

Determination of Sugar Beet Purity by Use of Mechanical Blenders

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The standard method of determining the apparent purity of beets has certain factors involved which introduce errors that are difficult to cope with when making an analytical analysis of elimination and factory operation.

To mention a few of the errors, we have: 1. the error introduced by pressure variations peculiar to the hydraulic press used; 2. condition of the press cloth both as to weight and sanitation; 3. the probability as to the degree of rupture of the individual cells or the degree of true representation of the expressed juice vs. the juice contained in the beet cells. The combination of these factors plus others make reproduceable results difficult and at times impossible.

In order to overcome these objections and to bring the analysis more directly under supervision the study of the use of the Waring Blender to replace hydraulic or manual presses has been made.

Table 1 represents the comparison between the conventional press juice and the blender extract. The press juice was obtained under as nearly ideal conditions as possible. Blending time in all cases was five minutes. The following data were taken from portions of the same lot of beets.

Table 1.

Sample No.	A. P.	Dev.	S. A. T. P.	Dev.	Per 100 Sugar based on A. P.			
					Raff	Ash	Invert	Amino N.
Press	85.7	.2	83.18	.11	.47	4.62	2.25	(N x 7.5) 5.16
Press	86.1	.2	83.89	.10	.62	4.47	2.01	3.92
Avg.	85.9		85.29		.55	4.55	2.13	4.54
Blended Samples								
1	85.3	0	84.65	.11	.62	4.22	2.10	4.66
2	85.6	.3	84.84	.08	.60	4.25	2.15	5.17
3	85.0	.3	84.47	.29	.51	4.26	2.13	4.50
4	84.8	.5	84.13	.63	.53	4.19	2.04	4.60
5	85.9	.6	85.42	.94	.44	4.12	1.99	4.19
6	85.4	.1	85.04	.28	.40	4.18	1.99	4.30
Avg.	85.3		84.76		.52	4.20	2.07	4.57

Blending 250 grams ground cossettes with 240 ml. dist. water. Sample 1 was blended at room temperature. Sample 2 was blended at 80° C. Samples 3, 4, 5, 6 were blended after adding 240 ml. boiling dist. water to 250 grams of ground cossettes.

From the data on the blended samples it is found that all of the measured factors are in close agreement. This indicates that equilibrium is well

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established even when blended at room temperatures. In each case the weight of cossettes approximately equaled the weight of water. This mixture produces about a 9.0 Brix sample of sufficient volume to run all the analyses usually required.

The procedure adopted for our standard method of analysis is as follows:

Couple the blender through an interval timer so that after the allotted blending time the apparatus is automatically shut off.

Blend approximately 250 grams of ground cossettes with 250 ml. boiling distilled water for exactly five minutes $\pm$ 15 seconds. Separate the liquid from the pulp immediately either by using toweling or by vacuum with a Buchner funnel fitted with a filter cloth. Cool the sample to 20° C. and complete the analysis as soon as possible, using the refractometer and either wet or dry lead methods.

Table 2 shows a brief study to determine proper blending times.

Table 2.

Control Sample	Blending			Blending			Blending			A.P.	Dev.
	A.P.	Dev.	Blended Time Sample (min.)	A.P.	Dev.	Blended Time Sample (min.)	A.P.	Dev.	Blended Time Sample (min.)		
Press 1	85.1	.2	1	3	85.1	.0	6	5	85.4	.1	
Press 2	85.5	.2	2	3	85.2	.1	7	5	85.1	.2	
Press 3	85.3	.0	3	3	84.8	.3	8	5	85.4	.1	
			4	3	84.7	.4	9	5	85.3	.0	
Avg.	85.3	.1	5	3	85.7	.6	10	5	85.5	.2	
			Avg.		85.1	.28			85.3	.12	
			Est. % Error	3		$\pm .46\%$			5		$\pm .16\%$

The relative percent error for a five-minute blending time is smaller than the error found in the three-minute period. For this reason the five-minute period is to be preferred.

This same method is applicable for rasped beets in tare laboratories when apparent purity or true purity data are required. With this type of material, blending time can be reduced to not less than three minutes without loss of accuracy.

After using this method in all factories the past campaign the author finds the method is to be preferred to the old press juice method and is more reliable. Cost of equipment is definitely not prohibitive and can easily be obtained from suppliers of laboratory equipment.