Quality of Crude Cottonseed Oil*

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IN DISCUSSING the quality of crude cottonseed oil, I would like to approach the subject from the point of view of a refiner and manufacturer of finished fatty oil food products such as shortening, margarine, salad and cooking oils. This approach differs from that of an oil mill operator's. The reason for this approach is believed to be in the interest of the cottonseed oil industry generally since it is hoped that I can bring to you certain things from this point of view that may have escaped your attention.

Before proceeding further I want to explain that I am qualified only to present certain problems regarding the quality of crude cottonseed oil. I am not qualified to present a solution to them beyond making general suggestions. However, I believe certain improvements in the quality of crude cottonseed oil are necessary for the general welfare of the industry. I further believe that certain problems involved in improving crude oil quality are amenable to solution by the oil mill industry itself.

I have chosen this subject and this approach for two reasons: first, I believe that in many cases the oil mill operator and the manufacturing consumer do not characterize quality in the same terms. And secondly, I believe certain improvements in quality from the manufacturing consumer's point of view are necessary for cottonseed oil to hold its diminishing but still favorable position in an increasingly competitive market with other vegetable oils, notably soybean oil.

The maintenance and improvement of the quality of any product is invariably the result of some incentive. A most important incentive is reward in the form of an increased price for improved quality. Perhaps the principal guardian of quality and incentive for improved quality today are the established trading rules of the National Cottonseed Producers Association. These rules govern almost all buying and selling of crude cottonseed oil in this country. A look at the history of these trading rules is important to our subject.

Only three characteristics of crude cottonseed oil are now or have ever been quality considerations in trading. They are, namely, flavor, refined color, and refining loss. Trading rules were established in 1901 (46 years ago) based on these three characteristics. This basis of trading established these 46 years ago is not materially different today except for details. This is a monument to the foresight of the men who developed these rules in the early 1900's.

The early trading rules did not provide monetary premiums for above average quality. They only provided discounts for off-flavors, refining losses in excess of 9%, and refined color in excess of 7.1 red Lovibond. In 1927 the familiar rule 142 of the N.C.P.A. rule book was adopted, establishing for the first time premium payments for above average quality on two of these three quality characteristics. Monetary premiums were then established for oils having a refining loss of under 9% and/or refined color under 7.1 red. In 1932 this premium established for better than average red color was eliminated. In my opinion this was a step backward in the gradual evolution of improved trading rules.

Therefore as our trading rules exist today, only refining loss is recognized with both a premium and a penalty for quality. No quality premium is recognized for refined color or flavor—only discounts when they are off quality.

I WOULD like to eliminate the characteristic of flavor as a quality consideration in this discussion since it is really meaningless, primarily because it cannot be evaluated. The trading rules now differentiate between prime and off-flavor as being over or under 3.25% free fatty acid. So actually it is the free fatty acid of the oil that is being used as the quality characteristic. Since oils of increasing free fatty acid generally are oils of increasing refining loss, this characteristic is largely equalized in trading through refining loss settlements.

We are now left with merely two considerations of quality, namely refining loss and refined oil color, of which only refining loss is recognized with a premium in trading. I am sure that most of you rightfully think of high quality crude cottonseed oil in terms of a low refining loss and a refined color that is not over 7.6 red. It may be disquieting to some of you when I say that many manufacturing consumers care very little what the refining loss or the refined oil color of the crude is, within reason. Of course, extremely high refining loss oils are not desirable because they generally are associated with other undesirable characteristics. But for normal run-of-mill oil, representing perhaps 90% of the annual production, the manufacturing consumer is not particularly interested in the refined color of the crude oil he buys and is only interested in the refining loss from an economic standpoint.

The refining loss of a crude is a measure of its yield of refined oil. It is purely an economic consideration, having very little to do with quality. It is, of course, important that the existing trading rules surrounding refining loss be maintained as they are fair and equitable from an economic point of view.

I know that the question arises in many of your minds immediately, "Does not a low refining loss oil mean that it will also have a low refined color, or a low bleach, or an improved flavor, or some other improved characteristic?" On the average there is a slight trend toward a correlation of this nature, but the exceptions are almost as many as those that follow the rule. In other words, with only the refining loss analyses on a lot of oil no experienced technical man would dare predict what its other quality characteristics might be although he might hazard a guess at a seasonal average.

I have knocked down two of the three so-called quality considerations of crude cottonseed oil as being of little or no value as measures of quality. "Surely," you say, "if flavor and refining loss are no measure of quality to the manufacturer consumer, the matter of refined color must be all-important." Again I must

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tell you that the refined color is not of particular interest to the refiner. It is not in itself a measure of any quality characteristic that reflects in the quality of shortening, margarine, or salad oil. Nor does it have any definite correlation with any quality characteristic that is a quality consideration in these finished products.

I know what must now be going through your head: "Does this man mean to tell us that none of these characteristics which have been used in the industry for close to 50 years have any bearing on the quality of the oils that we are producing?" I cannot truthfully answer that question with a definite "No" as there is a very small effect, but I must answer that the effect is extremely small.

The fact remains that from the manufacturing consumer's point of view there never has been much of an incentive, at least as far as trading rules are concerned, to improve crude oil quality. Consequently, there has been little improvement in real quality in many years. Then you ask, "What quality do you want in crude cottonseed oil?" This brings me to the meat of my subject.

ALTHOUGH the manufacturing consumer is concerned with perhaps a dozen different quality considerations, two characteristics stand out as all-important. First, he wants an oil that will be as stable as possible against rancidity and off-flavor developments in the food products that are manufactured therefrom. Unfortunately, there is no simple test to measure this characteristic directly. Secondly, he is interested in an oil that can be bleached to a very low color, approaching water white. Many of the products that he manufactures must, by consumer demand, be extremely light in color. This bleachability can be measured by a very old and simple test as standardized by the American Oil Chemists' Society and adopted by the N.C.P.A.

This bleach test has a very good correlation with flavor stability. So with this one simple test we can appraise both of these most important quality characteristics—its bleachability and its flavor stability.

This bleach test is the only test known that reflects the flavor stability of an oil and at the same time is a test simple and reproducible enough for use as a tool in trading. This address is not intended to be a technical treatise on the subject, but substantiation of this particular relationship as well as others that I have claimed or refuted can be found in the literature or in the technical files or experience of manufacturing consumers.

Let me discuss the history of bleachability for a moment. The use of the refined oil color as a consideration in trading has apparently always been practiced because of its supposed measure of the bleachability of an oil. Up until 1919 a 7.1 red refined oil color was the recognized limit for prime oil quality. This was because it apparently corresponded on the average to a 2.5 red bleach color. In 1919 this was changed to 7.6 red due to new evidence that this more correctly compared to a 2.5 red bleach color. In other words, the men who established and perpetuated the use of the refined oil color as a consideration in trading were apparently always thinking in terms of bleach color. The correlation between a 7.6 refined oil color and a 2.5 red bleach color is probably reasonably true today as an average. The refined oil color cannot be used, however, to predict the bleachability of a single lot of oil as the correlation is very poor. Knowing only the refined color, or the refining loss, of any given lot of oil no technical man would dare predict its bleachability although he might hazard a guess at a seasonal average.

Therefore the only way to measure the bleachability of an oil is to measure its bleachability directly by the official bleach test that has been in practice for many years as the principal basis of quality trading in bleachable refined oil.

Ever since the inception of trading rules on bleachable refined oil a 2.5 red color has been the principal quality requirement. When this required bleach was established, finished edible products such as shortening were seldom marketed below 2.5 red and the specification was adequate. In fact, 15 years ago a shortening with a 2.5 red color was the very best that was produced. Today, a shortening with as high as a 2.5 red color would be considered a very poor product. Shortenings with a 1.0 red color and under are quite common today. Most finished products today are required to be considerably under 2.5 red color whereas 15 years ago most of them were over 2.5 red color. This should explain why the manufacturing consumer is increasingly interested in purchasing low bleach oils.

NOW let me discuss the current practices involving the relationship of bleach to flavor stability. The manufacturing consumer is further interested in purchasing low bleach oils because it is his best assurance that these oils are the best available from the standpoint of keeping quality in finished products. The wise and careful buyer of crude cottonseed oil watches the bleach color of the oils he buys much more closely than any other quality characteristic. Although this bleach color is not a consideration in trading as set forth in the published trading rules, you can rest assured that in fact it is a vital consideration. Although the seller may not realize it, much of his oil is appraised for its bleachability. Quite frequently a purchase is either culminated or fails to materialize because of the bleach quality of the oil that has previously been received from the same source.

With these considerations in mind what would be adequate trading rules in the best interest of all concerned? In my opinion, they would be extremely simple. They would be based upon two tests only: refining loss for distinctly economic reasons and the bleach color for distinctly quality reasons, with both monetary premiums and discounts for over and under an established fair average for both of these characteristics.

It is quite interesting to compare this with the first set of N.S.P.A. rules designed specifically for trading in crude soybean oil for edible oil consumption. These rules will go into effect for the first time on October 1 of this year. They are fundamentally based on these two characteristics of refining loss and bleach color, and only these two. Premiums and discounts are provided for refining losses above and below 7%. Discounts for bleach color are provided for over 3.5 red, but no premiums are provided for better than 3.5 red. This specification for the bleach quality of soybean oil provides for no incentive to produce a superior oil. But after all, these trading rules to be initially established for soybean oil in edible use are certainly started in the right direction. I want to

call your attention to the fact that free fatty acid, flavor, and refined oil color are not to be considerations in trading on soybean oil. These three are the ones that I have pointed out as being of little value as now used as trading bases on crude cottonseed oil.

I would like to say just a little bit about the competitive situation between soybean oil and cottonseed oil since it has a definite bearing on this subject. Soybean oil has certain definite quality advantages over cottonseed oil to the manufacturing consumer. It is more of a natural salad oil, requiring no removal of stearine by winterization. It bleaches to a very low color incidental with its hydrogenation. It has a much greater resistance to oxidative rancidity when hydrogenated. There is only one major deficiency in soybean oil that gives cottonseed oil its present superior price and quality position. That is its tendency to develop an objectionable off-flavor on age in the finished product manufactured therefrom. The soybean oil producers recognize this as their one great problem, and every resource of that industry is directed toward its solution. Great strides have already been made, and it would be folly for the cottonseed oil industry to think that they are protected competitively by this thin margin. This problem of soybean oil flavor reversion will very likely be solved, and it could be very soon. Then the advantageous competitive position that cottonseed oil has enjoyed would be wiped out and a new set of comparative values between these two competing oils would be established, not necessarily favorable to cottonseed oil.

MY CLOSING thought to you is that cottonseed oil, for the first time in its glorious history, is faced with competitive soybean oil which could shake the very foundation of the cottonseed oil industry as we know it today. One form of protection against this unfavorable competitive possibility is to improve the quality of crude cottonseed oil. This matter of improved bleachability may seem rather unimportant, but keep in mind that this little quality characteristic, if kept low, means greatly improved shelf life and appearance and general improved quality of the shortening, margarine, salad and cooking oils, into which practically all of it is consumed.

I do not wish to infer that general quality improvements have not been made in the crude cottonseed oil produced over the past years. Great improvements have been made but largely in the realm of economics, not true quality. For instance, there has been no improvement of any kind in the bleachability of the crude cottonseed oils that I have seen in Texas in the last 12 years. Compare that with the improvement in the quality of soybean oil. Twelve years ago soybean oil was hardly considered of edible quality. Today as much soybean oil is used in edible products as cottonseed oil.

A logical question from you now would be, "Is there anything that we can do to improve this bleach quality?" Yes, I think there is. Many times I have seen both good and poor bleach quality oils produced from apparently the same seed and under apparently the same operating conditions, with little difference in refining loss or refined color. Obviously, these operating and seed conditions were not the same, but something controllable was causing the difference between good and poor bleach quality.

The problem, then, in improving the bleachable quality of an oil is probably largely in finding the conditions most favorable to production of low bleach oils. You have found these conditions that are most favorable to low refining losses and low refined colors because there was a monetary incentive to do so. I am sure you could improve the bleach quality in a similar manner if given a similar incentive.

I am not qualified to tell you what these conditions are that may favor the production of low bleach oils, but I am convinced that the oil mill industry itself can develop these relationships. I would like to suggest that you determine the bleach quality of your produced oils as frequently as you determine refining loss, free fatty acid, and refined color. Knowing the bleach quality of oil production is, of course, the first step toward its improvement.

My final thought to you is this. If the bleach color were instituted as a quality consideration in crude cottonseed oil trading instead of refined color, and on a premium and penalty basis, it would cause a real step forward in our competitive race with the soybean oil industry in quality improvement. I believe that this simple rule change, if so defined to serve as a real incentive, would result in a steady improvement in the bleach or real quality of crude cottonseed oil. Necessity is the mother of invention. If the cottonseed oil milling industry were given a necessity for improving bleach color, I am sure the inventive ability is present in the industry to accomplish the desired result.