Advances in oilseed processing

(The following two articles, each summarizing a talk given at the AOCS annual meeting in Hawaii in May, focus on research on techniques to make oilseed extraction more efficient.)

Enzyme use in oil extraction

Enzymes can be used successfully to facilitate oil extraction, according to Krystyna Sosulski of the Saskatchewan Research Council, who gave a talk on the subject at AOCS' annual meeting in May in Hawaii.

Oil extraction from canola, sunflowerseed and other oil-rich plant materials commonly involves a two-stage process of prepressing followed by hexane extraction; each of these processes is preceded by grinding, cooking or flaking, designed to mechanically disintegrate the cell walls and release the oil droplets more efficiently. Sosulski said the objective of the study, undertaken by the Saskatchewan Research Council in cooperation with the University of Saskatchewan, was to evaluate the potential of enzymatic hydrolysis for increasing the permeability of the cell walls in canola seed and thus enhance the extractability of the oil by either prepress or solvent extraction.

Sosulski said the enzymes tested were commercial products which exhibit strong cellulase, hemicellulase, pectinase, glucanase and amyloglucosidase activities. Enzyme treatment of flaked seed for three hours reduced the solvent extraction time by one-half. When enzyme-treated seeds were passed through an expeller which was adjusted to full-press conditions, over 90% of the oil was extracted by pressing alone. Since residual oil in the meal was reduced to less than 6%, she said, solvent extraction of the presscake might not be economically justifiable. Thus, elimination of this step could result in a substantial savings in processing costs.

Most of the cell-wall degrading enzymes were effective in enhancing the oil extraction rates by either the solvent or expeller system, and best results were obtained by using mixed enzyme activity, Sosulski said.

She concluded that enzyme use can be successfully introduced to oilseed processing to obtain more oil than from seeds that are not enzymatically treated. She said the study showed that enzymes changed the cell wall structure to facilitate oil extraction. Not only was more oil released but extraction was faster. The resulting oil was yellower as it contained less chlorophyll. She added that the quality of meal also was improved, with increased stability.

Trials using pre-extrusion

Also speaking at technical sessions on oilseed processing at the 1986 annual meeting, J.T. Farnsworth of Texas A&M University, College Station, Texas, discussed enhancing direct solvent extraction of oilseeds by pre-extrusion.

Reporting on a project conducted at the Food Protein R&D Center's Research Oil Mill, Farnsworth said the objective was to improve extraction efficiency and to reduce energy consumption and capital costs of cottonseed oil milling by developing pre-extrusion as a method for preparing cottonseed meats for extraction.

Farnsworth noted that pre-extrusion has been used in other countries as an alternative to conventional preparation practices for rice bran and soybeans and is being promoted in the U.S. This project was a follow-up to one begun two years ago; in the initial trials, none of the extruded materials was extracted as rapidly as flakes.

In this study, whole cottonseed was milled into meats which were then flaked. Flakes were divided into eight lots, with a control lot extracted without further treatment. The other lots were extruded under different conditions. Soybean flakes were prepared from cracked soybeans in the same manner. Also, a sample of extruded soybeans was obtained from a commercial soybean mill using expander preparation.

The extraction characteristics of commercially extruded soybean pellets were compared with those of conventional soybean flakes. Findings showed the extruded pellets were extracted much faster and more completely than the flakes. Conditioned and flaked cottonseed meats extruded well, but occasional pulsing of solids, interrupted by free oil, was observed.

Researchers credited the increased capacity of solvent extraction equipment with extruded pellets to several factors: the increased rate of extraction and therefore reduced extraction time to achieve equivalent or lower residual oils; increased density, allowing more material to be put into the extractor; and more complete drainage of solvent from pellets, reducing the amount of solvent to be evaporated.

Findings showed free gossypol levels were much lower, about 50% overall, in meals from extruded pellets than from flakes. As expected, extruding at the higher moisture level favored reduction of free gossypol. Levels of total gossypol were lower in both extruded pellets. The quality of crude oil recovered from extruded pellets was compared with that from conventional flakes. Increased hydrolysis of fat to free fatty acids was not observed as a result of extrusion, nor were there differences in phosphorous contents. As expected from the reduced levels of total gossypol in meals from extruded pellets, greater levels of gossypol were present in the oil. This was further reflected in darker-colored crude oil from extruded pellets. This may indicate increased costs in refining and bleaching the oil. "It is not known whether these costs would be as great as the value of increased oil recovery, or savings in

operational cost as a result of increased capacity," researchers on the project noted.

P&G to use canola oil

Procter & Gamble (P&G) has reformulated its Puritan cooking oil to contain 100% canola oil.

The previous version of Puritan, a blend of 80% sunflowerseed oil and 20% soybean oil, was introduced in 1978. P&G in late May began shipments nationally of the reformulated Puritan to retail operations and expected to have the new product widely available on store shelves by late June.

According to P&G, the changeover was done in response to marketing studies showing consumers' preference for products lower in saturated fats. The label on the new Puritan will emphasize that the reformulated oil contains less saturated fat.

"We think it will be a big winner," P&G spokesman Don Tassone said, explaining that Puritan always has been marketed with a strong health image.

The P&G product is the first major fats and oils product in the United States to be reformulated to contain canola oil. The U.S. Food and Drug Administration in 1985 gave approval for the use of low erucic acid rapeseed (LEAR) oil in food products in the U.S. Canola is Canada's low erucic acid, low glucosinolate rapeseed.

P&G declined comment on how much canola oil it will use annually, but said it is importing crude oil from Canada for refining at its U.S. food processing plants. Canola Council of Canada (CCC) personnel said the CCC will be watching the levels of canola oil exports to the United States during the summer months to get an idea of the volume. CSP is the firm providing the crude canola to P&G.

Tassone said price was not the major factor for conversion and, in fact, the price of the reformulated product will be slightly higher than the previous version because the company is paying more for the canola oil than it did for soybean and sunflowerseed oils. However, he added, it will compete with other premium vegetable cooking oils.

Tassone noted that P&G will continue to be a major user of United States-produced vegetable oil. He cited P&G's continued use of soybean oil in its Crisco product as an example.

World margarine production grows

World production of margarine, compound fats and shortenings, and cooking and salad oils increased sharply in selected countries during October 1984-September 1985, a trend that is continuing, according to *Oil World.*

The West German fats and oils weekly publication reported in June that world production of these products grew to 15.8 million metric tons (MT) during 1984/85 in selected countries of western and eastern Europe, America and Asia: margarine to 8.27 million MT; compound fats and shortenings to 3.49 million MT; and salad and cooking oils to 4.07 million MT. Production growth represented an increase of 5.1% over the previous year.

Production growth is continuing, except in India. *Oil World* credited a sharp decline in world vegetable oil prices, giving vegetable oils a favorable edge over butter and lard, as a major factor in increasing demand for secondary food oils and fats. *Oil World* noted that solid food fats have had a price advantage over salad and cooking oils, as the major ingredients of salad and cooking oils—soybean, rapeseed and sunflowerseed oils—have been relatively more expensive than palm and lauric oils.

Oil World noted that in India, the big decline in vanaspati output, by over 10% during October 1985-March 1986, was due to government policy to raise domestic prices for vegetable oils and oilseeds, accomplished in part through a restriction of supplies for the vanaspati industry. While the aim was to promote domestic oilseed production and reduce vegetable oil imports, the Indian people reacted by buying less vanaspati and shifting to cheaper palm oil or olein. Since March 1986, the government has progressively eased the supply restrictions, but production is still less than the previous year.

Consultant firm

Five internationally known French specialists have formed a consulting bureau, known as Reseau International de Consultants (RiC).

Louis Faur, Jean-Paul Helme, Jean-François Platon, Jean Poré and Aldo Uzzan are offering their expertise as a consulting network. The bureau offers consultation in foods, oleochemicals and fine chemistry, including product development, research and development, market evaluation, and processing.

Address of the bureau is RiC, c/o Actiotech, 18 bis, rue Violet, 75015 Paris, France; telephone: 16 45-75-41-81.

Corn report

The Corn Refiners Association Inc. has issued its *Corn Annual, 1986,* report, accompanied by *Industry Statistics, 1986.* Statistics used reflect shipments by members of the association, not the entire corn industry.

Figures show Corn Refiners Association members shipped a total of 273,308 tons (546.6 million pounds) of crude and refined corn oil during 1985, compared to nearly 261,800 tons (523.6 million pounds) in 1984. Corn oil exports, meanwhile, dropped from 159,055 tons (318 million pounds) in 1984 to 130,664 tons (261 million pounds) in 1985.

For copies of the report, contact the Corn Refiners Association Inc., 1001 Connecticut Ave. NW., Washington, DC 20036.

Burma project

A total of US $35 million has been loaned by the Asian and Develop-