standardize. The results obtained in this collaborative work, however, demonstrate its value. The results, by all those who reported, consistently indicated (1) that the blue-printed soap wrapper would be satisfactory and (2) that the green-printed wrapper would be unsatisfactory in use. These results have been amply and positively confirmed by factory experience with these wrappers in use.

The collaborative results show positively and clearly that

(1) Vegetable parchment paper and the A-P paper have a reasonably satisfactory resistance to alkali.

(2) Newsprint paper would be entirely unsuitable for use as a soap wrapper.

(3) The blue ink on blue-printed wrapper is resistant to alkali and to contact with freshly-cut soap.

(4) The green ink on green-printed wrapper is not resistant to freshly cut soap, although some collaborators found it reasonably alkali-resistant.

Recommendations

The Committee recommends that the methods used in testing soap wrappers in this 1934 collaborative work be published as a part of this report, but feels that more work should be done with these methods before they can be recommended even as Tentative Methods of the A.O.C.S.

The spot test and the extraction method for alkali resistance should be studied further.

The method of color comparison in the extraction method should be more rigidly standardized and the color standard investigated to determine if a closer match may be secured.

Correlation between the results of the spot test or the extraction method, and satisfactory use is most important. A soap contact test should be made on the same plain papers which are used for spot and extraction tests with at least three types of white soap, for example a white floating soap, a white filled laundry soap, and a freshly pressed milled toilet soap.

If it is possible to secure an additional supply of soap wrappers from any source which are known by factory experience to give either satisfactory *or* unsatisfactory results in use it would be very desirable, in the opinion of this committee, to use such wrappers in subsequent collaborative work.

Other forms of soap contact tests suggested by members of this committee should be tried. Mr. A. E. King of Swift & Co. suggests the following procedure: Place the wrappers between white blotters saturated with a 0.2% solution of coconut oil soap, piling up blotters and wrappers to make a pad about ½" thick. Place under a bell jar, containing a dish of water to maintain a saturated atmosphere, above a steam bath for 16 hours. Examine the blotters and wrappers for fading or bleeding of colors. Mr. H. C. Bennett of Los Angeles Soap Co. suggests a test which he has found gives results comparable to actual storage conditions, viz.: Three bars of soap wrapped with the soap wrapper under test are wrapped and tightly sealed in moisture-proof cellophane. Place in a warm oven maintained at 110-115° F. for a period of one week. During this time a weight on top of the soap develops the pressure which would ordinarily result at the bottom of a pile of soap in a warehouse. At the end of this period the soap is placed in an ice chest for two hours, then replaced in the oven for two hours more and then placed back in the ice chest for another hour. This develops sweating and gives results which are somewhat indicative of what may be expected in practice. Mr. Bennett states the unfavorable results by this test can be depended upon to correlate with unsatisfactory results in use.

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EFFECT OF COTTONSEED MEAL ON STABILITY OF VITAMIN A IN COD LIVER OIL*

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Vitamin A is necessary for maintaining a satisfactory state of nutrition and a high degree of health. Like other important factors, its deficiency in the diet will lower the vigor of the body and its ability to resist disease; therefore the incident of any number of diseases may be the result of inadequate amounts of vitamin A in the diet. This vitamin is sometimes referred to as the anti-infective vitamin, but experimental evidence is not sufficient to regard vitamin A as positive anti-infective agent, indiscriminate in its action.

One of the common and highly potent sources of vitamins A and D is cod liver oil, and it has now become a very common and rather extensive practice to incorporate cod liver oil into commercial feed mixtures, particularly poultry feeds where it is primarily desired to increase the vitamin D content of the ration. Various investigators,[1,2,4] reporting on the stability of vitamin D in cod liver oil-feed mixtures, have varied in their conclusions. This has probably been due to a variation in the conditions of the experiment and the failure to determine the minimum protective doses. Vitamin A, although relatively less stable than vitamin D, has received little attention as to its stability in cod liver oil-feed mixtures. Marcus[3] reported an appreciable loss of vitamin A potency when cod liver

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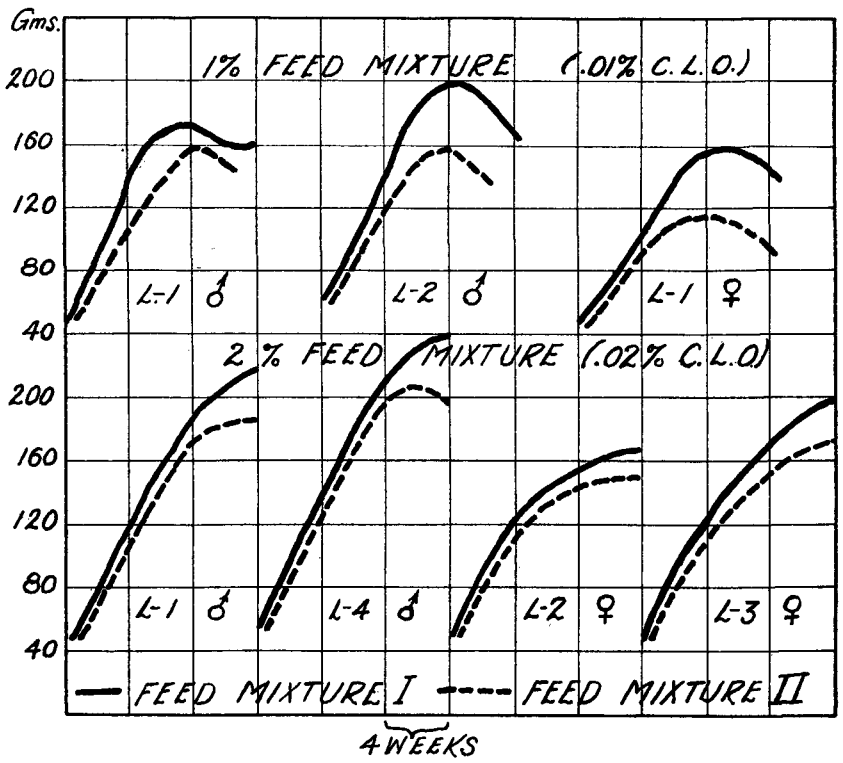
oil was mixed with various solid substances and allowed to stand. Our own experience has frequently shown a decrease in vitamin A values when mixtures of ground corn, oil meals and cod liver oil were stored in the laboratory.

The data reported in this paper show that not only the composition of a mixed feed but even the technique of mixing may have an effect on maintaining the vitamin A potency of mixtures containing cod liver oil. Since the cotton seed is known to contain antioxidant substances capable of protecting the oil against rancidity, and common experience shows that this protection applies to the residual oil in cottonseed meal, the latter suggests itself as a possible factor in controlling the keeping quality of cod liver oil and in preserving the vitamin A in mixed feeds. This preservative effect is obtained in high degree only by intimate mixing of the cod liver oil with the cottonseed meal, as illustrated by the feeding tests described in the present paper.

In a desire to obtain a feed mixture that was not too complicated, only cottonseed meal, ground yellow corn and cod liver oil were used. The composition of each of the mixtures was ground yellow corn 74%, cottonseed meal 25%, and cod liver oil 1%, and they were mixed in the following manner. Feed Mixture No. 1. The cod liver oil was first mixed intimately with the cottonseed meal and this combination was then mixed with the corn meal. Feed Mixture No. 2. The cod liver oil and corn meal were mixed together prior to mixing with the cottonseed meal.

Five hundred gram quantities of the above mixtures were placed in paper sacks and stored in covered metal cans for ten months at room temperature. At the expiration of this time, the vitamin A potency of these mixtures was compared by feeding them to young rats. This procedure consisted in taking young animals at the weaning stage and supplying them with a ration whose only source of vitamin A was 1% or 2% of one of the above feed mixtures. With respect to the total ration, the cod liver oil was thus supplied at .01 and .02% levels. It had previously been found that these levels of the particular cod liver oil used in the tests would show differences in the character of the growth curve and readily show any demonstrable changes in vitamin potency of the oil. The rations had the following composition: Casein, washed with dilute acetic acid and dried at 100° C. for 96 hours, 18%, salt mixture (Steenbock) 4%, dextrin 61-62%, yeast (Northwestern Yeast Co.) 8.0%, agar 2.0%, hydrogenated cottonseed oil 5%, feed mixture 1% or 2%.



Sixteen young animals taken from four different litters were divided into four groups. Group 1 received a ration containing 1% of feed mixture No. 1, group 2 received 1% of feed mixture No. 2, and groups 3 and 4 received 2% of feed mixtures 1 and 2, respectively.

Growth curves of the animals which represent the growth performance as a result of consuming the various rations are shown in the accompanying chart. Curves representing the growth of litter mates receiving cod liver oil at the same level, but introduced originally into the feed mixtures by the two different mixing methods, are grouped together in pairs. Thus the contrast in growth as a result of receiving cod liver oil stored under different conditions is clearly demonstrated. These curves and the data in Table I clearly illustrate the advantage and benefit obtained by first mixing the cod liver oil with cottonseed meal prior to adding the other ingredients.

As a result of this investigation, one may conclude that cottonseed meal, in addition to providing certain nutritive constituents in a mixed ration, can also function in preserving the vitamin A content when the latter is introduced as cod liver oil, and that it is desirable to premix the cod liver oil and the cottonseed meal in order to obtain the full advantage of this preservative effect.

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TABLE I

Group	1				2				3				4			
Feed Mixture*	1% No. 1 (C.L.O. — C.S.M. + Corn)				1% No. 2 (C.L.O. — Corn + C.S.M.)				2% No. 1 (C.L.O. — C.S.M. + Corn)				2% No. 2 (C.L.O. — Corn + C.S.M.)			
Litter	L-1	L-2	L-1	L-3	L-1	L-2	L-1	L-4	L-1	L-4	L-2	L-3	L-1	L-4	L-2	L-3
Sex	M	M	F	M	M	M	F	F	M	M	F	F	M	M	F	F
Initial weight, gms.	44	50	40	52	40	50	40	40	42	54	48	52	42	54	48	52
Weight after 10 weeks	160	186	150	144	150	138	100	(1)	210	234	168	192	182	206	150	164

*Up until 7th-8th week, when differences began to appear in the different groups, the feed consumption was the same for each group.

(1) Animal died between 9th and 10th week.