Corn Protein

Agricultural Utilization Research Institute

Minnesota Overview

In 2016, sales for corn in Minnesota surpassed $5 billion and yields topped 190 bushels/acre. Also in 2016, the average price in Minnesota per bushel of corn was $3.30, 10 cents lower than the U.S. average. Minnesota-based protein ingredient producers would benefit from the lower price of corn in the region, as it will offset transportation costs.

Nutritional quality

Protein content in corn ranges between 10 to 15 percent, lower than many other plant sources. Corn gluten meal, a byproduct of cornstarch production, has a greater protein content comprising of 60 to 71 percent. Corn protein is limited in lysine and tryptophan, making it an incomplete protein, and has a low PDCAAS of 0.42. The PDCAAS, specifically protein digestibility, may be enhanced through enzymatic hydrolysis during processing. Corn gluten meal may also contain antinutritive compounds, such as tannins.

Currently available protein ingredient forms

Corn protein in food systems is limited. Common applications of corn proteins are their use as corn gluten feed or corn germ meal for animals. There were smaller-scale attempts to incorporate corn germ protein isolates, germ flour and germ protein flour in various food systems as extenders and stabilizers.

Potential functionality and applications

Corn protein has very low solubility, which is detrimental to all other functional properties. If the protein is insoluble, it will not form an adequate gel, will not emulsify nor stabilize foam. Only small-scale attempts to improve the nutritional value of foods, such as cookies, muffins and beef patties through the incorporation of corn germ protein, have been made. The absence of larger-scale applications suggests the limited success of corn protein thus far. That said, subjecting corn protein to modification may result in targeted improvement in nutritional value and functional properties. This requires further investigation, however.

Advantages

Corn protein advantages are limited. The main advantage over other plant proteins, such as soy, is not being a common allergen. Corn protein also shows a minimal solubility loss after heat treatment, which is beneficial when trying to eliminate antinutritive factors. An extremely low initial solubility makes this advantage nearly inconsequential.

Corn Facts

Low in protein

Low PDCAAS score

Low solubility

Incomplete protein

Corn protein in food systems is limited

Not a common allergen

Barriers

Other non-allergenic protein sources, such as sunflower and hemp, may be more desirable, as corn protein has such low solubility and functionality. Additional barriers include corn protein's low nutritional value, antinutritive factor content and the fact that most supplies are genetically modified. About 92 percent of the total acreage of U.S. corn production in 2016 grew genetically modified corn. Accordingly, the supplies for utilizing corn protein in organic products is relatively low.

Feasibility

Corn production in Minnesota is extremely prevalent, but the amount, bioavailability, nutritional benefits, solubility and functionality of the protein in corn is limited. In addition, the demand for corn has increased with a recent push towards ethanol production. While corn production is possible, large-scale manufacturing and commercialization of corn-based protein ingredients will likely not occur until the industry addresses these barriers. Particularly important to improving the feasibility of the production, and utilization of corn protein ingredients, is the development of processing methods to improve nutritional quality, solubility and functionality. Based upon current corn sources, technology, and availability of other protein sources, the potential of corn becoming a key source for plant-based protein ingredients in the near future is low.

auri
Agricultural Utilization Research Institute

Contact AURI by calling 218.281.7600 or visit auri.org and complete the online contact form.

To download a copy of the full report, visit auri.org/plantproteins