apparent on oils produced from seed with over 1.0% F.F.A. than is indicated on the 0.5% F.F.A. seed processed during this test period.

A more complete appraisal of cup loss and color data correlated with the rest of the oil analysis shown in Table II is contemplated in the future. We propose to continue this work in our plant along comparably comprehensive lines. Periodic progress reports will be made to the American Oil Chemists' Society when justified by plant and laboratory data obtained.

Summary

Plant operating procedures and laboratory controls were set up to evaluate the quality of meal and oil which could be produced through each stage of commercial, prepress-solvent-extraction processing. By altering conventional, prepress-solvent-processing conditions and by increasing moisture during cooking and adding granular soda ash after cooking meats, cottonseed meal rations can be produced which are comparable in feed efficiency to soybean meal rations and satisfactory for feeding laying hens in amounts up to 10% of the total weight of the ration with no egg-yolk discoloration and crude cottonseed oils with low F.F.A. and light color can be produced which refined to low Lovibond colors and with refining losses approaching the chromatographic loss when miscella refined within minutes after separation from the source material with the exclusion of air and light.

Acknowledgment

The author wishes to express his appreciation to C. R. Grau, University of California, and his co-workers for their assistance in the egg-yolk discoloration phase of this work and to Robert Bean, John McKinney, Ralph Pratt, and Woodrow Turner Jr. for conducting most of the analyses.

References

1. A.O.C.S. method Ba 7-55.

Composition of Acidulated Cottonseed Soapstocks as Influenced by Commercial Methods of Processing Seed and Oil

MACK F. STANSBURY, VIDABELLE O. CIRINO, and HAROLD P. PASTOR, Southern Regional Research Laboratory, New Orleans, Louisiana

Soapstocks containing approximately 100 million pounds of anhydrous fatty material are produced as by-product in refining the annual domestic production of cottonseed oil. The major outlets for this material are as a source of fatty acids and pitch. In recent years increasing amounts of soapstocks have been used as a plasticizer in pelleting oilseed meals and as a source of fat in mixed feeds.

No systematic study of the composition of acidulated soapstocks as related to processing conditions and refining methods has been reported. In fact, relatively little information on their composition is available (3, 8, 9, 13, 20). The trend toward replacement of hydraulic pressing methods with screw-pressing,


<table>
<thead>
<tr>
<th>Refining process</th>
<th>Refining loss of crude oil</th>
<th>Maximum acidulation temperature</th>
<th>Moisture in acidulated soapstock</th>
<th>Composition and properties—moisture-free basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centrifugal</td>
<td>High: 7.0%</td>
<td>F%: 6.6%</td>
<td>6.22% 97.3% 29.56% 6.50% 9.82% 5.11% 2.70%</td>
<td>pH: 6.74</td>
</tr>
<tr>
<td></td>
<td>Low: 3.7%</td>
<td>F%: 3.1%</td>
<td>1.33% 90.0% 2.52% 3.45% 2.17% 0.15% 0.53%</td>
<td>Neutral matter: 93.3% 10.38% 4.77% 9.06% 1.39%</td>
</tr>
<tr>
<td></td>
<td>Mean: 5.1%</td>
<td>F%: 4.3%</td>
<td>2.86% 93.3% 2.52% 3.45% 2.17% 0.15% 0.53%</td>
<td>Unsat- fiable matter: 93.3% 10.38% 4.77% 9.06% 1.39%</td>
</tr>
<tr>
<td></td>
<td>Std. dev.</td>
<td>F%: 0.83</td>
<td>1.05% 2.52% 3.45% 2.17% 0.15% 0.53%</td>
<td>Oxidized fatty acids: 28.99% 3.93% 4.78% 2.73% 3.33%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gossypol: 78.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Phosphorus (P2O5): 1.05%</td>
</tr>
<tr>
<td>High</td>
<td>215</td>
<td>2.78</td>
<td>6.29% 95.9% 42.55% 3.55% 4.08% 0.93% 1.38%</td>
<td>pH: 10.38% 4.77% 9.06% 1.39%</td>
</tr>
<tr>
<td>Low</td>
<td>5.0</td>
<td>0.76</td>
<td>1.65% 92.2% 29.15% 1.62% 1.41% 0.08% 6.05%</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>197</td>
<td>1.38</td>
<td>1.11% 94.1% 22.67% 2.97% 2.53% 0.46% 6.41%</td>
<td></td>
</tr>
<tr>
<td>Std. dev.</td>
<td>±3.2</td>
<td>±0.6</td>
<td>±0.48</td>
<td>±1.05</td>
</tr>
</tbody>
</table>

- **Hydraulic oils**
- **Prepress solvent-extracted oils**
- **Direct solvent-extracted oils**
- **Blended oils**

### Solvent Extraction and Prepress-Solvent Extraction

The 99 acidulated soapstocks analyzed were supplied by 16 commercial refiners and were of known processing histories. They were prepared by commercial or laboratory acidulation of raw soapstocks resulting from centrifugal, miscella, or batch refining, including the caustic soda and soda ash—caustic soda methods. The crude oils from which the samples were derived were obtained from 27 widely located mills and are representative of the five major processes for the production of cottonseed oil. Data on the processing conditions are summarized in Table I.

The acidulated soapstocks were analyzed for total (unoxidized) and oxidized fatty acids, unsaponifiable matter, and iodine value by use of methods G 3-53, Ca 6b-53, and L 8a-55, respectively, of the American Oil Chemists' Society (1). Moisture was determined by a Karl Fischer-titration procedure adapted from the A.O.C.S. Tentative Method Ca 2e-55 and neutral oil by a modification of the method of Linteris and Handschumaker (11). The colorimetric method of Pons et al. (17) was used for determining total phosphorus after a preliminary ashing of the sample with magnesium nitrate. Gossypol was determined by an improved p-anisidine colorimetric method (16). The pH of an aqueous extract of the soapstock was measured in order to evaluate the acidity due to mineral acids.