Sampling Cottonseed at the Oil Mill *

Important Laboratory Analyses Absolutely Dependent Upon Care and Accuracy Devoted to the Sampling Operations

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IT IS probable that during the past season laboratories connected with the cottonseed industry have given more intensive thought to the analysis of cottonseed than they have previously given in several years. Inspections of laboratories were made, exceedingly detailed instructions were issued, check samples were run and every effort was made to produce uniform results from all of the laboratories.

Such steps were entirely proper. The present plan of buying seed on analysis rests on the premise that, given the same sample, all accredited laboratories will report results agreeing within reasonable limits. The necessity for uniform procedure is plainly recognized in the 1931 Rules in which five and one-half pages were used in setting forth the details of handling, testing and reporting seed samples. More, rather than less, of these detailed instructions may be expected in the future issue of the Rules.

In contrast, one and one-half pages of the Rules contain the methods of sampling and handling the samples. As the testing laboratory is entirely dependent upon the sample received, greater emphasis on this point might produce some good effects on the minds of the industry.

While the immediate interest of most cotton oil chemists is in the sample received at the laboratory, some of them are in actual contact with the problem of car sampling and those others not in immediate contact, must be interested and informed on this problem. They will be called upon in time to resample cars, or to give sound advice to mill operators.

For the past several years, the Buckeye Cotton Oil Company has maintained a laboratory at each mill and has sampled every car of seed received at each mill during this time. Many methods of sampling have been investigated and cleaning and division of samples have been studied. Some of the findings along this line are set forth in this paper.

Sampling

THE sampling of cottonseed presents, certainly, as many problems as the analysis of the sample. No uniform method of loading cars is in use. Any car may represent a restricted, or a remarkably large acreage. Some ginners return the trash to the seed; others do not, and carelessness in loading the cars frequently adds dirt. While simple rules may be laid down for sampling the average car, real intelligence is needed for sampling all cars.

In a recent experiment, 229 cars were sampled in three ways. In each case a 50# sample was taken from holes 30 inches deep. The methods of sampling were as follows:

1. Three holes 30 inches deep, one in either end and one in the middle of the car. 2. Five holes 30 inches deep, equally spaced throughout the length of the car. 3. Ten holes were dug 30 inches deep in two parallel five hole lines.

All of the mills in the Company took part in this experiment and nearly every variety of seed was encountered. The averages were as follows:

	3 Holes	*5 Holes*	*10 Holes*
Moisture	12.12%	12.05%	12.08%
Dirt and Trash	1.94	1.97	2.00
F. F. A.	2.3	2.4	2.4

Segregating these data and using the three-hole method as a base, 74 cars running from 0% to 1.00% dirt and trash ran as follows:

	3 Holes	*5 Holes*	*10 Holes*
Moisture	11.8%	11.7%	11.7%
Dirt and Trash	.66	.69	.71
F. F. A.	2.0	2.1	2.2

Using the same method, 95 cars running from 1.01% to 2.50% dirt and trash ran as follows:

	3 Holes	*5 Holes*	*10 Holes*
Moisture	12.2%	12.0%	12.1%
Dirt and Trash	1.30	1.59	1.57
F. F. A.	2.5	2.6	2.6

60 cars running from 2.50% plus dirt and trash ran as follows:

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* Presented at Annual Meeting American Oil Chemists' Society, New Orleans, May, 1930.

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	3 Holes	*5 Holes*	*10 Holes*
Moisture	12.5%	12.5%	12.6%
Dirt and Trash	4.38	4.14	4.30
F. F. A.	2.3	2.3	2.3

You will notice that the averages check remarkably well for the different methods of sampling.

Large vs. Small Samples

WHILE the rule specified that a 50# sample from each car should be taken, it is not at all unlikely that some mills, not having equipment themselves with shakers and sample reducers, take only one 1,000 gram sample from a single point in the car for settlement purposes. The dangers of this practice are brought out in the following experiment.

Ten cars of seed were sampled by taking a 50# sample from three levels in the car. Three holes 30 inches deep were dug from each level. Ten one-pint samples were also taken from each level. The average of the ten pint samples agree closely with the 50# samples, but the pint samples varied from each other remarkably. The results follow:

	Moist.	*F. F. A.*
Car #1—Level #1		
50# Sample	15.6%	7.9%
Pint Sample—Low	14.8	6.5
" " —High	16.4	11.2
Car #1—Level #2		
50# Sample	16.1%	8.9%
Pint Sample—Low	14.2	5.0
" " —High	16.1	11.5
Car #1—Level #3		
50# Sample	15.2%	8.9%
Pint Sample—Low	14.2	4.9
" " —High	15.5	12.4
Car #2—Level #1	*Moist.*	*F. F. A.*
50# Sample	13.4%	1.3%
Pint Sample—Low	13.3	1.2
" " —High	14.8	2.5
Car #2—Level #2		
50# Sample	13.7%	1.7%
Pint Sample—Low	12.8	1.4
" " —High	15.0	2.4
Car #2—Level #3		
50# Sample	13.7%	1.9%
Pint Sample—Low	12.5	.9
" " —High	17.0	2.7
Car #3—Level #1		
50# Sample	16.6%	7.9%
Pint Sample—Low	14.2	5.0
" " —High	17.0	8.0
Car #3—Level #2		
50# Sample	16.5%	9.2%
Pint Sample—Low	15.3	7.5
" " —High	16.9	11.1
Car #3—Level #3		
50# Sample	16.3%	10.1%
Pint Sample—Low	15.9	6.5
" " —High	17.0	11.3

It was observed also in this experiment that the water content of the seed was lower at the top level than at the lower level with cool seed, and that the reverse occurs with hot seed. For the same reason, condensation of water, the top seed of hot cars ran higher than the lower layers in F.F.A.

All of these cars showed similar differences between the small samples, the worse the seed the greater the difference. This is not hard to understand when it it realized that there are 88,000 pints, or 22,000 half gallons of cottonseed in the average car of seed.

Care of Sample

MOISTURE should be run on the sample as soon as possible after taking, or the sample for the laboratory should be inclosed in a tightly closed can immediately after reducing and cleaning the 50# sample from the car. Approximately 500 cars were tested by taking one-half gallon samples from the bottom of three holes from which the 50# sample was taken. The moisture content of these samples were compared with the moisture content of the reduced 50# sample. Time elapsing between sampling and testing was noted. Variable losses were found depending on original moisture, humidity and temperature, and elapsed time. One hour elapsed after sampling being a maximum for safety when a 50# sample is used.

Proponents of sampling cars as they are unloaded might ponder this. Most cars are in process of unloading from two to three hours. With small lots being taken at infrequent intervals and the receiving vessel being opened and possibly closed for each lot, a loss in moisture must ensue. Along this line, though we have tested the two methods carefully, no greater accuracy has ever been found in unloading samples.

Handling Sample

DIRT and Trash Determination. By all manner of means, all mills should be equipped with similar shakers, the length, width and metal clothing, throw and speed, all being alike. Our experience has led us to adopt a roll-fed mechanical feeder operating at not more than 10 R.P.M.

Suitable slots as specified in the Rule may be obtained by cutting three holes, 1½ inches long by approximately one inch wide, in the end of the seed deck in the shaker. Directly under these holes there should be a chute leading to a sample box. The two sides and back of the slot must have a guard of metal one inch high and the size of the sample may be regulated by having one of the side guards on each slot adjustable so that the hole may be opened or closed in making adjustments. All of the holes must be the same size. This

sampler performs a dual function of sampling and mixing as shown by the following experiment:

Known mixtures of linty and black seed were made to contain 4, 8 and 12% black seed. Fifty pound samples of these were run over the shaker by weighing 100 gram portions grabbed from the sample box. The findings of these tests are as follows:—

4%	Mixture —	4%	Found —	76	Samples
8%	" —	7.7%	" —	90	"
12%	" —	11.6%	" —	86	"

The use of black seed as a criterion of mixing may be considered sound and it might be added that unless the slots in the shaker are enclosed as directed, the black seed will shoot across the bare opening and the sample will not contain a proper mixture of this important class.

In taking samples for the laboratory from the receiving box, the one-half gallon can should be filled by taking complete vertical sections of the sample without any attempt at further mixing the sample.

Accuracy of Dirt and Trash Tests

VARIOUS experiments comparing laboratory shaker cleaning with mill cleaning show that it is not possible to remove as much dirt by passing over a small shaker and subsequently picking, as the mill does from the contents of the car. The dirt and trash reported by shaking and picking represents a minimum trash content for the average car. This factor is probably not generally understood and should be emphasized.

Confirming this statement, two experiments were run at different mills. At one of these mills, weighed amounts of sand were added to perfectly clean seed. At the other of the mills, weighed amounts of typical large trash, bolls, stems, etc., were added to clean seed. These seed were then passed and repassed over the shaker.

It was found that the shaker itself never returned all of the sand to the seed, nor all of the big trash in the seed and that the amount recovered varied inversely with the amount of sand and trash in the seed. This further emphasizes the need of sending mechanically correct samples to the laboratory for their determination of additional foreign matter.

In equipping themselves for this work, the mills need not be put to any considerable expense. There is hardly any oil mill which hasn't on hand an old shaker frame, a roll feeder, pulleys and eccentrics. The shaker can be built by mill labor and in many instances placed in the mill at some point affording power for the shaker. Two inexpensive scales are then needed. One a small platform scale on which the 50# of seed should be weighed and a reasonably priced counter scale on which the dirt and trash can be weighed in ounces. A table can be easily made from which the percentage of dirt and trash can be read for each given finding in ounces of trash.

For sampling cars before unloading, a cut-down seed fork is the best sampling tool and a sack is satisfactory for handling the sample from the car to the shaker. The sack is not satisfactory where the sample will be left for any length of time. This certainly simplifies sampling enough, and it is hoped that greater uniformity in methods of taking samples will be at the service of laboratories during the coming season.

Summary

DATA are presented showing that a number of cars sampled in three different ways produce averages which are in agreement.

Data are presented showing tremendous disagreement between small samples taken from the same car.

Recommendations are made that the sample for the laboratory be enclosed as quickly as possible in an air-tight container.

An automatic sampler with data supporting its accuracy is suggested.

The necessity for mechanically divided samples for the laboratory is indicated and the failure of any shaker to perform 100% cleaning is admitted.

An outline for equipment needed for car sampling by the mills is given.

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Rules of business practice adopted by the edible oil industry at a trade practice conference held in New York, in December, 1927, have now been accepted by the industry with changes suggested by the Federal Trade Commission.

Those rules, designated Group I as approved by the Commission, relate to such practices as use of deceptively slack filled containers; false branding of products; and packing of edible oil for resale in odd-sized or odd-shaped containers simulating in size or shape standard sized or shaped containers.

Other rules, accepted by the Commission as expressions of the trade and placed in Group II, bear on such subjects as proper packing and labeling of edible oil considered from the standpoint of trade ethics.