should cause a partial drying of the seeds and a coagulation of proteinaceous material. This pre-treatment is not considered necessary (it may be if the seeds are especially damp) since hereby it would be very easy to obtain low values. These low values are found because the fat residue is very difficult to extract after this treatment, especially when petroleum ether is used as solvent. The extraction should be carried out for 4 + 4 hours. In most cases 3 + 3 hours is sufficient, however for standard procedure an extraction of 4 + 4 hours is to be used. For oil cake and meal which contain only a small amount of fat, a first extraction of three hours and a second of one hour following the usual grinding is sufficient.

F. ITALY

(1) It is necessary to differentiate between an *"oil seed analysis"* and a *"determination of oil content in oil seeds."* In the first case we propose the German wording with the omission previously stated, for the determination of oil content of oil seeds, the following is proposed:

1. The solvent used must be stated in the investigation report. It is desirable that the solvent be stated in the separate contracts. As solvent, the following may be used: Petroleum ether, ethyl ether, and carbon disulfide. If the kind of solvent is not stated in the investigation report, petroleum ether is to be used. If the seeds contain important amounts of surface moisture (unnatural moisture), they are dried before crushing. The seeds are then ground in a mill which gives sufficiently fine grinding; 20-30 g. of the material so prepared is weighed into an extraction thimble and placed in a Soxhlet. The Soxhlet shall be equipped with a stop cock which regulates the speed of flow, also Soxhlets with standard taper joints may be used. The cock is then closed, an amount of solvent sufficient for extraction poured into the Soxhlet and the ground material allowed to stand in the solvent over night (14 to 15 hours). The following morning the stop cock is opened and the extraction begun. The distillation and reflux shall be so regulated that the solvent should run through 6-8 times per hour in a 200 cc. Soxhlet. After four hours the extraction is stopped, and the thimble removed from the apparatus. The residue is spread on a surface which is as large as possible, and the solvent driven off. The residue is ground in a mill to pass a sieve of 256 meshes per square centimeter. The residue is again placed in the thimble and extracted 2-3 hours more. After driving off the solvent, the residue is dried to constant weight at 105°. The constant weight is reached when two consecutive weighings differ by no more than 5 mg.

2. It is recognized as necessary to measure the fineness of the ground seed by means of a sieve. Since this is not always possible in seeds containing oil, the measurement should be made after the first extraction, as specified above. There are seeds, for example, grape seeds, whose strong woody cell walls are penetrated by the solvent with difficulty. The determination of fineness assumes importance on this account. The desired fineness is reached when the seed meal will totally pass a sieve of 256 meshes per square centimeter.

The Effect of Glyceryl Monostearate on the Baking Properties of Cakes

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Within the last few years various substances known as "addition agents" have been patented and used by certain commercial firms for the improvement of shortening. The role of these agents in baked products, for the most part, appears to be that of a stabilizer which, by virtue of its emulsifying properties, produces an unusually smooth, well-combined batter with a capacity for carrying relatively large amounts of sugar and moisture and with a marked resistance to variable conditions of baking and handling.

In cakes, especially those made with a high proportion of sugar and/or liquid to flour, the main beneficial effect of addition agents is to decrease markedly the customary tendency of such cakes to shrink during baking and cooling (2, 4, 7). Thus, successful high-sugar, high-moisture cakes, which are of particular commercial interest because they are described as having advantages over ordinary cakes not only in volume but also in color, texture, flavor, grain, keeping quality, and cost, have been made possible by the inclusion of suitable addition substances in the formulae (1, 2, 4). As far as characteristics other than volume are concerned in cakes made from conventional proportions of ingredients, at least one worker (4) claims to have obtained better color, texture, grain, and keeping qualities with an addition agent than without one. Of course, it should be borne in mind that the specific effects produced in a baked product by an improving substance may vary widely with the type and quantity of the substance used as well as with the baking formula and method of combining ingredients.

In view of the fact that most of the work found in the literature on addition agents seemed to emphasize their use with formulae of the high-sugar, high-moisture type, the study about to be reported was undertaken to determine the effect of such a substance, a glyceryl monostearate preparation, with several basic types of fats on the characteristics of a plain cake made from a conventional recipe.

The experimental work of the study included the baking and testing of cakes made both with and without a monostearate addition agent; using as shortenings butter, a type of hydrogenated vegetable oil, a modified lard which was partially hydrogenated, and an oleomargarine consisting of 100 per cent hydrogenated cottonseed oil with a saponification value of 190 to 192. As a matter of interest, a commercial preparation of monoglycerides whose exact composition was not available was employed as the improving substance for one additional group of butter cakes.

As it was finally incorporated into the batter the monostearate preparation was really a substitute for 1.7 per cent of the total shortening of the cake formula, approximately 1.5 per cent being glyceryl monostearate, 0.1 per cent free stearic acid, and the other 0.1 per cent potassium stearate. On the other hand, the commercial monoglyceride mixture was substituted for 5.0 per cent of the total shortening in accordance with directions which accompanied it.

Since the glyceryl monostearate preparation is not plastic at ordinary temperatures it was necessary to melt it with some of the basic shortening so that the product, when properly cooled to room temperature, could be creamed easily with the remaining shortening of the cake formula. In order that results in the baked products would be comparable, the percentage of the total shortening melted was always kept at 10.2 regardless of whether or not the batters were prepared with an addition agent.

The formula and method of mixing employed in the experimental bakings were adapted for use with a Kitchenaid Model G electric mixer from Halliday and Noble's (3) recipe for Plain Cake I given in *Hows and Whys of Cooking*. The proportions of ingredients in the modified formula are given below. During the standardization of the directions for mixing in the preliminary work butter was used as the fat and the conventional method of combining ingredients for butter cakes was adopted. For the sake of simplicity this method of preparing the batter was followed throughout the study regardless of variations in shortening, and each type of cake without an addition agent was considered as the standard with which the corresponding monostearate cakes could be compared.

Ingredient	*Weight in grams*	*Measure*
Shortening	205.8	
Sugar	600	
Eggs		
Yolks	108	
Whites	180	
Cake flour	522	
Baking powder S.A.S.-phosphate	22.5	
Salt	4	
Milk		474 c.c.
Vanilla		1½ teaspoons

In determining the effects of the addition agents with the four shortenings on the characteristics of the baked products, both subjective scoring and objective measurements were used. These tests and the qualities of the cakes which they are supposed to measure are as follows: judges' ratings for texture, flavor, and grain; index to volume for an indication of volume and lightness; compressibility measurements for softness and keeping quality; moisture absorption for eating quality and staling; and sand retention for size of grain. In the performance of the objective tests, index to volume and compressibility were determined according to methods described by Platt (5) and Platt and Kratz (6). For the moisture absorption and sand retention tests Swartz's (8) directions were followed.

A summary of the results of the objective tests in Table I shows that the most obvious distinguishing characteristic of the monostearate cakes as compared with the corresponding standard ones was their increased volume index. The increase in the index which may be attributed largely to the addition agent was as follows for the cakes made with the various shortenings: oleomargarine, 6.0 per cent; hydrogenated vegetable oil, 6.7 per cent; modified lard, 8.5 per cent; butter, 11.0 per cent when the glyceryl monostearate preparation was the addition agent, and 9.3 per cent when the commercial monoglycerides were used. As far as the standard cakes were concerned, the type of basic shortenings seemed to make relatively little difference in the final volume.

When other characteristics such as texture, flavor, grain, and keeping qualities are considered, the results of the tests, both subjective and objective, show no important differences among the respective cakes baked with and without an addition agent except, perhaps, in the products made with oleomargarine. This particular shortening, however produced relatively inferior standard as well as monostearate cakes, both types giving peculiarly low results in compressibility on the day of baking and showing more variability of results than the other cakes throughout most of the tests. In spite of being in general fine-grained, the oleomargarine cakes were found to have some large holes in them; furthermore, they were undesirably crumbly. The other shortenings which were used, namely, butter, hydrogenated vegetable oil, and the modified lard, all produced good products which, although they differed notably in color and flavor, were quite similar in most respects.

In any consideration of the findings of this study, of course, it should be kept in mind that the standard conditions set up for the experiment were not necessarily ideal for all the shortenings nor for the addition agents. It is possible that better results

TABLE I

Results[1] of Objective Tests on Cakes

Shortening			Compressibility[2]			Moisture absorption[2]			Sand retention[2]	Index to volume
Basic shortening	Substitution: Type	Substitution: Per cent	1st day	2nd day	4th day	1st day	2nd day	4th day		
			mm.	*mm.*	*mm.*	*g.*	*g.*	*g.*	*g.*	*sq. in.*
Butter	None	0.0	32.4	20.2	16.8	11.74	10.23	10.46	2.61	12.95
	Addition agent A[3]	1.7	38.1	25.4	19.8	10.93	10.27	9.93	2.45	14.38
	None	0.0	34.1	20.8	15.4	12.22	11.40	10.66	2.53	13.39
	Addition agent B[4]	5.0	32.2	21.2	19.2	10.75	10.65	10.34	2.58	14.64
Hydrogenated vegetable oil	None	0.0	33.8	21.5	17.2	12.96	11.72	10.96	2.10	13.37
	Addition agent A[3]	1.7	31.7	22.3	17.4	11.76	11.17	11.46	2.19	14.27
Modified lard	None	0.0	38.9	20.1	15.3	13.01	11.15	9.88	2.80	13.13
	Addition agent A[3]	1.7	40.5	24.9	21.0	12.36	11.27	10.16	2.61	14.25
Oleomargarine	None	0.0	24.4	21.8	17.9	11.88	11.42	11.52	1.80	13.17
	Addition agent A[3]	1.7	27.6	31.1	16.8	12.08	12.01	11.12	1.94	13.96

[1] Each figure recorded in the results represents the average of determinations done on six cakes.
[2] Determinations made on samples 1 inch thick and 2 inches in diameter.
[3] Contained 88.0 per cent glyceryl monostearate, 5.2 per cent stearic acid, and 6.8 per cent potassium stearate.
[4] Commercial preparation of monoglycerides.

would have been obtained in some instances if another recipe, method of mixing, or method of incorporating the addition agent had been adopted. Nevertheless, the results of this work show that the inclusion of a glyceryl monostearate addition agent in the shortening definitely improved the volume of plain cakes made by a conventional formula.

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Abstracts

Oils and Fats

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APPARATUS FOR EXTRACTION OF LIPOIDS FROM WET TISSUES. Frederic E. Holmes. *Ind. & Eng. Chem. Anal. Ed. 13,* 918-22 (1941).

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