would probably apply to hexane as well as trichloroethylene extraction, sufficient data are not available to demonstrate this. In general, it may be observed that hexane is inferior to trichloroethylene as a solvent for cottonseed oil. The effect of change of miscella concentration on the amount of residual oil in the meal is greater in hexane extraction than in trichloroethylene extraction.

The toxicity to cattle of certain batches of trichloroethylene-extracted soybean oil meal has raised the question of possible toxicity of other products extracted by trichloroethylene. Since the work presented in this paper was a study in extraction only, the use of trichloroethylene as an experimental solvent should not be construed as a recommendation by the authors that the product resulting from this extraction is or is not suitable as a feed.

Summary

In the experimental countercurrent extraction of flaked cottonseed meats by trichloroethylene the residual oil content of the extracted flakes decreased with: first, a decrease in the final oil content of the final miscella; second, decrease in the flake moisture down to 8.64%; third, decrease in flake thickness; fourth, increase in temperature; and fifth, increase in extraction time. For the batch of cottonseed meats used the following equation was developed:

$$R = 26{,}000 \left(\frac{b^2}{D_m \, \theta^{.995}}\right) e^{(7.15\,\mu/\rho - 0.0117t)}$$

where R is percent residual extractables, b is flake thickness in feet, D is meat diameter in feet, θ is extraction time in hours, μ is viscosity, lb. per ft. hr., ρ is density, lb. per cu. ft., and t is extraction temperature in degrees F.

Not enough data were secured by extraction with hexane to check the equation developed for trichloroethylene extraction. Hexane is a poorer solvent for cottonseed oil than trichloroethylene. The amount of oil remaining in the meal is affected to a greater extent by the miscella concentration in hexane extraction than in trichloroethylene extraction.

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Summary of Study of Economies of Cottonseed Oil Mills[1]

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IN 1948 the Secretary of Agriculture's Cotton and Cottonseed Advisory Committee recommended that a study be undertaken to determine what types and sizes of cottonseed oil mills would constitute the most economical industry.[2] It also desired a determination of the extent to which industry-wide shifts to more economical processes might affect the supply and price of oil and returns to growers of cottonseed.

Four types of processes were involved: the hydraulic, screw-press, direct-solvent, and prepress-solvent. High-speed Expellers were not included as the study was too far under way when this development came into the picture. The same was true of the filtration-extraction process.

Mills of the four processes were nowhere in operation under the same conditions; therefore their comparative economies could be determined only by designing model mills and checking their elements against the experience of well-operated mills.[3] These mills were assumed as operating at their normal rates.

It was necessary to compare the net revenue yields of the four processes at specified crushes under comparable operating conditions. The comparisons were made in terms of 1949-50 cost-price relationships, the most recent period for which all needed data were available.[4]

The study led to six main findings. 1. Cost of diverting seed from competitors usually puts a relatively low limit on the sizes of mills, whatever the type. 2. In general, for widely different specified volumes of seed at uniform seed prices, the higher oil-extraction types of processes yielded greater net revenue per ton of seed. 3. Either of the solvent processes can handle a smaller crush without losing money than can the hydraulic process. 4. With each process operating at its normal rate on 1949-50 average quality seed, an industry-wide shift from the hydraulic process to the prepress-solvent process would increase the supply of cottonseed oil by approximately 10.8% and of all edible oils (exclusive of butter and lard) by 5.4%. Similar shifts to the direct-solvent and screw-press processes, respectively, would increase cottonseed oil by 9% and 2.1% and all edible oils by 4.5 and 1.1 %. 5. As a consequence, industry-wide shift from the hydraulic to the prepress-solvent process would reduce the price of cottonseed oil by approximately 8.9% as compared with reductions of 7.6% and 1.8% for the direct-solvent and screw-press processes, respectively. 6. As measured by change in size and type of the industry's marginal mill (or mills), industry-wide shift to more efficient mills of whatever type could benefit growers in the form of higher seed prices. But shifts to a more efficient hydraulic industry could benefit growers more than similar shifts to either of the solvent industries although the latter would be more beneficial to consumers.

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[2]John M. Brewster, "Comparative Efficiencies of Different Types of Cottonseed Oil Mills and Their Effects on Oil Supplies, Prices, and Returns to Growers," U. S. Department of Agriculture, Agricultural Marketing Service, Washington, D. C., Marketing Report No. 54, 1954.

[3]Data for this phase of the study were developed by A. Cecil Wamble and S. P. Clark of the Cottonseed and Cottonseed Products Research Laboratory of the Texas College of Agriculture.

[4]These prices contributed to conservative conclusions because the price of oil (approximately 11.5 cents per pound for prime crude) in that year, as compared with other years, was low in relation to the prices of other cottonseed products and also the costs of most production factors.