Patented Feb. 22, 1949 2,462,664

UNITED STATES PATENT OFFICE

2,462,664

STABILIZATION OF OLEAGINOUS MATERIALS

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No Drawing. Application December 1, 1944, Serial No. 566,244

18 Claims. (Cl. 99—163)

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The present invention relates to a process of stabilizing oleaginous materials against the development of rancidity, and to the resultant product. The invention is directed particularly to oleaginous materials composed of or containing animal fats or oils, such as oils, shortening, salad dressings, spreads, and the like.

The present invention involves a synergistic anti-oxidant effect resulting from the combined use of a plurality of substances. It has been found that combinations of certain antioxidants produce a resultant stability far in excess of the sum of the stabilities obtained by the use of the compounds singly.

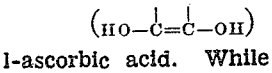
It is therefore a primary object of the present invention to provide a process of stabilizing fatty or oleaginous materials against oxidation and the development of rancidity.

It is another object of the invention to provide products containing fats or oils which are stabilized against oxidation and the development of rancidity.

A further object of the invention is to provide a process of stabilizing fatty or oleaginous products of animal origin by means of antioxidants which exhibit synergistic effects.

These and other objects of the invention will be apparent from the following description of the invention with particular reference to specific examples which are to be understood as illustrative only and not as limiting the invention.

It has been found that a synergistic antioxidant effect is obtained by the conjoint use of gallic acid and compounds containing the ene-diol group



such as l-ascorbic acid. While ascorbic acid, which is water-soluble, has been known to have antioxidant effect in aqueous media, it has not been particularly effective in fats probably because of its extremely low solubility. Gallic acid on the other hand has a considerable antioxidant effect in fatty media. It has been found, however, that when these two compounds are used together, they exhibit a pronounced synergistic effect which gives the oleaginous material a stability far in excess of that of the untreated material and far in excess of the sum of the individual stabilities contributed when each of these compounds is used alone. This is demonstrated by the following table showing the effect on prime steam lard.

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Table I

	Sample	"Swift" Stability Hours	Protective Factor
1	Prime steam lard	3.5	
2	(1)+0.02% gallic acid	107	30.6
3	Prime steam lard	2.5	
4	(3)+0.05% l-ascorbic acid—less than	11.5	4.6
5	Prime steam lard	3.8	
6	(5)+0.02% gallic acid+0.05% l-ascorbic acid	207.5	54.7

In place of l-ascorbic acid other compounds having the ene-diol grouping such as reductone, dihydroxymaleic acid, analogues or isomers of ascorbic acid, such as iso-ascorbic acid, glucoascorbic, araboascorbic, etc., may be used. In place of the free gallic acid, low aliphatic esters of gallic acid, such as methyl, ethyl, propyl, and butyl esters may be employed with similar synergistic effects.

It has also been found that in addition to the synergistic effect mentioned above a further synergistic effect is obtained when p-amino-benzoic acid is used in addition to the gallic acid and the compound having the ene-diol group. The synergistic action of these compounds is demonstrated by the following table showing the effectiveness of gallic acid, l-ascorbic acid, and p-amino-benzoic acid.

Table II

	Sample	"Swift" Stability Hours	Protective Factors
1	Prime steam lard	3.5	
2	(1)+0.02% gallic acid	107	30.6
3	Prime steam lard	2.5	
4	(3)+0.05% l-ascorbic acid—less than	11.5	4.6
5	Prime steam lard	3.8	
6	(5)+0.02% gallic acid+0.05% l-ascorbic acid	207.5	54.7
7	(3)+0.03% p-amino-benzoic acid—less than	2.3	1.
8	(1)+0.05% l-ascorbic acid+0.03% p-amino-benzoic acid	22	6.7
9	(1)+0.05% l-ascorbic acid+0.03% p-amino-benzoic acid+0.02% gallic acid	318	90.9

The prime steam lard employed was the article

available on the market, and it was used in these tests without any additional purification. Hydrogenation of this impure material results in a decided increase in stability. However, for the purpose of these tests, the material was not hydrogenated in view of the fact that even without hydrogenation the time required for some of the tests was prolonged for weeks because of the high stabilities. It will be apparent, therefore, that the process may be employed on other materials having originally higher or lower stabilities, in which case it may be desirable to reduce or increase the amount of antioxidant added.

Instead of the amounts of antioxidants shown above, it is possible to employ decidedly lower concentration where such a high stability is not necessary or desirable. The lower limit of antioxidant to be added appears to be dictated by the resultant stability desired. There does not appear to be any upper limit to the amount of antioxidant which may be employed. However, the cost of the antioxidant constituents usually dictates that they should not be employed in much greater concentration than 0.1 per cent.

In addition to its effect on the antioxidant properties of the product, p-amino-benzoic acid has decided preservative action and represses microbiological growth. The common materials employed to inhibit oxidative rancidity have no effect on microbiological growth. Consequently yeast, molds, and the like, continue to grow and produce hydrolytic or other enzymic changes which result in rancidity. Thus, while the rancidity so produced is a distinct disadvantage in itself, the presence of large numbers of microorganisms is an even greater disadvantage in view of the possible ill effect on those who consume such a product.

It is apparent that these various objections of the prior art are overcome by the present invention in that it inhibits both oxidative rancidity and microbiological growth. Hydrolytic and enzymic rancidity are likewise inhibited in view of the inhibition of microbological growth. Moreover all of the substances are non-toxic and the p-amino-benzoic acid and l-ascorbic acid are recognized vitamins which perform additional functions when consumed.

While particular reference has been made to the use of l-ascorbic acid as a compound of the ene-diol group in the multiple synergy, it is to be understood that other compounds having this group, such as those specifically enumerated with respect to the single synergy, may also be employed in the multiple synergy. Likewise the lower aliphatic esters of gallic acid previously mentioned may be used in place of free gallic acid in the multiple synergy.

It is also to be understood that the invention may be applied to animal oils or fats of any nature whether edible or not, all of which products are contemplated by the term "oleaginous material of animal origin" as used in the appended claims.

I claim as my invention:

1. A composition of matter comprising an oleaginous material of animal origin containing, and being stabilized against the development of rancidity by, not substantially in excess of one-tenth per cent of each of l-ascorbic acid and gallic acid.

2. A composition of matter comprising an oleaginous material of animal origin containing, and being stabilized against the development of rancidity by, not substantially in excess of .1 per cent of each of a compound containing an ene-diol group, and a compound selected from the group consisting of gallic acid and its lower aliphatic esters.

3. A process of stabilizing an oleaginous material of animal origin which comprises incorporating therein, not substantially in excess of one-tenth per cent of each of l-ascorbic acid, and a compound selected from the group consisting of gallic acid and its lower aliphatic esters.

4. A process of stabilizing an oleaginous material of animal origin which comprises incorporating therein, not substantially in excess of one-tenth per cent of each of l-ascorbic acid and gallic acid.

5. A process of stabilizing an oleaginous material of animal origin which comprises incorporating therein, not substantially in excess of .1 per cent of each of a compound containing an ene-diol group, and a compound selected from the group consisting of gallic acid and its lower aliphatic esters.

6. A composition of matter comprising an oleaginous material of animal oringin containing, and being stabilized against the development of rancidity by, not substantially in excess of one-tenth per cent of each of l-ascorbic acid, p-amino-benzoic acid, and gallic acid.

7. A composition of matter comprising an oleaginous material of animal origin containing, and being stabilized against the development of rancidity by, not substantially in excess of .1 per cent of each of a compound containing an ene-diol group, p-amino-benzoic acid, and a compound selected from the group consisting of gallic acid and its lower aliphatic esters.

8. A process of stabilizing an oleaginous material of animal origin which comprises incorporating therein, not substantially in excess of one-tenth per cent of each of l-ascorbic acid, p-amino-benzoic acid, and a compound selected from the group consisting of gallic acid and its lower aliphatic esters.

9. A process of stabilizing an oleaginous material of animal origin which comprises incorporating therein, not substantially in excess of one-tenth per cent of each of l-ascorbic acid, p-amino-benzoic acid, and gallic acid.

10. A process of stabilizing an oleaginous material of animal origin which comprises incorporating therein, not substantially in excess of .1 per cent of each of a compound containing an ene-diol group, p-amino-benzoic acid, and a compound selected from the group consisting of gallic acid and its lower aliphatic esters.

11. An edible shortening containing an oleaginous material of animal origin, and being stabilized against the development of rancidity by, not substantially in excess of .1 per cent of each of l-ascorbic acid and a compound selected from the group consisting of gallic acid and its lower aliphatic esters.

12. An edible shortening containing an oleaginous material of animal origin, and being stabilized against the development of rancidity by, not substantially in excess of .1 per cent of each of l-ascorbic acid, p-amino-benzoic acid, and a compound selected from the group consisting of gallic acid and its lower aliphatic esters.

13. A composition of matter comprising an oleaginous material of animal origin containing, and being stabilized against the development of rancidity by, approximately 0.02% of a compound selected from a group consisting of gallic

acid and its lower aliphatic esters and 0.05% of a compound containg an ene-diol group.

14. A composition of matter comprising an oleaginous material of animal origin containing, and being stabilized against the development of rancidity by, approximately 0.02% of a compound selected from the group consisting of gallic acid and its lower aliphatic esters, 0.05% of a compound containing an ene-diol group, and 0.03% p-amino-benzoic acid.

15. A composition of matter comprising an oleaginous material of animal origin containing, and being stabilized against the development of rancidity by, approximately 0.02% gallic acid and 0.05% l-ascorbic acid.

16. A composition of matter comprising an oleaginous material of animal origin containing, and being stabilized against the development of rancidity by, approximately 0.02% gallic acid, 0.05% l-ascorbic acid, and 0.03% p-amino-benzoic acid.

17. A process of stabilizing an oleaginous material of animal origin which comprises incorporating therein approximately 0.02% of a compound selected from the group consisting of gallic acid and its lower aliphatic esters, and 0.05% of a compound containing an ene-diol group.

18. A process of stabilizing an oleaginous material of animal origin which comprises incorporating therein approximately 0.02% of a compound selected from the group consisting of gallic acid and its lower aliphatic esters, 0.05% of a compound containing an ene-diol group, and 0.03% of p-amino-benzoic acid.

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