CONSISTENCY STUDIES ON CREAM STYLE CORN

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This year terminates our study of consistency in cream style corn. During the past three years we have been concerned with first; determining the best method available for measuring consistency in cream style corn and secondly; determining the factors which effect the consistency of cream style corn and how variations in these factors will effect the overall quality of the corn.

A previous report has discussed the instruments for measuring consistency. The following factors are included as those which will have a direct effect on the consistency:

1. Variety
2. Maturity
3. Formula
   a. Water
   b. Starch - amount and type
4. Washed - drained residue, or percentage of whole kernels present
5. Storage Temperature

Last year's report covered the factors of variety, maturity, and water, and to some extent storage temperatures and washed-drained residues. The emphasis for the past season has been on the amount and type of added starch.

The processing methods, quality evaluations, and formulation are basically the same as used in previous years. The variations in the formulation were; the amount of added water, which was determined by the corn maturity, and the amount and type of added starch. The added water percentage ranged from 15.5% to 27.0%. The added starch percentage ranged from 0% to 1.4%. The types of starch used in this year's study are as follows:

1. Amaizo Fluftex. A thin boiling, linear corn starch.
2. W-13 Stabilizer. A waxy maize, or branched, corn starch.

All data and results included in this report refer to the variety 'Deep Gold' exclusively.

The amount of added starch has a pronounced effect on the consistency, as shown by Table 1. This significant increase in consistency as the starch is increased is also apparent in the samples which were stored at 40°F. and 90°F., as well as those stored at room temperature. The average increase in consistency from the filler through the storage periods, is also shown in Table 1, and is highest in the samples containing 1.0% starch, and not in those containing a 1.4% starch concentration as would be expected.

Table 1 also permits comparison of the setting-up efficiency of the linear starch (Fluftex) to the waxy maize starch (W-13). The waxy maize starch, although it has a lower Adams value at the filler, sets-up as well as and in many cases better than the linear starch. Also, the average increase in consistency from the filler through the storage periods is higher in the waxy maize starch samples, 0.25 Adams values for the 0.4% and 1.4% starch samples, and 1.0 Adams values in the 1.0% starch samples.

There is one more aspect which must be considered in discussing starch type. This is the retrogradation of the starch which occurs in storage. When retrogradation occurs the starch looses its water holding capacity and releases much of the bound water. When this occurs in a can of cream style corn the kernels will sink to the bottom of the can and the starchy cream remains as a watery mass at the top of the can. Fortunately retrogradation is reversible and a thorough shaking of the can will eliminate it completely.

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However, it will occur again on standing. Retrogradation occurs quite readily in the linear starches, but not in the waxy maize starches. Thus, a can of unshaken cream style corn containing a waxy maize starch looks virtually the same as a similar can of shaken cream style corn, while an unshaken can of cream style corn containing a linear starch has a very unappetizing appearance in comparison to a similar can which has been shaken.

Table 2 shows the effect of storage temperature on the consistency of cream style corn. The average set-up of consistency from the filler through the storage periods is the same for the samples with no added starch. In the samples with the lowest concentration (0.4%) of waxy maize starch the 90°F. samples had the highest set-up and at the increased starch concentrations (1.0% and 1.4%) the 40°F. samples had the thicker consistency while the room temperature and 90°F. samples were about the same. When the linear type starch was used the 40°F. samples were considerable thicker at the 1.0% and 1.4% starch concentrations, while the 90°F. samples were comparatively thinner at the 0.4% starch concentration. In comparing the two types of starches at the different storage temperatures, it can be concluded that the storage temperature had a greater effect on the linear starch samples than on the waxy maize starch samples.

In summary, this study has shown that the factors of variety, maturity, added water, and added starch all have a highly significant effect on the consistency of cream style corn. The variety of corn must be considered important because the 'pasting' characteristics of the inherent starch will determine the setting-up pattern of the finished product.

The maturity of the corn can be directly associated with the amount of added water. Through a quick test for maturity, such as percent moisture or specific gravity, a given amount of water can be added to give the desired consistency, provided the added starch concentration remains constant. We have found that the added water may be increased as much as 5-fold as the maturity of the corn increases.

The added starch also has a significant effect on the consistency. However, the amount of added starch is far more important than the type of starch which is used. The amount of added starch improves not only the consistency, but the overall quality of the cream style corn, to such a point that it is doubtful if any advantages could be derived from packing cream style corn without the addition of starch.

The washed-drained residue will have little effect on the corn if it is kept between 35 to 50 percent kernels. Extremes either way could, of course, have a decided effect on the consistency.

The storage temperature appears to have only a minor effect on consistency, however, storage at higher temperatures will tend to decrease the overall quality of the cream style corn.

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TABLE 1

THE EFFECT OF STARCH ON THE CONSISTENCY OF CREAM STYLE CORN

STARCH CONCENTRATION — ADAMS VALUES (Samples at room temperature storage)

		STORAGE TIME (in weeks)						
	FILL (190°)	2	4	6	8	10	12	AVERAGE INCREASE
No Starch	0	2.5	1.75	1.75	1.75	2.0	1.5	1.75
0.4% W-13	0.5	3.4	3.25	4.0	3.0	3.0	3.25	2.75
1.0% W-13	1.75	5.75	5.25	6.0	5.5	5.5	6.0	4.0
1.4% W-13	5.5	8.25	7.75	8.0	8.5	7.25	8.5	2.5
0.4% Fluftex	0	2.25	2.0	2.25	1.5	2.25	1.5	2.0
1.0% Fluftex	0	2.75	3.0	3.75	2.75	3.5	2.75	3.0
1.4% Fluftex	5.5	8.0	7.75	8.0	7.75	7.5	7.75	2.25

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TABLE 2

THE EFFECT OF STORAGE TEMPERATURE ON CONSISTENCY

TREATMENT	STORAGE TEMP.	ADAMS VALUES STORAGE TIME (in weeks)						AVERAGE INCREASE
		FILL (190°)	2	4	6	8	10	12	
No Starch	40°	0	2.0	1.5	2.0	1.75	2.0	1.5	1.75
	75°	0	2.5	1.75	1.75	1.75	2.0	1.5	1.75
	90°	0	1.75	2.5	1.25	1.75	1.75	1.75	1.75
0.4% W - 13	40°	1.5	2.5	2.75	3.5	3.25	3.25	3.0	2.5
	75°	0.5	3.5	3.25	4.0	3.0	3.0	3.25	2.75
	90°	0.5	3.5	3.5	3.25	3.75	3.5	3.5	3.0
1.0% W - 13	40°	1.5	5.5	5.75	6.0	6.0	5.75	5.75	4.25
	75°	1.75	5.75	5.25	6.0	5.5	5.5	6.0	4.0
	90°	1.5	5.5	5.5	5.25	6.0	5.5	5.25	4.0
1.4% W - 13	40°	5.5	9.0	9.75	9.75	9.0	9.0	9.0	3.75
	75°	5.5	8.25	7.75	8.0	8.5	7.25	8.5	2.5
	90°	5.75	8.5	8.25	8.5	8.5	8.5	8.25	2.5
0.4% Fluftex	40°	0.5	2.75	2.5	2.5	2.75	2.75	2.25	2.0
	75°	0.75	3.0	2.75	2.75	2.25	3.0	2.25	2.0
	90°	0.5	2.25	2.0	2.75	2.25	2.0	1.75	1.5
1.0% Fluftex	40°	2.25	6.0	6.5	6.5	6.5	6.75	7.0	4.25
	75°	2.5	5.25	5.75	6.25	5.25	6.0	5.25	3.0
	90°	2.25	6.0	5.5	5.5	5.25	5.25	5.25	3.25
1.4% Fluftex	40°	5.0	8.75	9.25	9.25	9.0	9.75	9.5	4.25
	75°	5.5	8.25	7.75	8.0	7.75	7.25	7.75	2.25
	90°	5.0	7.75	7.25	7.25	7.25	7.0	7.25	2.25

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