

# Pennycress Protein



Agricultural Utilization Research Institute

## Minnesota Overview

Pennycress is a winter cover crop that has numerous environmental benefits, including soil stabilization, nutrient sequestration and reduced nitrate leaching. Being an oilseed crop, pennycress has high oil/fat and protein content. Pennycress yields are variable, with research trials yielding 1,500 to 2,000 lbs/acre, while farm production averages around 700 to 900 lbs/acre. In Minnesota, pennycress production is limited, as farmers are unfamiliar with the crop and there is currently no commercial application for pennycress in the United States. The University of Minnesota and USDA-ARS, however, are currently researching pennycress as part of their Forever Green Initiative. The research efforts may lead to increased production and utilization.



## Nutritional quality

Pennycress seeds contain around 20 to 27 percent protein, while defatted pennycress meal contains about 40 percent protein. The defatted meal, a potential byproduct of oil pressing, can thus be an excellent starting material for the production of protein isolates. Research on pennycress protein digestibility is lacking. The amino acid composition and content of essential amino acids are similar to those of soy protein isolate. Wild-type pennycress seed is naturally high in glucosinolates, a class of potentially toxic secondary metabolites, and is high in erucic acid, a fatty acid associated with adverse health effects. Additional screening has identified candidate lines of pennycress that reduced seed glucosinolates.

## Currently available protein ingredient forms

Pennycress, mainly processed for its oil, has potential biodiesel applications. Interest in pennycress as a potential source for protein ingredients is relatively recent and under development. Accordingly, commercially available products are non-existent at the present time.

## Potential functionality and applications

Research on the functional properties of pennycress proteins is limited. Pennycress proteins might have potential as foaming and emulsifying agents. Pennycress protein has a superior foaming capacity and stability compared to soy protein, suggesting that pennycress could replace soy in some foods. Research has determined that protein isolated following salt extraction versus alkaline extraction methods had superior solubility and emulsification properties. Pennycress protein functionality and potential applications in comparison to other protein ingredients requires further investigations.

## Pennycress Facts

Fairly high protein content

---

Protein component similar to canola and camelina

---

Assists in soil stabilization

---

Assists in nutrient sequestration

---

Reduces nitrate leaching

---

Oilseed crop

---

High potential but more research is needed

### Advantages

Pennycress is well-suited as a cover crop, as it limits soil erosion, weed growth and nutrient loss, benefitting farmers long-term through a reduced need for herbicides and soil fortification. Pennycress may integrate well with conventional corn/soybean and summer cropping systems. Additionally, pennycress is of nascent interest, thus market competition is low. Utilization of pennycress as a novel source of plain protein has a potential to rise. Those that enter the market soon could obtain an economic edge before pennycress garners the attention of others.

### Barriers

Pennycress is relatively unknown to the public, which could delay its use and profitability. This lack of familiarity is associated with limited research on the properties of pennycress proteins, its functionality and potential uses. Through selective breeding, new pennycress lines with much reduced glucosinolates are developing and thus may serve as an ideal source for protein isolates. On the other hand, there is not an established processing method of functionalization for pennycress protein isolates.

### Feasibility

Based upon the research conducted as part of the University of Minnesota's Forever Green Initiative, growing pennycress in Minnesota is feasible. The benefits of growing pennycress include limiting weed growth, which reduces herbicide needs. Low herbicide and low labor requirements make pennycress economically feasible for many farmers. Pennycress is eligible for price loss coverage under the 2014 Farm Bill, making the monetary risk low. This may increase production of pennycress. Research that proves the benefits of pennycress as a source of oil and protein ingredients will provide economic incentives to farmers to increase production, allowing for sufficient supply needed by food processors.



Contact AURI by calling **218.281.7600** or visit [auri.org](http://auri.org) and complete the online contact form.

**To download a copy of the full report, visit [auri.org/plantproteins](http://auri.org/plantproteins)**