USDA Agricultural Marketing Service

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ACTION MEMORANDUM FOR THE CHAIRMAN OF THE NATIONAL ORGANIC STANDARDS BOARD

FROM: Miles McEvoy
Deputy Administrator
National Organic Program

SUBJECT: Corn Steep Liquor

ISSUE:

The National Organic Program (NOP) requests that the National Organic Standards Board (NOSB) review the process for corn steep liquor and issue a recommendation concerning its classification as synthetic or nonsynthetic as an input for crop production at the next NOSB meeting in Fall 2010.

If the NOSB determines that corn steep liquor is nonsynthetic, it will continue to be allowed as an input (i.e. liquid fertilizer) for organic crop production. If the NOSB determines that corn steep liquor is synthetic, future uses of corn steep liquor as an input will be prohibited unless it is added to the National List.

DISCUSSION:

Corn steep liquor is a product of the corn wet milling process. This material has been previously considered nonsynthetic by the accredited certifying agents (ACAs) and the Organic Material Review Institute (OMRI). Corn steep liquor has been used as a nonsynthetic input (liquid fertilizer) for crop production under the National Organic Standards.

Corn steep liquor was recently reevaluated by OMRI using the National Organic Standard Board's (NOSB) 2005 clarifications regarding the classification of synthetic and nonsynthetic substances. OMRI concluded that corn steep liquid should be classified as synthetic based on the use of sulfur dioxide during processing. Synthetic substances are prohibited for use in organic crop production unless they appear on the National List, 7 CFR Part 205.601.

Production Process for Corn Steep Liquor
The corn wet milling process is designed to separate the corn into its components: starch, germ, gluten and fiber. These components are further processed into high value products such as ethanol, high fructose corn syrup, corn oil, starch, bran, gluten feed, and meal.

The first step of the wet milling process involves steeping the corn in a solution of water and small amount of sulfur dioxide at 120-130°C for 30 to 50 hours (Figure 1). The corn is then coarsely ground and the insoluble material is separated from the steep water. The steep water contains soluble nutrients, carbohydrates, and protein and is further condensed to produce corn steep liquor. Corn steep liquor contains approximately 50% dry matter and 23% protein. The majority of corn steep liquor is used for conventional livestock feed; however, it is also a source of nutrients for a variety of other applications, including use as a liquid fertilizer.

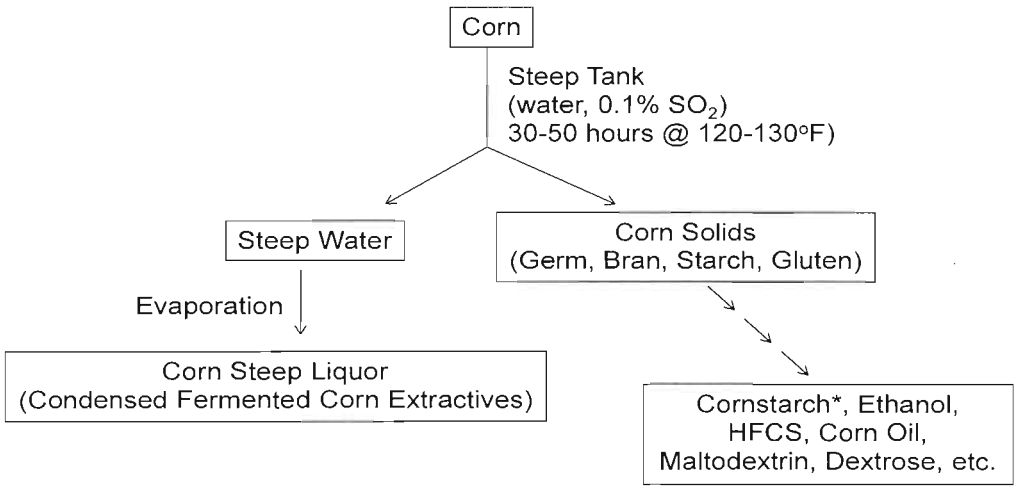

Figure 1. Corn steep liquor production as a by-product of the corn wet milling process.

Use of Sulfur Dioxide

Approximately 0.1% sulfur dioxide (SO_2) is added to the steep water during the initial soaking period. Sulfur dioxide is soluble in water, forming sulfurous acid (H_2SO_3), which dissociates into bisulfite (HSO_3^-) and sulfite (SO_3^-) ions in solution:

$$SO_2 + H_2O \rightleftharpoons H_2SO_3 \rightleftharpoons HSO_3^- + H^+ \rightleftharpoons SO_3^{2-} + H^+$$

The sulfur dioxide helps prevent excessive bacterial growth (putrefaction) in the warm environment. It also helps separate the starch and the protein. Based on a review of the literature, sulfur dioxide assists in the separation by functioning as a reducing agent, breaking disulfide bonds within the protein. Disulfide (i.e. sulfur to sulfur) bonds play an important role in the three-dimensional structure of proteins.

Synthetic or Nonsynthetic

The NOSB has done considerable work concerning the classification of materials as synthetic or nonsynthetic. The current National Organic Standards provide the following definitions for synthetic and nonsynthetic:

> **Nonsynthetic (natural).** A substance that is derived from mineral, plant, or animal matter and does not undergo a synthetic process as defined in section 6502(21) of the Act (7 U.S.C. 6502(21)). For the purposes of this part, nonsynthetic is used as a synonym for natural as the term is used in the Act.

> **Synthetic.** A substance that is formulated or manufactured by a chemical process or by a process that chemically changes a substance extracted from naturally occurring plant, animal, or mineral sources, except that such term shall not apply to substances created by naturally occurring biological processes.

In its decision to classify corn steep liquor as synthetic, OMRI indicated that "sulfurous acid induces chemical and physical changes in the kernel, in effect, separating the starch and insoluble protein by cleaving protein disulfide cross-links in the endosperm protein matrix" (*OMRI Materials Review*, Spring 2010). The final vote of the OMRI Advisory Council was reported as 7-3 with the majority voting that corn steep liquor is synthetic.

Other Products of Corn Wet Milling

A variety of products are produced through the corn wet milling process including cornstarch, corn oil, high fructose corn syrup (HFCS), ethanol, dextrose, and maltodextrin. Cornstarch (native) was reviewed by the National Organic Standards Board in 1995 for use in processing. It was recommended that cornstarch (native) be allowed for use in processed organic products. One TAP reviewer commented that sulfur dioxide is a "temporary preservative to avoid putrefaction of soaked corn;" this reviewer also indicated that the cornstarch should be classified as nonsynthetic. Cornstarch (native) is currently on the National List as a nonorganically produced agricultural product [§205.606(t)(1)] with a sunset date of 2012. Cornstarch (native) has not been re-reviewed by the NOSB according to the most recent recommendation regarding the classification of materials.

Alternatives to Sulfur Dioxide in Corn Wet Milling

Many products of the corn wet milling process are also available in an organic form. Sulfur dioxide is not permitted in the processing of certified organic corn products. A brief survey indicated that the use of enzymes (Ramírez 2009), lactic acid (Daily 2009), and ozone (Ruan 2004) may be available as alternative materials.

ACTION ITEM:

On November 10, 2009, the National Organic Program issued a policy notification to USDA Accredited Certifying Agents and Third Party Materials Reviewers regarding corn steep liquor. The notice indicated that corn steep liquor would be allowed for continued use as a nonsynthetic input until the material has been reviewed by the National Organic Standards Board. The NOSB is authorized under the Organic Food Production Act to review and approve substances used in organic production and handling. The NOP requests that the NOSB review the production process for corn steep liquor and issue a recommendation regarding its classification at the next NOSB meeting in fall 2010.

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