0.63	0.90	0.99
6	0.55	0.66	0.68	0.66	0.69	0.83	0.73	0.82	0.96
7	0.62	0.80	...	0.68	0.84	...	0.78	0.99	...
60° F.									
1	0.26	0.27	0.25	0.28	0.35	0.27	0.31	0.32	0.29
2	0.22	0.25	0.27	0.24	0.21	0.32	0.24	0.32	0.32
3	0.22	0.21	0.20	0.22	0.20	0.22	0.22	0.22	0.25
4	0.26	0.31	0.30	0.33	0.37	0.33	0.35	0.34	0.39
5	0.33	0.39	0.39	0.36	0.44	0.44	0.44	0.50	0.52
6	0.38	0.37	0.41	0.38	0.44	0.46	0.46	0.52	0.53
7	0.37	0.48	0.45	0.41	0.52	0.53	0.47	0.72	0.71
70–75° F.									
1	0.31	0.36	0.27	0.35	0.40	0.32	0.38	0.35	0.35
2	0.25	0.29	0.29	0.27	0.28	0.38	0.27	0.35	0.37
3	0.31	0.33	0.32	0.32	0.35	0.39	0.34	0.37	0.43
4	0.25	0.28	0.26	0.28	0.32	0.34	0.31	0.36	0.38
5	0.29	0.34	0.36	0.36	0.36	0.41	0.32	0.41	0.27
6	0.36	0.36	0.37	0.38	0.41	0.42	0.42	0.48	0.46
70–75° F. for 2 months, then 60° F.									
1	0.23	0.23	0.25	0.24	0.24	0.28	0.26	0.27	0.30
2	0.23	0.28	0.25	0.24	0.30	0.31	0.28	0.33	0.36
3	0.32	0.33	0.33	0.32	0.35	0.42	0.34	0.40	0.46
4	0.30	0.33	0.33	0.33	0.31	0.39	0.41	0.41	0.44
Effect on Carotene Content[b]									
0 days (fresh)	183	143	177	183	149	146	177	149	121
10 days (cured)	212	190	204	210	169	208	206	167	175
50° F.									
1	266	177	221	224	181	209	224	182	218
2	205	248	226	224	206	211	212	195	212
3	212	255	240	226	252	227	229	246	212
4	280	244	282	244	230	241	258	230	226
5	288	271	273	295	249	263	288	228	278
6	244	260	252	265	253	244	246	225	200
7	250	260	...	233	250	...	230	250	...
60° F.									
1	244	203	241	232	197	236	228	207	231
2	216	253	223	199	205	210	192	193	201
3	211	236	218	214	239	183	208	224	198
4	251	223	241	218	198	233	254	191	230
5	248	232	249	265	223	240	253	224	239
6	257	265	261	249	248	231	225	240	210
7	216	238	237	230	230	212	224	206	196
70–75° F.									
1	225	231	227	214	198	207	193	169	201
2	199	241	215	204	200	210	196	201	202
3	231	245	226	214	255	202	213	247	201
4	234	208	227	235	209	193	242	209	183
5	221	198	197	226	182	197	216	188	199
6	155	193	176	167	196	164	177	178	164
70–75° F. for 2 months, then 60° F.									
1	200	195	215	194	211	182	190	211	180
2	251	224	240	250	206	221	230	217	196
3	238	214	230	229	216	237	234	214	207
4	195	205	177	178	190	170	167	188	181
5	181	185	186	186	191	180	175	181	175

[a] Absorbance of extracts measured at 390 mμ; values determined at 420 mμ indicate similar trends.
[b] Reported as p.p.m. (dry basis).

Extractable Color. The degree of nonenzymatic browning, as defined by Hendel, Bailey, and Taylor (*9*), was determined by measuring the absorbances at 390 and 420 mμ of aqueous, buffered, alcoholic extracts of the dehydrated products. A 10-gram ground sample, passing through 40-mesh screen, was thoroughly shaken for 1 hour with an extracting solvent composed of 75 ml. of ethyl alcohol (95%), 55 ml. of water, and 20 ml. of 0.5*M* phosphate buffer (pH 4.5). The mixture was allowed to settle for 10 minutes, and then the supernatant was decanted. An aliquot of the supernatant was clarified by centrifugation at 16,000 relative gravities for 15 minutes, and examined spectrophotometrically.

Rehydration. The rehydration properties of the dehydrated products were determined, as follows: sixty grams of diced, dried product were weighed into a 500-ml. flask; 240 grams of distilled water were added, and then the product was allowed to soak for 15 minutes; the mixture was brought to a boil in 10 to 15 minutes, under a reflux condenser to prevent loss of water; then the product was allowed to simmer for 30 minutes, and the rehydrated product and excess water were poured into a Büchner funnel and allowed to drain for 2 minutes. A drained weight was determined, and the volume of excess water and the dissolved solids which it contained were measured. The moisture contents of the drained, reconstituted product and of the original raw stock were compared.

Sugar. Sugars were determined by heating an aqueous extract of the products with alkaline ferricyanide (*16*). The decrease in the initial yellow color is directly proportional to the quantity of sugar present and was measured quantitatively with a photoelectric colorimeter. The results were compared with a standard curve relating sugar concentrations to the colorimeter readings.

Shrinkage. The losses in weight of about one half crate of sweet potatoes (25 pounds) during the indicated conditions of storage were determined periodically. Shrinkage was calculated by dividing the observed loss in weight by the initial weight of the sweet potatoes when placed in storage.

Materials

The investigations were conducted during the 1951–52 and 1952–53 seasons on sweet potatoes of the Unit I Porto Rico variety grown in Louisiana. The potatoes were harvested about November 1, cured for 10 days at 85° F. and 80 to 85% relative humidity, and then placed in storage at the Louisiana Agricultural Experiment Station. Samples were shipped (approximately 3 hours' traveling time) periodically to the Southern Regional Research Laboratory for processing. The analyses of potatoes during the two seasons were substantially in agreement. The analytical data for the raw materials harvested in 1952 are given in Table I.

Shrinkage (loss in fresh weight) increases with increasing temperature and time of storage; the percentage of dry weight is about constant; the carotene content is more stable at a storage temperature of 60° F.; the ascorbic acid content decreases at a storage temperature of 50° F. but is relatively stable at 60° and 70° to 75° F.; and the sugar content increases to a much greater value at 50° F. than at 60° or 70° to 75° F.

Results

Properties of Freshly Dehydrated Sweet Potatoes. The effects of conditions of storage of raw materials harvested in 1952 on the properties of freshly dehydrated sweet potatoes are shown in Table II. The carotene contents of products prepared from sweet potatoes stored for 1 to 7 months at 50° or 60° F. are relatively constant and higher than the carotene contents of products stored at 70° to 75° F.; comparing data from Tables I and II, the amount of carotene was not materially reduced by dehydration; although the retention of ascorbic acid in the raw sweet potatoes was dependent on time and temperature of storage, the dehydrated products contained about the same amounts of ascorbic acid; storage of raw materials at 50° F. resulted in an increase in the extractable color of derived products as compared with products stored at 60° or 70° to 75° F.; and the rehydration of the products was apparently independent of the conditions of storage of the raw materials.

Extractable Color of Dehydrated

Table IV. Effect of Conditions of Storage of Raw Materials and of Dehydrated Products

Storage of Raw Materials, Months	Storage Conditions of Dehydrated Products: −10° F. 9 weeks	−10° F. 18 weeks	−10° F. 27 weeks	75° F. 9 weeks	75° F. 18 weeks	75° F. 27 weeks	100° F. 9 weeks	100° F. 18 weeks	100° F. 27 weeks
Effect on Ascorbic Acid Content[a]									
0 days (fresh)	49	53	42	51	49	39	40	40	33
50° F.									
2	47	42	25	42	32	27	34	29	23
4	36	34	34	34	32	22	22	26	19
6	25	26	21	25	22	20	20	19	16
60° F.									
2	43	41	30	40	28	28	34	24	21
4	34	30	33	37	21	23	27	21	21
6	28	30	29	25	25	22	24	22	19
70–75° F.									
2	43	38	32	37	29	29	33	22	27
4	34	31	33	35	26	23	30	21	19
6	27	27	26	27	22	20	20	23	17
70–75° F. for 2 months, then 60° F.									
2	33	33	35	34	24	25	28	17	20
4	30	30	28	27	24	23	22	19	17
Effect on Rehydration Properties[b]									
10 days (cured)	4.13	3.63	3.82	3.58	3.62	3.67	3.69	3.67	3.60
50° F.									
1	3.98	3.98	3.88	4.00	4.12	3.93	3.95	3.98	4.05
3	3.75	3.95	4.00	3.91	3.98	4.05	3.84	3.98	3.89
5	...	4.18	4.07	3.84	4.09	4.00	3.96	4.13	...
7	4.14	4.16	...	4.09	4.09	...	4.07	4.16	...
60° F.									
1	3.89	3.78	3.87	3.73	3.93	3.91	3.89	3.95	3.93
3	3.78	3.91	3.78	4.00	3.91	3.84	3.87	3.87	3.93
5	3.93	3.98	4.02	3.93	4.07	3.93	4.00	3.98	3.91
7	4.14	4.04	4.11	4.09	4.00	4.04	4.07	4.20	4.02
70–75° F.									
1	3.74	3.76	3.89	3.93	3.57	3.93	3.93	3.78	3.84
3	3.91	4.14	3.96	4.04	4.02	4.00	4.04	4.00	4.09
5	4.07	4.16	4.07	4.11	4.09	4.02	4.09	4.05	4.05
70–75° F. for 2 months, then 60° F.									
1	3.84	3.63	3.89	3.86	3.95	3.98	3.86	3.82	3.91
3	4.11	4.04	4.09	3.89	4.02	3.98	4.02	4.09	4.02
5	3.98	3.91	3.98	3.98	3.93	4.00	3.98	4.02	3.96

[a] Reported as mg./100 g. (dry basis).
[b] Reported as drained wt./solids.

Products. The effects of conditions of storage of the dehydrated products on their extractable colors are shown in Table III. In general, there was very little change in the color of the dehydrated products packaged in nitrogen and stored at −10°, 75°, and 100° F. for 0 to 27 weeks, except in the case of products derived from raw sweet potatoes which had been stored at 50° F. These products tended to increase in extractable color with increasing time in and temperature of storage.

Carotene of Dehydrated Products. The effects of conditions of storage on the carotene contents of the dehydrated products are shown in Table III. The carotene was relatively stable, as the products were packaged in an atmosphere of nitrogen. However, there is a measurable decrease in carotene with increasing time in and temperature of storage.

Ascorbic Acid of Dehydrated Products. The effects of conditions of storage on the ascorbic acid contents of the dehydrated products are shown in Table IV. The content of ascorbic acid decreased with increasing time in and temperature of storage.

Rehydration of Dehydrated Products. The effects of conditions of storage on the rehydration properties of dehydrated products are also shown in Table IV. These properties are apparently independent of the conditions of storage of either the raw materials or the dehydrated products.

Processing Materials Balance. The data presented in Table V are of economic significance in the production of dehydrated sweet potatoes. The quantity of raw material is given on an "as is" basis at the time of withdrawal from storage or on an "original basis" allowing for shrinkage during storage, required to produce a unit quantity of dehydrated product.

Data on organoleptic evaluation of products are being reported separately.

Table V. Effect of Conditions of Storage of Raw Materials on Processing Materials Balance

Storage of Raw Materials, Months	Raw Materials, Lb.	Peel Loss (Raw), %	Trim Loss (Raw), %	Raw Material/Dehydrated Product, Lb./Lb.	
				Original raw	As is raw
0 days (fresh)	44.8	22	7	5.3	5.3
10 days (cured)	45.5	22	6	5.0	4.9
50° F.					
1	45.6	29	5	7.0	6.8
2	48.0	28	3	6.3	6.1
3	46.8	30	6	6.7	6.4
4	45.4	31	4	6.5	6.2
5	44.0	29	9	7.0	6.8
6	44.1	30	3	7.6	7.1
7	45.9	35	10	12.8	11.8
60° F.					
1	44.9	26	5	6.5	6.1
2	44.0	23	4	5.7	5.2
3	38.8	22	4	6.0	5.4
4	41.8	27	6	6.4	5.7
5	40.8	26	6	6.5	5.8
6	41.0	27	2	7.2	6.3
7	44.9	31	6	8.3	7.2
70–75° F.					
1	37.9	24	4	6.1	5.3
2	44.1	27	3	7.1	6.4
3	38.8	29	8	7.8	6.8
4	36.3	26	8	6.6	5.7
5	31.8	27	10	7.2	6.0
6	37.8	28	4	7.8	6.3
70–75° F. for 2 months, then 60° F.					
1	41.1	27	7	6.1	5.5
2	43.2	29	4	6.6	5.9
3	40.8	26	6	6.5	5.8
4	37.4	25	2	6.6	5.8
5	43.2	30	7	7.8	6.8

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