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Effects of Freezing on a Modified Cream Pie Filling

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Although frozen storage of foods has been highly successful, the usual formula for starch sauces has resulted in a product of granular, undesirable composition. Waxy type starches have given more satisfactory results for frozen sauces, puddings, or pie fillings than have the common cereal starches available to homemakers. However, even with the waxy or low amylose starches, Hanson *et al.*, (1951) found a slight liquid separation after prolonged freezer storage. Heating after frozen storage and thawing improved the appearance of sauces in which syneresis had occurred (Hanson *et al.*, 1951). Snow and Briant (1960) utilized this reversal in appearance and found that lemon pie fillings handled in this way resembled freshly made products.

In previous work in this laboratory a formula was developed for a cream pie filling which was thickened with flour and egg yolk and which contained a small amount of gelatin (Christy *et al.*, 1963). It was the purpose of this study to evaluate the qualities of this pie filling when held under conditions simulating home freezer storage.

PROCEDURE

Cream pie fillings (vanilla, chocolate, and lemon flavored) were frozen in baked shells and evaluated by a six member taste panel. Using a fresh pie as a control, frozen products were evaluated after storage periods of one day, one week, one month, and two months.

Formula

Ingredients and amounts required for the basic cream pie and its variations are listed in Table 1. The dry ingredients (sugar, flour, salt, and gelatin) were mixed together; the egg yolks and 1/2 cup of milk were added and the mixture was blended with a rotary beater. The remaining milk was scalded in a heavy pan, then stirred into the egg-milk mixture and cooked over medium heat, stirring constantly until bubbles formed around the edge of the mixture.

The heat was reduced to low, and the cooking was continued for 1.5 minutes, after which the pan of pie filling was set in cold water. Butter and flavoring were stirred into the filling. After cooling (75°F), the filling was poured into a baked pie shell. Throughout the entire study, oil pastry was used for the pie shells (Cunningham, 1960).

The filled pie shell was frozen, and then covered with a light weight aluminum pie pan, sealed in a polyethylene bag, and stored in an upright home freezer (-10°F) until thawed for testing. The aluminum pie pan was used to cover the frozen product in order to prevent the formation of ice crystals on the surface of the pie filling. One and one half to two hours at room temperature were required for defrosting. At the time of sampling the internal temperature of the fillings averaged 37°F.

TABLE 1 - INGREDIENTS FOR FROZEN CREAM PIE

Type of Filling	Ingredients	Weight	Approximate Measure
Vanilla cream		g	
	Sugar	100	$\frac{1}{2}$ c
	Flour	16	2 Tbsp.
	Salt	3	$\frac{1}{2}$ tsp.
	Gelatin	3	1 tsp.
	Egg yolk	38	2
	Milk	488	2 c
	Vanilla		1 tsp.
	Butter		1 Tbsp.
Chocolate cream	Cocoa (added to ingredients)	21	3 Tbsp.
Lemon-flavored cream	Lemon juice (substituted for vanilla)	45	3 Tbsp.

Sampling

Judging was conducted in an air conditioned room especially designed for organoleptic testing. Taste panel members, seated in individual, artificially lighted booths, rated pie fillings for flavor, texture, appearance, and consistency, using a scale ranging from 5, very good, to 1, very poor. Two plates, each including one wedge from vanilla cream pies representing each storage period, were scored by each judge. Pies were cut into 12 pieces so that two observations per judge per pie were made.

Chocolate and lemon-flavored cream pies were evaluated on two days of testing. The storage periods and conditions were the same as those for the basic vanilla cream pie except that one plate of samples consisted of chocolate and the other of lemon-flavored fillings.

RESULTS AND DISCUSSION

Preliminary work indicated that flour and gelatin in the pie filling resulted in greater stability in texture and consistency than did corn-starch and gelatin. However, Hanson *et al.* (1953) reported that gelatin played a minor role when used in combination with waxy rice flour to prevent syneresis in frozen sauces. Wheat flour alone was found by Jordan (1961) to be a satisfactory thickening agent for frozen white sauces if the sauces were heated prior to serving. A small amount of gelatin used along with flour in the formula reported herein gave satisfactory results for one month of frozen storage.

Mean scores for the vanilla cream filling showed that the judges considered it to be good in texture, flavor, appearance, and consistency through one month of frozen storage, but there was a decided change in texture, appearance, and consistency after the one month storage period. Although the chocolate cream filling did not rate as well in appearance and consistency, it was scored good in the other characteristics through the one month storage period (Table 2). The lesser degree of stability to frozen storage was in agreement with the findings of Hanson *et al.* (1953). The lemon flavored pie filling was considered fair in all characteristics when judged at the end of one month (Table 2). Even at the end of two months storage none of the experimental fillings demonstrated evidence of liquid separation.

In agreement with Snow and Briant (1960) it was felt that comparatively short storage periods (four to six weeks) are sufficient to allow homemakers to include pies as desserts and yet reduce preparation procedures on the day of the meal.

Other workers have reported satisfactory results with frozen lemon pie fillings which were heated over hot water and then poured into baked shells (Snow and Briant, 1960). The procedure for preparing and handling the fillings in this study was simplified so that a minimum of manipulation was required. The one pan in which the milk was scalded was the only cooking utensil. No treatment other than defrosting was needed prior to serving the pie. Several simple toppings were developed to add interest and variety. Thickened fruit sauces, crumb toppings, toasted coconut, or shredded chocolate were found to be appropriate garnishes when added to the pie when it was removed from the freezer.

Commercial cream pies, when evaluated by laboratory personnel, were found inferior to the experimental product in all qualities. The commercial pies containing egg were more similar to the laboratory product in consistency than the so called cream pies. However, these pies required baking before serving. Cream pies available on the market are fluffy in consistency and demonstrate a marked tendency to coat the mouth. It is of interest to note that gelatin is one of the ingredients included in both the commercial and the laboratory products. Mono- and di-glycerides, not available to the homemaker, are also included in the commercial products.

TABLE 2 - MEAN TASTE PANEL SCORES* FOR CREAM PIES HELD IN FROZEN STORAGE (-10° F) DIFFERENT LENGTHS OF TIME

Type of Filling**	Storage period	Texture	Flavor	Appearance	Consistency
Vanilla cream	Fresh	4.8	4.7	4.8	4.7
	1 day	4.5	4.4	4.4	4.3
	1 week	4.4	4.4	4.2	4.3
	1 month	4.3	4.3	4.3	4.3
	2 months	3.5	4.0	3.3	3.5
Chocolate cream	Fresh	4.7	4.7	4.8	4.8
	1 day	4.6	4.9	3.9	4.1
	1 week	4.3	4.4	3.9	4.1
	1 month	4.0	4.0	3.4	3.5
	2 months	3.3	3.2	3.7	3.6
Lemon-flavored cream	Fresh	4.7	4.3	4.7	4.7
	1 day	4.6	4.2	4.6	4.5
	1 week	3.8	3.7	3.5	3.6
	1 month	3.8	3.1	3.7	3.4
	2 months	2.8	3.6	3.3	3.3

*Scoring; 5, very good; 4, good; 3, fair; 2, poor; 1, very poor.

**Formula given in Table 1.

SUMMARY

Vanilla, chocolate, and lemon-flavored cream pie fillings including flour and gelatin as ingredients were evaluated by a taste panel after being held in frozen storage through two months. A simplified procedure was used for preparing the filling, and the frozen product required no handling other than defrosting. Mean scores for texture, flavor, appearance, and consistency of the vanilla cream filling showed the product was considered good through one month of frozen storage. Chocolate and lemon-flavored fillings were not as stable to frozen storage as the vanilla cream filling but were considered fair and superior to commercial products available in this locality. Even after two months of frozen storage no liquid separation was evident in any of the products.

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