

Fiber Separation from Ground Corn Flour using a Combination of Sieving and Air Classification

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Abstract

The goal of this research is to evaluate the combination of sieving and elutriation (upward air flow), known as the “Elusieve” process, for fiber separation from ground corn flour. After separation, we will determine the composition of the processed corn flour.

In the dry grind process, corn flour is converted into ethanol. During conversion, fiber is not fermented and the remaining corn components (protein, fiber, fat and ash) are called DDGS. Using the “Elusieve” process, fiber is separated before conversion into ethanol. This separation would increase ethanol productivity; however, it would not increase ethanol yield. The “Elusieve” process separates the fiber, and the remaining corn is termed “enhanced corn flour.”

We first sieved the material through three different sized mesh screens and a vibratory sifter (Sweco, Model LS18S33333P1WC, KY, USA). Next, we used elutriation to separate the fiber. We passed the material through an aspirator (Model VJ8X6, Kice, Wichita, US). The material carried by the air is called “lighter” fraction, and the material that was not carried is called “heavier” fraction. Mix all of the lighter fractions together to produce a fiber product; likewise, the heavier fractions should be mixed together, and this forms enhanced corn flour.

After analytically testing the nutritional components of fiber and enhanced corn flour, we confirmed that significant amounts of fiber can be removed before ethanol production. Fiber separation increased the amount of starch in the enhanced corn flour. Least loss of starch occurred when we separated fiber at a 5% yield. The loss of starch was larger as the yields increased. The fiber can be used to make “cellulosic” ethanol as well as feed for cattle and other ruminant animals. The work could also have implementations for non-ruminant animals (poultry and swine). Although this process does not increase ethanol yield, it increases ethanol productivity of the plant, and it produces fiber as an additional coproduct which helps make the plants more profitable.