National Organic Standards Board
Crops Committee
Corn Steep Liquor
Synthetic/Nonsynthetic Determination

Revised Committee Decision Discussion
October 7, 2010

Discussion

A number of issues emerged in the committee's deliberations on CSL that span a range of concerns, based on what we know and what we do not know about its manufacturing process. The fundamental issue that the committee confronts is applying the definition of chemical change against the mechanism occurring in the CSL production process. Two issues emerge here, the first (chemical changes) being a threshold issue that obviates the need for further consideration of the second (synthetic residuals).

Chemical Change

The Technical Review (TR) (29-30) states that, "The major objectives for corn steeping are to induce chemical and physical changes in the kernel by leaching the soluble components from the corn. " It goes on to say that "sulfur dioxide is added at rates of 0.1 to 0.2 percent and is used to cleave disulfide linkages, resulting in the degradation of the corn protein that encapsulates the starch granules. " (TR 99-102) The cleavage process breaks chemical bonds, thus releasing amino acids from the protein matrix into the CSL liquid.

OMRI looked at CSL and reached the conclusion 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) Research finds that the steeping process creates chemical changes that release soluble proteins in the steepwater. According to Biss and Cogan (1996), "The introduction of SO2 into the process is accompanied by a rapid increase of the soluble proteins as a result of an accelerated degradation of the corn [heretofore] insoluble proteins (Biss and Cogan 1988)."[1]

[1]Biss and Cogan state, "It is generally accepted that lactic acid is beneficial for corn steeping, due to its softening action on cell walls (Watson 1984) and possibly due to induction of some proteolytic activity which enhances protein degradation (Watson et al 1955, Roushdi et al 1981). The major role of sulfur dioxide in steeping is to cleave disulfide linkages, thereby loosening the protein matrix that encapsulates the starch granules (Watson 1984). The introduction of SO2 into the process is accompanied by a rapid increase of the soluble proteins as a result of an accelerated degradation of the corn insoluble proteins (Biss and Cogan 1988)" ("Sulfur Dioxide in Acid Environment Facilitates Corn Steeping," 1996)

Incomplete information and manufacturing variability

Unanswered questions and lack of uniformity in process and outcome raise concern. The TR (167-169) states that, "[T]he chemical composition of corn steep liquor will probably vary and is reflective of the processing strategy used by a particular manufacturer, depending on which corn component they are interested in isolating." The TR characterizes the manufacturing of CSL as a "complicated process of chemical and biochemical reactions that, despite the long history of the wet-milling industry, are still not fully understood." (TR 192-194)

In addition to uncertainties concerning the traditional wet-milling process, there are further questions and concerns that arise from the recent use of a new process, for processing corn to ethanol, that results in a byproduct also called "corn steep liquor." The new process results in higher-sulfur CSL, a product that could actually be dangerous when used as a livestock feed ingredient[2] in the same ways that traditional CSL has been used.

Application of classification of materials policy

Regardless of the uncertainties mentioned above, the best available evidence and scientific understanding indicate that chemical change does occur in the process of steeping corn. The policy allowing synthetics in processing at levels that are determined not "significant," thus does not, first and foremost, come into play with CSL The use of sulfur dioxide in this case is not incorporated into wet milling as part of an additive process, but rather as an agent that is intended to change the chemical and physical characteristics of an agricultural product. In this context, the committee believes that the significant issue of sulfur residuals is not the central issue, although important given its synthetic character and contravening the existing prohibition of adding sulfur in the processing of organic corn products. While it may be unclear as to whether the lactic acid fermentation results in the cleavage of any of the disulfide bonds, it is established that the addition of sulfur dioxide does result in the cleavage of those bonds. Regardless, confusion only strengthens the need for the committee to take a precautionary approach based on the worst case scientific understanding. Lack of understanding or disagreement in the scientific community is not, in the committee's opinion, an adequate basis for moving forward with an allowance.

If the committee were to focus on the mere introduction of sulfur dioxide and its remaining residuals in the finished CSL product, applying the policy voted on by the NOSB at its November 2009 and April 2010 meetings, we would now confront the question of the allowance of proposed policy changes in light of underlying statutory and rule making standards. While the NOSB voted to adopt policy changes on the classification of materials the standards have not been promulgated and have raised legal questions regarding compatibility with existing rules under OFPA.[3]

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[2] "Too much sulfur destroys thiamine in the rumen, leading to thiamine deficiency and polioencephalomalacia (PCM, also known as "Brainers," or "Polio"). Theuer, July 30, 2010.

[3] Subsequent to the committee discussion on CSL, the NOP in a September 30, 2010 memo to the NOSB, entitled "Memorandum for the Chairman of the NOSB," on the Board's April 2010 and November 2010 recommendations found that the NOSB classification of materials policy change "adds a meaning to

Future uses of CSL or other products associated with sulfur-based wet milling processing

The committee in this decision is not passing judgment on the future uses of CSL or other products derived from the sulfur-based wet milling process. The committee decision focused on whether the sulfur-based wet milling process effects a chemical change. The committee, however, is aware that "crop products could use synthetic substances already allowed in organic crop production. (TR 243-244) The same is true for livestock producers. (TR 250-251) Additionally, while there are questions about the quality of the end-products, "[W]et corn milling could be conducted without sulfur dioxide, the lactic acid fermentation and the subsequent separation of the corn components (including natural drying to concentrate the soluble materials in the liquid portion) may be another method of processing the corn." (TR 225-227) Ultimately, however, CSL can still be petitioned for inclusion on 205.601 to be placed on the National List and used as an input in liquid fertilizers allowed in organic crop production.

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the term chemical change" that is contrary to common understanding of a widely used term." The memo point out that "a substantive rule" cannot be contained in the definition, finding that, "The proposal to exempt certain processing methods and synthetic materials from causing the effect of chemical change is a substantial regulatory provision, which conflicts with the common understanding of chemical change..."