The data indicate that both water cooking and alkali cooking had an adverse effect on the neutral oil yields. The losses resulting from water cooking were of a low order while those resulting from alkali cooking were sufficiently high as to be significant.

The flakes cooked with water only yielded 99.85%, 99.84%, and 99.18% as much neutral oil, respectively, as the corresponding uncooked flakes while the yields of neutral oil from the flakes cooked with alkali were 99.24%, 98.54%, and 98.81%.

If the yields of neutral oil from the water-cooked flakes are taken as 100% and the yields from water- and alkali-cooked flakes are compared on this basis, it is found that the yields from the three batches of alkali-cooked flakes were 0.61%, 1.30%, and 0.37% lower than those from the corresponding water-cooked flakes. This is an average loss of 0.76% by alkali cooking.

The amounts of alkali used and the conditions of its use were not necessarily optimum with respect to oil yields since no oil-yield data on which to base the studies were available. The conditions were selected on the basis of the data on oil quality. The relatively small losses of neutral oil found to result from the use of the alkali-cooking method would probably be compensated by the lower refining losses of the oils since for each 1% of refining loss below 9% there is an increase of 0.75% in the value of the oil. The improvement in meal quality resulting from alkali cooking, while unquestionably a contribution of great potential value, cannot presently be evaluated since the existing trading rules of the industry fix the value of a meal as a function of its protein content, with no consideration of the quality of the protein.

Summary

Equal quantities of flaked cottonseed meats of identical composition were similarly cooked at high moisture conditions with and without alkali present. The cooked flakes were exhaustively extracted with commercial hexane, and the yields of crude oil, neutral oil, and meal were determined. The yields from an equal quantity of uncooked flakes were similarly determined, chiefly to serve as a neutral oil control. Analyses of the crude oils and meals were compared to determine the effects of the presence of alkali while cooking on the composition of the products.

These experiments show that there was a reduction in the yields of both crude and neutral oil resulting from the admixture of alkali with cottonseed flakes while cooking. Assuming yields from flakes cooked with water as 100%, and average of 0.6% less crude oil was obtained from alkali-cooked than from water-cooked flakes. A similar comparison of the yields of neutral oil shows that those from the alkali-cooked flakes averaged about 0.75% less than from the flakes cooked with water.

The crude oils from alkali-cooked flakes contained only about one-fifth as much gossypol as those from the water-cooked flakes and were appreciably lower in free fatty acids. The crude oils from alkali-cooked flakes were significantly higher in phosphorus. The sodium content of the oils from alkali-cooked flakes indicated that their content of soaps ranged from 0.07% to 0.19%.

Acknowledgments

The authors extend their thanks to V. O. Cirino for determination of neutral oils, oxidized fatty acids, and unsaponifiable matter, to R. M. H. Kullman for gossypol determination, to J. A. Harris for determination of phosphorus, and to H. P. Pastor for nitrogen analyses. They also thank I. W. Lohmann for determination of sodium in the crude oils.

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[Revised July 26, 1957]

Effect of Long-Term Storage on Acute Oral Toxicity and Gossypol Content of Cottonseed Pigment Glands

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COTTONSEED PIGMENT GLANDS, distinct structures made available in essentially unaltered condition from cottonseed kernels by a flotation process (1, 2), contain gossypol, a polyphenolic yellow pigment, as their principal component. Although gossypol has been regarded as the sole toxic principle of cottonseed for more than 40 years, some investigators have questioned the analyzed gossypol content as a true indicator of toxicity of cottonseed products. This subject has been reviewed by Eagle *et al.* (3). During the past 10 years we have studied numerous samples of cottonseed pigment glands and of pure gossypol for their acute oral toxicity (4, 5, 6, 7). Since some of these samples were available after storage periods lasting as long as nine years, re-evaluations were made to determine the effect of prolonged storage on the oral, median, lethal dose in the rat and on the analyzed gossypol content.

TABLE I

Effect of Prolonged Storage of Cottonseed Pigment Glands and Pure Gossypol on Their Acute Oral Toxicity and Gossypol Content

Sample No.	Description	Before storage		After storage		
		Gossypol content	Oral LD50 value	Time stored	Gossypol content	Oral LD50 value
		%	mg./kg.	yrs.-mos.	%	mg./kg.
1.	Untreated cottonseed pigment glands	....[a]	1060	9–7	36.8[b]	1100
2.	Sample 1 heated dry for 1 hr. at 105°C	....[a]	1110	8–3	35.1[b]	1310
3.	Untreated cottonseed pigment glands	....[a]	1350	9–0	29.7[b]	1480
4.	Sample 3 heated dry for 1 hr. at 103°C	....[a]	1520	8–5	27.3[b]	1710
5.	Untreated cottonseed pigment glands	32.5[b]	1430	5–1	30.2[b]	1410
6.	Untreated cottonseed pigment glands	28.6[b]	2170	4–9	27.0[b]	1965
7.	Pure gossypol	ca. 100.0[b]	2480	5–8	....	2200[c]
8.	Pure gossypol	ca. 100.0[b]	2600	7–4	....	2315[c]
9.	Untreated cottonseed pigment glands	37.8[b]	1140	....	....	....
10.	Untreated cottonseed pigment glands	34.3[b]	1345	....	....	....
11.	Untreated cottonseed pigment glands	30.3[b]	1635	....	....	....
12.	Untreated cottonseed pigment glands	34.1[b]	1845	....	....	....

[a] Analyzed by the then current antimony trichloride method of Boatner *et al.* (10, 11).
[b] Analyzed by the Official A.O.C.S. method of Pons and Guthrie (9).
[c] Administered in soybean oil instead of distilled water.

Experimental

The acute oral toxicity was determined on male rats (150–220 g.) of the Holtzman strain, which had been fasting for 18 hours with water *ad libitum*. Each rat was individually caged in an air-conditioned animal room maintained at 78 ± 1°F. and *ca.* 45% relative humidity. All of the samples had been stored in sealed containers in coolers held at 2 to 10°C. The pigment glands (or gossypol) were thoroughly mixed with distilled water and administered in a single dose. After intubation all animals were allowed free access to stock diet and water. Calculation of the median lethal dose (LD50) was made after one week by the method of Reed and Muench (8). Duplicate gossypol analyses on the stored samples were made by each of two independent laboratories, according to the method of Pons and Guthrie (9).

Results

A summary of the LD50 values and the gossypol analyses before and after storage is given in Table I. The total number of rats used was 1,148. It may be noted that there was no great change either in the LD50 values or in the analyzed gossypol content of the samples stored from 4¾ to 9½ years. As was also the case before storage, there is no apparent correlation between the acute oral toxicity of the various stored samples of cottonseed pigment glands and their analyzed gossypol content. In all cases the samples of cottonseed pigment glands containing only 27.0 to 37.8% gossypol were more toxic than pure gossypol.

Summary

Six samples of cottonseed pigment glands and two samples of pure gossypol stored for more than four to nine years were re-evaluated for their acute oral toxicity in the rat and re-analyzed for gossypol content. There was no appreciable effect on the acute oral toxicity or gossypol content after these long storage periods.

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[Received June 26, 1957]

An Electron Microscope Study of Certain Dispersions of Detergents in Oil[1]

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IN CONTRAST to the extensive investigations of soaps and detergents in aqueous solution, comparatively few studies have been reported on such compounds in hydrocarbon solvents. The studies which have been made show that the hydrocarbon systems are similar in many ways to aqueous systems (7, 9). Micelles of soaps and detergents in hydrocarbon solvents are generally assumed to be "inverted" (*i.e.*, with polar heads in the interior of the micelle). In liquid systems of this type, micelles have been postulated which are threadlike or rodlike (8), spherical (14), platelike (18), and lamellar (11). Arkin and Singleterry (1) and Singleterry and Weinberger (16) have presented evidence to show that the critical concentration for micelle formation in benzene solutions of calcium xenyl stearate is less than 10^{-6} moles/liter at room temperature and that the size and shape of soap micelles in benzene may be markedly altered by small amounts of water.

Nonliquid soap-hydrocarbon systems have been fairly extensively investigated (3, 8, 10). Such sys-

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