DECORTICATING LINSEED AND OTHER SEEDS

Material	Whole Seed % Moist.	Whole Seed % Oil	Seed Cut and Picked by Hand % Hulls	Seed Cut and Picked by Hand % Kernels	Products from Seed Decorticated Mechanically, Using Special Model Huller — Percent Yields: Clean Hulls	Hull Screenings	Kernel-Hull Mixture	% Oil (10% Moist. Basis): Clean Hulls	Hull Screenings	Pure Kernels	Kernel-Hull Mixture	% Protein (10% Moist. Basis): Clean Hulls	Pure Kernels
Bombay Linseed	7.5	43.0	42.9	57.1	25 to 30	1 to 4	70 to 75	16 to 25	27.9-28.3	57.0-59.4	48 to 54	18.8	21.9
Hempseed	7.7	30.9	38.0	62.0	26.7	2.2	71.1	2.2 to 6.7					35.8
Canteloupe seed	7.5	29.1	39.9	60.1	27.7 to 36.8	0.5	64 to 72	0.5 to 2.7		48.3		4.4	32.9
Rape seed (Nasturtium)	6.4	42.2	17.8	82.2	10.8	1.6	87.6	6.2					
Perilla seed	6.6	33.8	32.4	67.6	18.6	1.0	80.4	8.1					
Large Yellow Mustard seed			20.7	79.3	17.3	0.6	82.1	2.9					
Small Yellow Mustard Seed			20.1	79.9	13.7	3.7	82.6	19.6 (?)					
Small Brown Mustard seed	5.6				4.3								
Small Purplish Brown Mustard seed	6.9	34.8			11.9	4.9	83.2						

would be increased by removing the hulls, as the resulting pure kernels would probably be too soft to handle.

The particular variety of Perilla used in this test was quite small. Doubtless better decorticating could be done on some of the larger varieties.

MUSTARD SEED — Tests were made on 4 different varieties of mustard seed, 2 white mustard, and 2 black mustard. Actually the white mustard seed are yellowish, while the black seed are brownish.

Good results were obtained on the larger yellow seed, and fair results on the smaller yellow seed, altho in the latter case the hulling elements in the model huller were not suitable, and better results could have been obtained by providing correctly designed elements.

The brown mustard was more difficult to handle, especially one variety the kernels of which stuck in the hulls even tho it was not very high in moisture.

While decortication of mustard seed may not be of much interest to oil millers, it is possible manufacturers of mustard flour condiments might find some advantage in taking off the hull before grinding the seed.

Lint on Cottonseed by Analysis and by Nature

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Abstract

The quantative analysis for lint on cottonseed is successful in the laboratory, in that reproducible results can be obtained. The percentage of lint found cannot be translated to reliable predictions of actual yield values because of the effect on delinting efficiency of variations in seed size and shape, and the proportionate distribution of long and short fibers. Analysis for residual lint on delinted seed does not indicate the cellulose content of second cut linters.

FOR many years the chemists of the cotton oil industry have worked on the development of a reliable laboratory method for determining the amount of lint on cottonseed. The degree of interest and activity on this problem has varied with the value of linters. During each period of high prices interest revives and a new method is usually presented. The recent development of the analysis of second cut linters for cellulose content as a basis for evaluation and sale to the chemical industry stimulated interest in some sections in the analysis for lint on seed. It was thought that by determining in the laboratory and controlling in the mill the residual lint on seed, second cut lint of a uniform cellulose value could be produced.

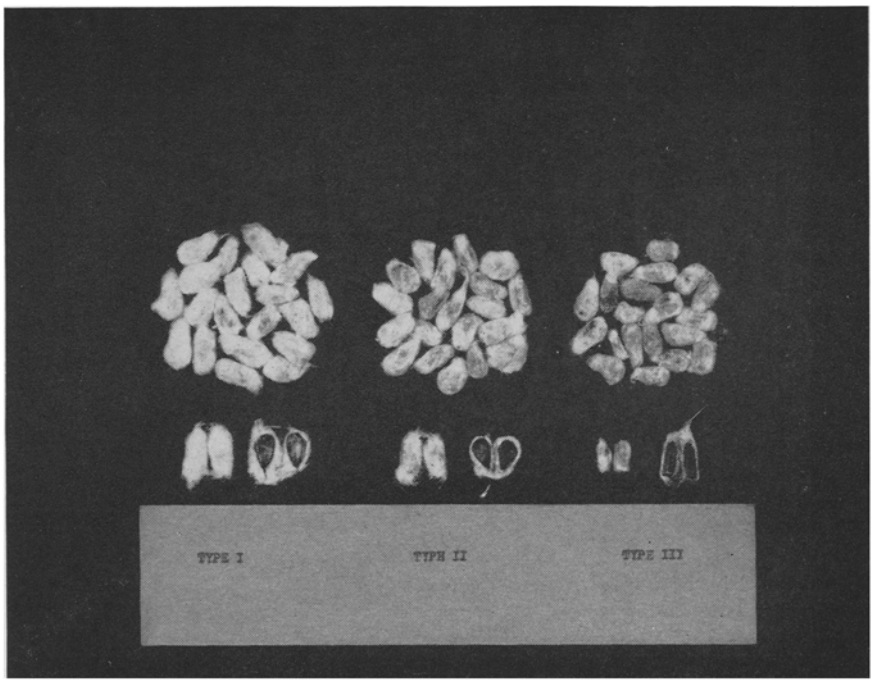
The presentation of each new modification of a lint on seed analytical method is accompanied by data showing the precision of the method, and often some evidence of agreement with actual plant yields. Laboratory procedures for removing the lint from the seed have varied from the traditional use of sulphuric acid to the radical attempt to nitrate the fiber and explode it off. With the development by Malowan about 1921 of the use of hydrochloric acid to hydrolize the lint in order to grind whole seed for analysis, the use of this acid has been generally preferred. With the standardization of the acid fuming procedure of the official seed analysis method, most chemists concerned with the problem have developed their own lint on seed tests. Usually 50 grams of seed are fumed, the brittle lint is rubbed off, and the loss of weight calculated as percent lint on seed. The individual variations apply to the way in which moisture is calculated and results converted to predicted yield figures. Apparently the most accurate method is to determine the moisture on a separate portion of the original sample, and to dry completely the denuded seed. The difference between the total loss of weight, and the calculated loss due to moisture only, gives dry lint on dry seed. This figure can then be calculated to the desired basis, which is usually 8% moisture basis lint on original moisture basis seed.

The method of McKinney and Jamieson published in OIL & SOAP, Vol. XIII, No. 6, even with an assumed constant moisture in the fumed lint which was rubbed off, gave results which could be reproduced with some accuracy. With a well established routine, control of all moisture variables, and the use of 50 gram samples in duplicate, a uniform lot of clean seed can be analysed repeatedly with results agreeing within .5% of lint on seed. Therefore, as far as reproducible laboratory results are concerned, the analysis of clean cottonseed for percentage of lint is successful. That its use has not been applied more generally must be due to some reason in addition to the relatively high cost of analysis.

During 1937 a study was made at two oil mills of the relation between the amount of lint left on the seed after the second delinting, and the cellulose content of the second cut lint. For a period of thirty operating days the delinted seed were accurately sampled each hour and daily composites were analyzed for residual lint. It was found that the mill which had the lowest percentage of lint left on the seed produced second cut lint of the higher cellulose content, even though a much greater proportion of first cut was being made. Every precaution was taken in sampling for these tests, corrections were made for all moisture variations, and a large number of analyses were made. From the results obtained it was concluded that, on a comparative basis between mills, the amount of lint left on the seed was not an index of the cellulose quality of second cut linters. Tests made on other mills indicated, paradoxically, that high yields and high quality were accompanied with a low percentage of lint left on seed.

During most of the season 1937-38 the percentage of lint was determined regularly on the seed crushed at two mills located about 250 miles apart. One mill received seed preponderantly of southeastern character, while the second received a high percentage of delta seed. The average yield from the latter was 60 pounds more lint per ton, with the government grade of the first cut, and the cellulose content of the second cut, being superior. Using a uniform moisture basis throughout, the first mill showed 9.8% total lint on seed, the second 11.5%. This difference of 1.7% of lint would logically be expected to produce about 34 more pounds of lint at the second mill. But instead of the factor 20, to convert percentage to pounds per ton, a factor of 35 is required in this case.

A number of lint analyses and yield comparisons were made at other mills to check the possibility that a difference in linter room capacity and operation was causing this wide variation in yield. The several mills included in the study received valley, hill, and eastern seed which gave a full range of comparison of seed types and yields. It was found that in most cases the difference in lint by analysis had to be multiplied by 40 to check the actual difference in plant yield. As the percentage of lint on seed increases the possible yield mounts tremendously. In the first comparison above, 1.7% more lint on seed produced 60 pounds per ton of seed more lint in the mill. With linters at 2c per pound there was an increase of $1.20 per ton, or 6% on $20 per ton seed. Each .3% of increase in total lint on seed by analysis would be approximately equal to one grade unit on the value of the seed. Present methods of analysis for lint on seed cannot be expected to give results accurate to .3%.



These findings were of such interest that a study was made of the variations in physical characteristics of seed typical of the simultaneous receipts at three mills. The accompanying photograph shows the wide variations in seed character which appeared at these three mills which are located within an area smaller than an average cotton producing state. Each group is composed of twenty seed, and below each group are two typical seed which have been split.

Examination of the split seed shows an abnormal amount of lint, evenly distributed on uniformly large seed, in Type I. These seed were inadequately ginned. Type II shows average delta seed, which are large and uniform in size, with an even distribution of medium length fiber over the entire cortex. Type III, which are hill seed, are irregular in size and shape. The split seed show a concentration of long fibers at the seed ends, with short and often sparse fiber on the sides.

The mill working Type I seed cut 93% of the total lint by analysis, leaving only 20 pounds per ton difference between total lint on seed and actual yield. Nearly half of the total yield was first cut of exceptionally good quality. From Type II a normal delta cut was made, the yield being 88% of the total lint by analysis, with a difference of 28 pounds per ton between total and yield. A third of the total yield was first cut. From the hill seed in Type III the yield was 81% of the total, with a difference of 40 pounds. Only a fourth of the yield was first cut.

Examination of the seed offers some explanation of these yield variations, and also of the character of the lint produced and the problems of linter room operation. First cut lint from Type III contains some definitely longer fibers than typical delta lint, and is of poorer color, with underlying short fiber. The total lint on the seed consists of very long fibers on the seed ends and short fuzz on the sides. Therefore, when it is attempted to exceed the normal yield of grade #2 linters, the quality breaks sharply to grade #3 or worse as the increased yield is obtained from the fuzz. Irregularity of the size and shape of the seed makes for ineffective ginning. The linters cannot remove all of the fiber from the ends of the seeds, nor from the indentations. If the seed are small there are relatively more ends to resist ginning, and very small seed slip through the linters almost intact. Effort to in-

crease the second cut to obtain more of the high residual lint results in producing off grade lint of low cellulose content which is unacceptable for chemical industry because of high bran and hull content.

Type II will yield a higher percentage of grade #2 lint which, while lacking the small percentage of extra long fibers of hill lint, will be smooth, uniform, and bright in color. The roundness and uniformity of the seed make it possible to obtain a greater relative total yield as a result of thorough delinting. In the second cut linters a very high percentage of the residual lint can be cut without excessively contaminating the product with hull particles. Type I are abnormal seed which exceed in the desirable qualities of typical delta seed. The amount of long fiber present greatly exceeds the short fuzz and in consequence a very high proportion of first cut, of good quality, could be made. Only a negligible amount of fiber remained on the seed after the second cut was made.

The conclusion drawn from this study is that the determination of lint on cottonseed by analysis, while successful from the laboratory standpoint, does not and cannot indicate lint value to the mill. The determination of residual lint on seed cannot be relied upon to indicate the efficiency of the delinting operation or the quality of the product, because of variations of seed size and shape which are inconstant not only between mills but at a single mill. In analysing cottonseed for total lint during an entire crushing season it was found that for each 1% increase the actual yield increased by approximately 40 pounds per ton. But as it has been shown that lint yield is so dependent on natural seed and fiber characteristics other than the amount of lint present, it cannot be assumed that on any single lot of cottonseed the total lint by analysis is any indication of the amount or quality of available linters. It is quite possible that in milling two lots of seed the one with the lower total lint would give the higher yield. There is little in common between lint by analysis and lint by nature.

The Presence of Long Chain Aliphatic Alcohols in the African Palm. (Elaeis Guineensis)

Abstract

Attention is called to the occurrence of Long Chain Aliphatic Alcohols in the unsaponifiable fraction of African palm oil. A short description of the isolation of these compounds and the evidence obtained is presented. The constants of the separated sterols are given and compared with those of other research workers.

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DURING the investigation of the unsaponifiable fraction of an African palm oil a dark red precipitate from petroleum ether solution was obtained. In trying to free this residue from the expected sterols by boiling with concentrated alcohol, the slight solubility of the compound was revealed even in extreme dilution. The hot filtrate showed a tendency to gelatinize, during cooling. After separation from the carotene, repeated crystallization from hot methanol, finally with the addition of charcoal, yielded a white waxy residue. The compound is insoluble in water, slightly soluble in alcohol and in petroleum ether, but quite soluble in acetone and ethyl ether. Melting in contact with boiling water and then cooling to room temperature gives a yellow white wax. The melting point of different preparations of the crude substance was 83.4 — 86.0° C. The melting point after purification by recrystallization from ethyl ether was 85.5° C. The acetyl ester was prepared by acetylation with acetic anhydride. Repeated crystallization from hot alcohol yielded the following fractions:

(1) *Acetate*	*M.P.°C*
(1) Fraction	67.1,
(2) Fraction	68.6
(3) Fraction	69.6
(4) Fraction	73.5

The saponification number of the fourth fraction was 116.8; Mol. W. calculated from this value 479.20; Mol. W. calculated for $C_{30}H_{61}OH$, 438.5. The alcohol regenerated from the acetyl ester melts at 85.5° C. after repeated crystallization. Mol. W. for the alcohol prepared in this manner determined, according to the method of Rast, was found to be 437.5.

Alcohols having the constants recorded above, have been reported from many plant sources and have been shown by Chibnall, et al., to consist of difficultly separable mixture of alcohols having a mean molecular weight corresponding to $C_{30}H_{61}OH$. (See The Constitution of the Primary Alcohols, Fatty Acids, and Paraffins Present in Plant and Insect Waxes by Chibnall, Piper, Pollard, Williams, and Sahai. Biochem. Jour. 28, 2189-2208 (1934).

From the data presented the presence of long chain aliphatic alcohols has been concluded.

The palm oil sterols after repeated recrystallization from methanol finally with the addition of charcoal had the following characteristics: colorless, plates, M. P. 136.5° C., spec. rotation $(\alpha)_D^{23}$ — — 43.2° in chloroform. Acetylation with acetic anhydride yielded an acetate melting at 130.5° C. Having a saponification number of 136.5 and a specific rotation $(\alpha)_D^{20}$ — — 37.2° in chloroform.

These data agree with those reported by K. S. Markley and M. B. Matmack in science, Vol. 80, No. 2070, page 206. These authors found for the sterols, M. P. 136.6 — 137.0° C. and a specific rotation in chloroform $(\alpha)_D^{20}$ — — 41.66°; for the acetate M. P. 130.5 — 131.5° C., the specific rotation — 36.5°.

This paper was originally presented at the Milwaukee Meeting of the American Chemical Society.