A. D. Rich of the Filtrol Corporation. Containers for packaging 8,000 four-pound cans of the Natural Earth and 2,000 of the Activated Earth have been obtained and work of testing for uniformity of the lots chosen is well underway. The discovery of an inventory error by our distributor has relieved somewhat the urgency for replacement of the Natural Earth so it now appears that thoroughly tested stocks of both types will be available well in advance of probable exhaustion dates.

It will be recalled that the Society approved a recommendation of the Uniform Methods Committee, made to the Atlanta Meeting in May, 1950, that future stocks of Natural Earth should be of U. S. origin. The wisdom of this decision is becoming quite apparent since a survey of our supply of Official Natural Bleaching Earth, bearing the 5% dosage label, showed some indication of non-uniformity and the Governing Board authorized replacement of all cans, which had been issued within the three-month period prior to the normal expiration date of July 31, 1950, of this lot of earth. This was done, at no cost to the purchaser, using as a basis the record of sales by the Chicago Office. According to records of Central Scientific Company, the 5% lot of earth was exhausted before the expiration date of July 31, 1950. Since then only the 5.67% earth has been issued and constitutes our sole remaining supply. Thorough tests have shown this stock to be entirely uniform in bleaching potency.

With a domestic source of supply there is every reason to believe we need have no fear of a recurrence of this unfortunate experience. Every precaution is being taken to insure the complete uniformity of the supply now being processed. The equivalent dosage values will be certified by both the Chemists' Committee of the N.C.P.A. and the Technical Committee of the N.S.P.A. before any is issued as A.O.C.S. Official Bleaching Earth.

J. T. R. ANDREWS, chairman.

Pre-Treatment of Peanut Kernels for Effective Skin Removal

J. POMINSKI, E. L. D'AQUIN, L. J. MOLAISON, E. J. McCOURTNEY, and H. L. E. VIX,
Southern Regional Research Laboratory,[1] New Orleans, Louisiana

COLOR is a major factor in the acceptance by industry of solvent-extracted meals and proteins processed from peanuts. Objectionable dark color in these products has been attributed by Stansbury *et al.* (10) to the presence of certain tannin pigments in the skins. Fontaine *et al.* have reported a rather extensive investigation of the color of peanut proteins (3). Burnett has demonstrated that the darkening effect of the skin pigments on the protein can be practically eliminated, without removal of the skins, by the treatment of the kernels with dilute sodium hydroxide solution (1, 2). Obviously, complete removal of the skins is a satisfactory solution to the problem of color in the meal and protein. But the commercial practice of mechanically blanching peanut kernels for the confectionery trade involves roasting them at relatively high temperatures, which denatures the protein considerably (7).

A method of pre-treating the kernels by water-dipping and drying at low temperatures prior to mechanical blanching to remove the skins is described, and results obtained in its application to the various commercial grades of shelled Spanish peanuts (U. S. No. 1, U. S. No. 2, and oil mill stock[2]) are given. The term "blanching" is used throughout this report to indicate subjecting the kernels to the mechanical action of a standard split-nut peanut blancher. The optimum process conditions were established for removing 98% or more of the skins from U. S. No. 1 shelled peanuts. The color of protein prepared from treated shelled peanuts of this grade compared favorably with light-colored peanut proteins prepared by other methods.

[1] One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

[2] The grading and chemical analyses of the various lots of commercial peanut kernels used in these experiments were reported in a previous publication (8) dealing with the removal of objectionable skin color by the lye treatment. U. S. No. 1 and U. S. No. 2 shelled kernels are essentially whole and split kernels, respectively. Oil mill stock kernels consist of small kernels, shrivels, pieces, and damaged kernels rejected during grading operations.

Determination of the Percentage of Skin Removal

To evaluate the effectiveness of separation of skins from kernels, a method was devised for the estimation of the percentage of skins removed. A 100-g. sample of shelled peanuts was taken, and any kernels containing skins were separated, weighed, and counted. These kernels were divided into fractions estimated to have complete, half, one-third, and one-fourth skin coverage, etc. For the calculation, kernels with skins partially removed were converted to equivalent kernels with 100% skins, i.e., four kernels with one-fourth skin coverage were considered equivalent to one kernel having 100% skin.

Calculation:

$$\text{Percentage of skin removal} = 100 - \frac{\text{No. of equivalent kernels with 100\% skin}}{\text{Total no. of kernels containing skin}} \times \text{Wt. of total kernels containing skin.}$$

Experimental and Results

Preliminary. U. S. No. 1 shelled Spanish peanuts were used in experiments to determine the best conditions for maximum skin removal by water-treatment, drying, and blanching. Important variables studied were the effects of moisture remaining after dipping and after drying, dipping and drying temperatures, different methods of heating without dipping, and overnight moisture equilibration prior to blanching.

In general: results (Table I) showed the following optimum conditions for de-skinning peanut kernels by the water-treatment, drying, and blanching process: dipping in water at room temperature (86°F.) to gain moisture of at least 20% of the original weight; forced air-drying of the dipped peanuts to obtain a

TABLE I

Preliminary Data on Skin Removal From U. S. No. 1 Spanish Peanut Kernels

Description	Experiments												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	Control, No Treatment	Dipping at Room Temperature								Dipping at 140°F.		Heat Only	
		Drying at 120°F.[1]						Drying at 180°F.[1]		Drying at 180°F.[1]		Vacuum Oven[2]	Circulating Air Oven[3]
Wt. of peanut kernels, lb	5	5	5	5	5	5	5	5	5	5	5	2.5	5
Moisture, %	7.37	7.37	7.37	7.37	7.37	7.37	7.37	7.37	7.37	7.37	7.37	7.37	7.37
Soaking time, minutes	.....	.....[4]	25/60	2	10	2	2	2	2	1	1	.....	.....
Soaking temperature, °F	.....	87	87	87	74	86	86	87	87	140	140	.....	.....
Moisture absorbed, % original weight	.....	7.0	14.0	21.2	27.0	22.0	21.4	20.8	20.8	21.2	21.4	.....	.....
Moisture in wet peanuts, %	.....	13.46	18.77	23.6	27.1	24.10	23.75	23.35	23.35	23.6	23.75	.....	.....
Drying time, hours	.....	20.75	20.75	19.0	25.33	20.75	6.22	5.55	2.13	6.0	3.67	4.0	4.0
Drying temperature, °F	.....	120	120	120	120	120	120	180	180	180	180	200	200
Moisture after drying, %	.....	3.94	5.14	3.99	4.88	4.63	7.26	4.40	7.80	4.56	6.65	2.14	1.72
Blanched immediately	x	x	x	x	x	.....	x	x	x	x	x	x	x
Blanched next day	.....	.....	.....	.....	.....	x	.....	.....	.....	.....	.....	.....	.....
After blanching.													
Deskinned meats, %	96.9	93.8	94.1	94.1	93.8	93.0	92.5	93.2	94.3	93.2	93.0	93.9	93.5
Skins removed, %	1.8	3.5	2.8	3.1	2.5	4.4	4.9	3.4	3.6	3.3	3.0	3.5	3.6
Hearts removed, %[5]	1.3	2.9	3.1	2.8	3.7	2.6	2 6	3.4	2.1	2.5	4.0	2.6	2.9
Skin removal, %	44.6	91.7	95.4	97.6	98.3	97.1	96.0	98.3	96.9	98.9	98.1	75.0	94.9

[1] Drying after dipping was done in air circulating oven.
[2] Kernels several layers thick.
[3] Kernels one layer thick.
[4] Dipped in water and pulled out instantaneously.
[5] Total hearts were not removed; part remained with split nuts.

final moisture content of approximately 4.5%; and blanching.

In detail: experiments 1 through 5 showed that a moisture absorption of at least 20% by original kernels was necessary for approximately 98% removal of the skins. However an increase of only 7% in moisture absorption by weight of the original kernels increased the skin removal from 44.6 to 91.7%. Experiments 4 and 6 showed that overnight moisture equilibration of the dried water-dipped kernels (at approximately 4% moisture) had negligible effect on the percentage of skins removed. Experiments 4, 7, 8, and 9 showed that at lower final moisture levels greater skin removal was obtained for drying temperatures of either 120° or 180°F. Experiments 10 and 11 showed that a highly satisfactory percentage of skin removal was also obtained by dipping kernels at 140°F. and drying at 180°F. and again that lower final moisture levels resulted in greater skin removal. Experiment 13 showed that a high percentage of skin removal was obtained by simply drying the untreated kernels in an air-circulating dryer. By comparison (Expt. 12), drying the kernels in a vacuum oven at the same temperature gave a much lower skin removal. It was noted that kernels heated at 200°F. (Expt. No. 13) in an air-circulating oven without prior treatment resulted in a skin removal of 94.9% as compared to 95.4 (Expt. No. 3) and 97.6% (Expt. No. 4) for water dipping at moisture absorptions of 14 and 21.2%, respectively. The treated kernels produced in Experiments 3 and 4 were superior from a standpoint of total content of skin pigments since water-treatment *per se* removes a large part of the objectionable color in the skins remaining on kernels.

Using these optimum conditions, similar experiments were conducted with U. S. No. 2 and with oil mill stock kernels using 5-pound batches. Results showed skin removals of 90.7% for U. S. No. 2 and 59.1% for oil mill stock shelled peanuts. In an experiment in which the U. S. No. 2 shelled peanuts were dried at 180°F. without prior treatment, a skin removal of 80.2% was obtained. These are all appreciably below the desired skin removal, 98+%.

It was of interest for comparison to determine the effect of substituting lye-dipping (1) for water-dipping, and then blanching. A sample of each of the three grades of shelled peanuts was treated with 0.5% lye solution, dried to approximately 4.5% water, and blanched. The U. S. No. 1 shelled peanuts gave a satisfactorily high percentage of skin removal. U. S. No. 2 and oil mill stock peanuts showed no improvement over the unsatisfactory percentage of skin removal obtained in the water-treatment, drying, and blanching method.

Processing of Larger Lots at Optimum Conditions. The optimum conditions established in the small-scale experiments were used as a basis for processing a 40-lb. batch of U. S. No. 1 shelled peanuts identical with those used in the preliminary tests; by water-dipping, drying, and blanching (see Table II, Column 1). Prior to blanching, a 5-lb. portion of kernels was removed and further dried at 180°F. for 2 hours. A high percentage of skin removal, 98.9%, was obtained for the remaining 35 lb. of kernels; additional heating at 180°F. showed practically no increase in skin removal. Lipids and protein losses were low, 0.04 to 0.05% by weight of kernels, as compared to previously reported losses of 0.13 and 0.53% with the 0.5% lye treatment (8). Thus, as would be expected for the water-treatment, drying and blanching method, lipids and protein losses were lower than for the lye treatment of U. S. No. 1 shelled peanuts.

TABLE II

Skin Removal From U. S. No. 1 Spanish Peanut Kernels by Water Dipping, Drying, and Blanching Process at Optimum Conditions

Batch No.	1	2	3	4	5	6
Wt. of peanut kernels, lb	40	120	98	105	111	112
Moisture, %	7.4	7.6	5.2	5.2	5.7	5.7
Soaking time, minutes	10	35	15	10	2.5	2.5
Soaking temperature, °F	83	66	81	82	88	88
Moisture absorbed, % of original wt	27.5	21.5	25	23.8	22.6	21
Drying time, hours	23.3	15.5	21.5	21.5	18.5	18.5
Drying temperature, °F	120	120	120	120	125	125
Moisture after drying, %	4.3	5.5	4.3	4.1	4.4	4.4
Deskinned meats, after blanching, %	93.9	94.1	92.9	92.9	93.2	93.2
Skins, removed by blanching, %	3.5	3.2	3.5	3.5	3.6	3.6
Hearts, removed by blanching, %	2.6	2.7	3.6	3.6	3.2	3.2
Skin removal, %[1]	98.9	99+	99+	99+	98.7	98.7
Losses in process						
Lipids, % of kernel wt	0.04	.....	.....	.....	0.004	0.004
Lipids, % of original lipids	0.08	.....	.....	.....	0.008	0.008
Protein,[2] % of kernel wt	0.05	.....	.....	.....	0.02	0.02
Protein, % of original protein[3]	0.19	.....	.....	.....	0.05	0.05
Protein solubility of solvent extracted meal[4]	.....	96.2	94.1	94.1	89.7	89.7

[1] The comparable results obtained in runs on the different lots of peanuts indicate that any variations due to mechanical blanching may be considered insignificant.

[2] Protein = 6.25 × nitrogen.

[3] Percentage of protein or nitrogen = 100 × nitrogen lost/nitrogen in original kernels.

[4] Protein solubility determined at pH 7.5 with NaOH and at room temperature.

The remaining columns in Table II show results obtained in water-dipping and processing four other lots of U. S. No. 1 Spanish shelled peanuts. These lots were cracked, flaked, and solvent-extracted with commercial hexane in a batch extractor to give defatted meals having a high protein solubility.

Protein Preparation and Color Evaluation. Approximately 1,000 g. of U. S. No. 1 shelled peanuts from the 40-lb. batch which had undergone the water-treatment, drying, and blanching process were flaked and defatted with commercial hexane in a large Soxhlet extractor. The meal produced was air-dried. Protein was prepared by peptizing the meal at pH 7.5 (4) with sodium hydroxide using a 20:1 water to meal ratio at room temperatures, removing the solids by screening and centrifuging, precipitating the protein at pH 4.5 (1) with sulfur dioxide, and recovering it by centrifugation. The protein was then dried at 120°F. in an air-circulating oven. Visual examination showed it to have a cream color.

TABLE III

I.C.I. Tristimulus Data on Alkaline Solutions of Peanut Proteins

Protein	Treatment of U. S. No. 1 Kernels Prior to Solvent Extraction	x	y	Luminous Transmittance	Dominant Wave Length	Purity
					mμ	%
1	Lye dipping (0.5% NaOH)	0.3215	0.3335	91.6	572.0	7.8
2	Water dipping 98.9% skin removal	0.3215	0.3341	91.8	571.5	7.9
3	Water dipping 100% skin removal	0.3206	0.3336	92.9	570.8	7.5

Table III gives I.C.I. tristimulus data determined on an alkaline solution of this protein in accordance with the method of Fontaine (3), using a psychophysical system of color values (6). These data were compared with those obtained on similarly prepared proteins from two portions of U. S. No. 1 kernels, one of which was treated with 0.5% lye for color removal and the other of which had 100% skins removed by hand after water-dipping and drying. The data show that the color of the protein solutions made from kernels treated with lye and made from kernels treated by water-dipping, drying, and blanching was essentially the same and differed only slightly from the color of protein solution prepared from shelled peanuts with 100% skins removed.

In using Fontaine's method to determine color values it was difficult to obtain sufficiently clear solutions in some cases. It was also observed that this method could not be used on some proteins since their alkaline solutions remained so turbid that they gave incorrect values. It is thus evident that this method is not entirely satisfactory. Perhaps the development of a color determination based on reflectance measurements of solid particles should give a method of evaluation more generally suitable.

Applications

In addition to the total of 586 lb. (Table II) of peanut kernels treated by water-dipping, drying, and blanching, approximately 2,200 lb. were similarly treated and were then cracked, flaked, and solvent-extracted with commercial hexane in a continuous solvent extraction pilot-plant (5). The meals produced were used in numerous industrial and nutritional investigations, and investigators have found that these relatively skin-free meals have superior color and flavor characteristics over other solvent-extracted peanut meals in food utilization (9).

There are several conditions in which a combination of lye-treatment with blanching of the kernels may be preferable. Hexane-extracted peanut meals may be prepared from U. S. No. 2 shelled peanuts that have been both blanched and lye-treated, which are not only free of the undesirable soluble skin pigments but also have the greater portion (90%) of the skins removed. It is necessary in the solvent extraction of shelled peanuts to have the optimum moisture content. The optimum moisture content, 7% (5), being higher than the 4.5% moisture remaining in the kernels as a result of the water-treatment process makes it necessary to remoisten the kernels before extraction. However drying water-treated U. S. No. 1 peanut kernels to higher final moisture levels than 4.5% results in a greater percentage of skins remaining after blanching. Where it is necessary to obtain protein products free of the objectionable skin pigment color or meal products wherein a small percentage of skins is permissible, a lye-treatment of the U. S. No. 1 peanut kernels prior to blanching would

allow them to be dried directly to the optimum moisture for solvent extraction.

Summary

A new method for the removal of skins from peanut kernels by water-treatment, drying, and blanching in a standard split-nut blancher has been developed on a pilot-plant scale. Optimum conditions for approximately 98% skin removal from U. S. No. 1 shelled Spanish peanuts by this method are water-treatment at room temperature, to gain not less than 20%, drying with forced circulated air at 120° to 125°F. to approximately 4.5% moisture in the peanuts, and blanching. The lipids and protein losses resulting from the water-washing action on the kernels were relatively low and less than those losses obtained by lye treatment of the kernels. The method however did not give satisfactory results with either shelled U. S. No. 2 or oil mill stock kernels.

Meal prepared by hexane extraction of de-skinned (98%) water-treated U. S. No. 1 kernels had color and flavor characteristics superior to other hexane solvent-extracted peanut meals for food utilization. Protein prepared from this meal had a light color equal to that produced from peanut kernels treated with 0.5% lye solution.

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Pyrogallol Derivatives as Antioxidants for Carotene

E. M. BICKOFF, G. M. COPPINGER, A. L. LIVINGSTON, and TOD W. CAMPBELL,
Western Regional Research Laboratory,[1] Albany, California

PYROGALLOL and esters of gallic acid have been shown to possess marked ability to prolong the induction period of autoxidizing fats and oils (1) and under certain conditions similarly to protect carotene (2). In connection with studies at our laboratory on the stability of carotene in dehydrated alfalfa meal, a series of compounds related to or derived from pyrogallol was prepared (3), and their ability to stabilize carotene in different media was measured. As far as possible the compounds tested were chosen to permit observation of change in activity with systematic change in structure. The present report deals with the results of these stability tests.

Experimental

Stability of Oil Solution. The effectiveness of the antioxidants for the protection of carotene in oil solution was first determined. The substrates used for testing the antioxidants included a highly refined medicinal mineral oil, a good-quality steam-rendered lard, and a commercially refined coconut oil.

The details of the stability test for carotene in oil solution have been published previously (4). It consists of a determination of the time required for breakdown of 20% of the carotene in the oil solution stored as a thin layer at 75°C. under specified conditions. As in previous work (2), the antioxidant compounds which had been highly purified were incorporated on an equivalent molecular basis rather than on a weight basis in order to facilitate the comparative evalution of the antioxidants in the oil solution.

[1]Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture. Report of a study made under the Research and Marketing Act of 1946.

Stability in Alfalfa Meal. To test the effect of the antioxidants on the stability of carotene in alfalfa meal, a rapid, simple method of incorporating the antioxidant was employed. This involved spraying a Cellosolve (ethylene glycol monoethyl ether) solution of the antioxidant on a 200-g. sample of meal while it was being tumbled at 12 r.p.m. in a rotary mixer. Samples were then stored for 2 weeks at 65°C. Results so obtained were comparable to about 8 months' storage at 25°C. Details of this technique have been described fully in an earlier report (5).

Results

PYROGALLOL DERIVATIVES IN MINERAL OIL SOLUTION.

Alkyl Substitution. The results showed that pyrogallol is a very effective antioxidant for carotene in mineral oil solution (Table I). The addition of one alkyl group to pyrogallol as in 4-ethyl pyrogallol produced a moderate increase in antioxidant effectiveness. The addition of a second alkyl group as in 4,6-diethyl pyrogallol was less effective. Furthermore, if tertiary butyl groups were introduced in the 4 and 6 positions, the activity was decreased below that of the parent compound. Substitution of a triphenylmethyl group in the 5 position greatly enhanced the activity when compared to pyrogallol.

Acyl Substitution. With the exception of 4-acetyl pyrogallol, an acyl group in the 4 position increases the activity to about the same extent, independently of the size of the group. If an alkyl group is substituted in the 6 position of 4-acetyl pyrogallol, the antioxidant activity is markedly increased. Substitution of a benzoyl group in the 4 position of pyrogallol