Utilization and Agronomic Studies of Cow Cockle (*Saponaria vaccaria*)

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*Saponaria vaccaria*, L., cow cockle, a member of the Caryophyllaceae, is a weed commonly infesting cereal fields in many areas of the world. It is most common in the grain-producing sections of the northwestern states and western Canada. Although it usually does not persist, it may appear in other areas where western grains are fed.

Cow cockle seed was examined in a screening program for high oil-producing seeds, and, since it was too low in oil, it was discarded as a potential oil crop. The seed was observed to contain a rather high concentration of starch; this was confirmed by a fermentation test. These observations, together with the fairly large seed size, plant vigor, acceptable height, and apparent abundant seed production as a weed, suggested that this species might have potential as a crop. It was decided to investigate in more detail its agronomic characteristics and the chemical composition of the seed. This paper deals with these preliminary studies.

Materials and Methods

Three sources of cow cockle seed were available for these studies: 58-8140, an indigenous collection from Bozeman, Montana; 59-1, an indigenous collection from Mocassin, Montana; and 58-8158, a separation from P. I. 180264 mustard seed from Abu Road, Sirohi, India.

These three accessions were compared in 1960 plantings at five dryland and four irrigated sites in Montana. These plantings were made as single 10-ft rows.

Subsequent plantings in 1962 and 1963 at the nine testing sites were made in four replications of four row plots, rows spaced 1 ft apart, with eight ft of each of the two center rows harvested for yield. All plantings in 1962 and 1963 were with the 58-8158 strain of cow cockle at a rate of 15 lb per acre. The data reported were taken from larger tests of 11 entries grown each year. Nitrogen was determined on the whole seed received from each source and is reported as percent protein (N x 6.25). Nitrogen determinations were made on a composite of replications I and II and a composite of replications III and IV.

A composite of 1962 and 1963 seed from all locations was used for milling and subsequent determinations.

Flour was prepared by milling the seed on a Brabender Quadromat Jr. mill and sifting on a U. S. standard Sieve No. 100. This sieve has a 149 micron opening. Material that passed through the sieve was considered flour, and material staying on top of the sieve was considered bran. No tempering was used, since preliminary milling results indicated no appreciable advantage.

Starch was prepared from the flour by the use of the alkali process described by Dimler (2). A Brabender viscosity curve was run on the starch at a concentration of 8 g/100 ml of water, using the procedure described by Mazurs et al. (3)

Seed and flour fractions were analyzed for ash, fat, fiber, protein, and starch by usual methods (1), ash, 22.010; fat, 22.033; crude fiber, 22.040; protein, 2.036; and starch 22.043.

Results

Chemical analysis of cow cockle seed and milling fractions are reported in Table 1.
The composition suggests that cow cockle seed might be a good source of starch. It appears to contain also an appreciable amount of material which is carbohydrate in nature, but is not starch. This material is probably hydrolyzed by conditions present during the determination of crude fiber content. An examination of fractions show that, although there were improvements in both starch content and elimination of fiber from the flour fraction, the flour is still very high in ash.

With the limited amount of seed available, satisfactory conditions for milling were impossible, since the best flour yields were only 25%. Although this would suggest the alkali process to be uneconomical, the ease with which it could be carried out suggested its use for obtaining enough starch for preliminary investigations.

The alkali process involves the removal of the protein by solution in dilute alkali. Since each particular protein has its own solubility characteristics, a cow cockle solubility study

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Ash</th>
<th>Crude fiber</th>
<th>Fat</th>
<th>Protein</th>
<th>Starch</th>
<th>Nitrogen free extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole seed</td>
<td>2.87</td>
<td>5.57</td>
<td>3.85</td>
<td>12.37</td>
<td>64.2</td>
<td>75.3</td>
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<tr>
<td>Bran</td>
<td>2.90</td>
<td>8.62</td>
<td>3.42</td>
<td>12.28</td>
<td>63.9</td>
<td>72.8</td>
</tr>
<tr>
<td>Flour</td>
<td>2.45</td>
<td>2.17</td>
<td>4.10</td>
<td>12.87</td>
<td>67.1</td>
<td>78.4</td>
</tr>
</tbody>
</table>