sitiveness to allergens of cottonseed is considered, demonstrates the fallacy of summarizing the separate groups of such data for statistical study or even comparison. Important differences are apparent in the methods employed by different clinicians to determine both frequency and degree of sensitiveness to cottonseed. Multiple sensitiveness further confuses the interpretation of positive evidence of sensitization toward cottonseed, except in very rare instances, when the contributory effects of separate allergens have been studied separately.

It is apparent that the major portion of available evidence concerning the role of cottonseed products in allergic diseases rests upon observations of the skin reaction to an extract of cottonseed or cottonseed press cake. To what extent the skin response can be relied upon to denote a significant degree of reactivity of other organs of the body has not yet been determined quantitatively. Admittedly useful as a guide in the diagnosis of allergic diseases the skin test is also notably unreliable. Rackemann (11), in a recent review of the current literature on allergy, pointed out two fundamental discrepancies in the skin response to allergens. First, is the fact that a positive skin test may have no clinical significance and, second, is the frequent observation of negative skin reactions to allergens that may be conclusively proved by other means to be the primary extrinsic cause of outspoken allergic symptoms. Grow and Herman (12) have recently determined that 55 per cent of a group of persons, none of whom showed detectable evidence of allergic disease, exhibited positive skin reactions to one or more substances.

Extensive inquiry has shown that a prevalent source of error in attributing allergic disturbances to ingestion of allergens rests upon incomplete evidence or erroneous assumptions with respect to the identity of a suspected allergenic component. A case in point is the previously mentioned reference to the use of cottonseed oil in preparation of gin. This unique idea, which has been restated by several authors of texts on allergy, was subjected to examination by Stevens (13), who found that among the flavoring ingredients used in this beverage were more than twenty recognized allergens, and no basis for the inference that gin might contain cottonseed allergens was discovered. Inquiry has also revealed the fact that "vegetable salad oil" and "vegetable shortening," otherwise unidentified, have on some occasions been assumed to be the cause or a contributory factor in allergic disturbances among patients who exhibited a positive skin reaction to a saline extract of fat-free residues of cottonseed or cottonseed meal.

CONCLUSIONS

Some fundamentally important concepts of allergy and the methods of identification of the extrinsic causative factors in allergic disease have been reviewed.

Clinical evidence bearing upon the occurrence of allergic disturbances attributed to allergens of the cottonseed has been assembled and examined to illustrate the fact that effective discrimination against a single class of food products may result from faulty interpretation of valid clinical data.

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CHINESE COTTON OIL*

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OUR problem of refining Chinese cotton oil is somewhat different than that confronting the majority of refiners. Where compound is the chief product, the obtaining of a bleachable or near bleachable oil is necessary. We are, however, primarily interested in salad oil, and hence, our problem was to produce an oil light enough for our purpose with one refining, if possible. It was necessary to get this color with one refining, and, needless to say, without excess loss. All the oil in question was refined through a Sharples plant, so all comparisons will be between laboratory tests and Sharples refinings.

First as to the characteristics of the oil.

Color—

The crude oil is very dark, almost black, much darker in color than the general run of domestic oil.

Odor and Flavor—Terrible—

Some of it smells as if they had thrown some of their dead brethren into the cookers. The better grades have anything but a sweet prime smell and flavor. At best, it is made from rotten and musty seed.

Moisture and Impurities—

Here they seem to have something on us. We have also noticed that this is true of English pressed oil. Peculiar as it may seem though, the English pressed corn oil is even dirtier than our domestic. The crude cotton, however, is exceptionally clean. We stored one shipment of crude Chinese oil for nearly six months, and the fatty acids in-

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creased just 0.10%, from 2.9% to 3.0%.

Free Fatty Acids—

On several shipments the fatty acids ran between 2.9% and 4.1%, with an average of 3.35%.

Constants (Average)—

Iodine Number 104.7; Saponification Number 193.0; Unsaponifiable 1.51%; Titer 31.0 C. All shipments were very close to these averages. You will note a very low Iodine Number, and a high Unsaponifiable. The Titer is somewhat lower than on most domestic oils, and in winterizing this oil acted quite different from domestic. In some ways it acted more like peanut oil. It would be interesting to make a complete analysis of this oil.

Our first shipment of Chinese oil ran between 3.9% and 4.1% free fatty acids, and with normal amounts of lye gave an average laboratory refining of 16.8% with a color of 30.0 red. Increasing the amount of lye did nothing more than increase the loss with practically no change in color. Lengthening the time of agitation made no difference whatever. (We ran all our laboratory refinings for half an hour, any lengthening of time over this did no good). Decreasing the amount of lye shot the color up. While reducing the loss from 16.8% to 16.0% the color increased from 30.0 red to 43.0 red. These losses seem extremely high for clean oil of this fatty acid, but after innumerable tests, they must be accepted as correct, at least for this shipment.

Through the Sharples plant we obtained a refining loss of 12.9% with a 28.0 red color. Of course, this color meant a re-refining. We had several cars of southeastern crude on the siding. These cars ran an average of 5.5% free fatty acids, laboratory loss 15.6% and color 12.0 red. As you see, nothing fancy, but as a last resort we mixed these oils, one-third domestic with two-thirds Chinese, with the most surprising results. The results are shown as follows:

	F. F. A.	Loss	Red Color	Standard Bleach
Chinese Oil Laboratory	4.0	16.8	30.0	35—15.0
Chinese Oil Plant	4.0	12.9	28.0	
Domestic Oil Laboratory.....................	5.5	15.6	12.0	35— 3.0
Mixture Laboratory	4.5	16.6	13.0	
Mixture Plant	4.5	10.98	14.0	35— 4.3

This mixture when bleached in the laboratory with 3% activated earth and ½% carbon gave a color of 30 yellow and 3.0 red. On increasing the bleach we were unable to reduce the color to any extent. A bleach of 6% activated earth and 1% carbon gave a color of only 30 yellow and 2.7 red. These results sound out of line, but they have been checked and rechecked many times and we feel they are correct. Our plant results are based upon the refining of twenty-three tanks of this oil.

At the conclusion of the above run we again tried refining the straight oil to an acceptable color without a re-refining. In the meantime we had received a cargo of so-called refined Chinese oil. This oil had a free fatty acid of 0.21% and a color of 29.0 red. We found that upon making a mixture of two parts refined oil with one part crude we got fairly good results, especially in the Sharples plant. The plant results were Loss 4.33% color 12.5 red. Bear in mind that the free fatty acids on this mixture was only 1.4%. This result was much better than we were ever able to get in the laboratory. The best laboratory results were, loss 7.2% with an 11.0 red color. This mixture bleached rather well, to about 4.0 red on the average, with a standard laboratory bleach.

From the foregoing it can be seen that this type of oil handles well when diluted with either refined oil or domestic crude.

On another shipment which was the best we have ever received the free fatty acid was 2.8%. The laboratory losses ran all the way from 15.4% with an 11.3 red color, to 11.8% with a 28.0 red color. It still looked pretty hopeless, but if we could only combine the 11.8% loss with the 11.3 red color all would be well.

After several trial runs in the plant, we finally hit upon a combination of water, caustic, heat and agitation that gave us real results. On the Sharples machines, we obtained an average loss of 9.03% with a color of 12.0 red. As this result was obtained on only one shipment of about twenty tanks, we are not so sure it will work on any other, and will divulge what we have done after we have checked ourselves, and know we have something worth while. Below is a tabulation of the results on this lot.

	F. F. A.	Loss	Color	Standard Bleach
Laboratory ref. No. 1..................	2.80	15.4	35—11.8	35—6.1
Laboratory ref. No. 2..................	...	11.8	35—28.0	
Re-refining on No. 2	...	2.4	35—10.8	35—4.9
Total loss ref. No. 2	...	13.9	....	
Sharples results	...	9.03	35—12.0	35—4.2

Another interesting sidelight on the processing of this oil was winterizing. The straight Chinese oil behaved most peculiarly. When mixed with as little as 25% of domestic oil, all went well, but alone it was impossible. From the low Iodine No. we expected a large yield of stearine and a high turning point. (The point at which the crystalization starts and the temperature of the oil rises, we term the turning point.) The low Titer, however, contradicted this, so we hardly knew what to expect, and our first chillers we chilled rather cautiously. As you know, on domestic oil this turning point is around 42 F. We expected a turning point on the Chinese oil of about 40 F. Believe it or not, we had turning points as low as 29 F. on this oil. And how it turned, from liquid to solid in ten minutes. Never before had we seen summer yellow liquid and practically clear at 32 F.

Our first thought was that we were super cooling the oil. We slowed down the chilling, kept the chillers in constant agitation, still just about the same effect. The stearine would not start to crystalize until the oil reached a temperature of about 32 F., then the whole tank would set solid in ten minutes. After many head aches and grabbing at straws, we found that if we added about ½% of crystalized stearine to a chiller after it was cooled to about 45 F., we obtained a perfectly normal crystalization, with an extraordinary fine cold test, and a very low stearine yield. This stearine was bleachable even though the oil bleached only to 4.0 red.

Our conclusions have been that very good results can be obtained by mixing the crude Chinese oil with crude domestic. It is apparent that a dilution of some kind is necessary. On some laboratory tests we have made using a prime domestic oil, the mixture seemed to refine about the same as a straight domestic oil of a similar grade. The last shipment however, gave us hopes that we will be able to handle this oil straight in the future.

Monday, May 25, 1936, we received a sample of Crude Chinese Oil, which was of a much better quality than any we had received in shipments. We ran laboratory refinings which shows it almost the same quality as our domestic oil of the same fatty acid.

Below are the results:
F. F. A., 4.1%.
Lye used, 12% 16 dg.
Refining loss, 17.4.
Color, 35—12.3.
Standard bleach, 35—5.5.
Bleach 3% Activated earth, 0.5%.
Activated Carbon, 35—4.3.

We do not know the history of this oil, but it shows evidence that the Chinese are beginning to strive for quality, and will soon be able to give us an oil equal to our own.

SOY BEAN ANALYSIS*

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THE question of a method for the analysis of soy beans for oil mill purposes is one that this year has been of considerable importance to both the mill chemist and the commercial chemist.

To the cottonseed analyst the most natural approach is to follow the general procedure for cottonseed and I imagine most of us started, at least, along that line. However, the fact that the oil is considerably more of a drying oil than cottonseed oil and the fact that heating increases the tendency of an oil to oxidize, made some of us question whether or not we were safe in preheating the beans before preparing them for anlysis. This was the starting point for our experiments, which proved, we believe that the procedure for cottonseed must be considerably changed for the analysis of soy beans.

The moisture determination is usually made by the government licensed graders of soy beans by the use of a Brown-Duval Moisture Tester. This agrees very well with figures obtained by the use of a Bidwell-Sterling apparatus using Toluol. As neither of these methods lend themselves well to quantity work we tried drying overnight at 101° as we do cottonseed. The results we got averaged about five-tenths per cent lower than the figures obtained by the Toluol distillation. After considerable work we found that three hours at 130° C. in a Freas Forced Draft Oven will produce results agreeing exactly with the Toluol method. However, a longer period at this temperature darkens the beans and gives results that are too high. This tendency to hold moisture extends to the partially dried ground beans, for samples dried overnight at 101° C. do not show the maximum results which are obtained in two hours at 130° C. Three hours does not materially affect this determination.

The oil contained in the beans must be pretty well protected from oxidation, for we find no difference in the amount of oil extracted when the beans are airdried, dried one hour at 130° C. or two hours at 130° C. If airdrying (overnight on top of the Freas Oven) is used, grinding in the Bauer Mill is possible, but a very fine powder cannot be produced. After two hours at 130° C. the beans can be ground to flour by using the new 3,600 r.p.m. Bauer Brothers' Mill or by grinding twice through the regular seed mill. If airdrying and coarse grinding be used, regrinding of the partially extracted beans is essential. If very finely powdered meal is used and two gram portions are weighed out a continuous eight-hour extraction will give practically maximum results. Similar amounts will be shown by extracting two hours, regrinding in a mortar and re-extracting for three hours' additional. This regrinding should not be done before the beans have had two hours' extraction, for if reground sooner a loss of meal while regrinding would cause low results.

Five gram portions, either with or without regrinding, do not give maximum results. This is probably due to the difficulty of regrinding the larger quantity sufficiently fine in the mortar. Regrinding with sand in the mortar adds to the difficulty and to the time necessary to regrind, but does not seem to give higher extractions.

The ammonia determination does not offer any trouble, the ground beans being so uniform that closely agreeing results are easy to obtain.

The work that has led to these facts and figures was done in our laboratory and that of a mill interested in crushing soy beans. It was done largely for our own information, however, as there is no committee of the Society on the analysis of soy beans and as there has been quite a demand for this work during the past year, which will probably increase in the future, I thought possibly the Society would like to adopt as a temporary or tentative method the procedure I am going to suggest as a means of obtaining more concordant results between different laboratories. This method, of course, to be succeeded by an official method when such is submitted to and approved by the uniform methods committee.

The procedure is probably not perfect, but it seems to me that its use would at least tend toward better results than those being obtained at present where every one is using his own plan.

The question of foreign matter in the beans is slightly different from foreign matter in cottonseed. As long as government graders are doing the grading of the beans, the foreign matter contained as determined by them affects the grade of the beans and in that manner the price. Furthermore, the question of whether split beans and shell particles should be classed as Dirt and Trash is a rather difficult one and as most of the mills at least are running the beans without further cleaning I do not believe the question of foreign matter should enter into the laboratory analysis.

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