

Pulses Overview

Pulses are receiving quite a bit of buzz as viable sources of protein. The U.N. General Assembly named 2016 the international year of the pulses. It promoted recognition of the nutritional benefits of pulses while making the public aware of these sustainable crops that could contribute to food security and nutrition. Pulses, which include various types of beans, lentils, chickpeas, and peas, are low-fat sources of protein, fiber, minerals and vitamins. While there has been major advances in the production of pea protein (globally 20 manufacturers are producing pea protein ingredients), utilization of other pulses as sources of protein ingredients remain limited. This section will focus on other pulses, mainly beans, as viable sources of protein ingredients.



Minnesota Overview

Pulses, which include various types of beans, lentils, chickpeas, and peas, are low-fat sources of protein, fiber, minerals and vitamins. In 2016, dry beans grown in Minnesota yielded an average of 2,230 lbs/acre and generated just over \$97 million in sales. For the same year, the national average price of dry beans was \$30.20/cwt; \$0.60 higher than the average price in Minnesota. Compared to peas, dry beans are about \$17.00/cwt more expensive. While lower bean prices would offer Minnesota-based businesses using bean proteins an advantage over out-of-state competitors, they may be too expensive to compete well with manufacturers using other, less expensive pulses, namely peas.

Nutritional quality

Certain varieties of dry beans, such as, kidney contain around 18 to 24% protein. Similar to other legumes, kidney beans have a low concentration of sulfur-containing amino acids, namely methionine, as well as a low concentration of tryptophan, both are essential amino acids. Most legumes appear to have a relatively low PDCAAS mostly attributed to low digestibility. However, several techniques, including dehulling, soaking, and autoclaving can improve the digestibility of some pulse proteins.

Currently available protein ingredient forms

Flour, concentrates, and isolates produced from pulses include chickpea, black-eyed bean/pea and common bean. For example Top Health Ingredients Inc., supplies AdvantaFAVA 85 protein concentrate (85% protein).

Pulses Facts

Group includes beans, lentils and chickpeas

Lower in fat and source of fiber, minerals and vitamins

Relatively low PDCAAS due to low digestibility

Limited functionality in food applications, more work needed to improve

Poor solubility

Not a major allergen

Adding pulses to crop rotation results in improved nutrient levels in the soil

Potential functionality and applications

Research is limited on pulse proteins other than peas. However, bean proteins studied as meat extenders showed potential for improving water retention, preventing fat loss, and increasing protein content. Additionally, proteins, such as kidney bean proteins, showed they could be acceptable emulsifiers and foaming agents at neutral pH. However, as is the case for pea protein, the solubility of bean proteins is far from adequate at pH levels relevant to food applications, impacting other functionalities. As most pulses have similar properties, pulse protein manufacturers must consider the limited functionality of these proteins, and consider ways to improve their performance following protein modification and unique processing.

Advantages

Adding legumes to crop rotations results in improvement to the nutrient levels in the soil. Nutrient improvement can reduce synthetic fertilizer needs and thus encourage farmers to enter into pulse production. Another advantage is the low occurrence of allergenicity to pulse proteins, with only few incidences reported.

Barriers

Legume production may present environmental problems, such as nitrate leaching into the water supply and nitrous oxide production. Addressing these problems may increase the cost of pulse production and reduce profit margins. Another barrier pertains to the limited functionality of pulse proteins discussed earlier.

Feasibility

The production of pulses, such as dry beans, is possible in Minnesota, as demonstrated by the high yields and sales for 2016; in fact, dry beans may be more profitable than the production of other pulses like peas, since bean prices in 2016 were much higher per cwt than pea prices. Additionally, the average price for Minnesota beans was lower in 2016 than the national average, which may encourage manufacturers to buy Minnesota beans, benefiting local farmers. Pulse protein functionality, however, is inferior to other protein ingredients, namely soy and milk proteins. Creative measures need to be employed during manufacturing of the ingredients and during formulation with such ingredients.



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