



*Review*

## **Soybeans as bioreactors for biopharmaceuticals and industrial proteins**

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**ABSTRACT.** Plants present various advantages for the production of biomolecules, including low risk of contamination with prions, viruses and other pathogens, scalability, low production costs, and available agronomical systems. Plants are also versatile vehicles for the production of recombinant molecules because they allow protein expression in various organs, such as tubers and seeds, which naturally accumulate large amounts of protein. Among crop plants, soybean is an excellent protein producer. Soybean plants are also a good source of abundant and cheap biomass and can be cultivated under controlled greenhouse conditions. Under containment, the plant cycle can be manipulated and the final seed yield can be maximized for large-scale protein production within a small and controlled area. Exploitation of specific regulatory sequences capable of directing and accumulating recombinant proteins in protein storage vacuoles in soybean seeds, associated with recently developed biological research tools and purification systems, has great potential to accelerate preliminary characterization of plant-

derived biopharmaceuticals and industrial macromolecules. This is an important step in the development of genetically engineered products that are inexpensive and safe for medicinal, food and other uses.

**Key words:** Plant farming; Transgenic soybean; *Glycine max*; Plant seed storage proteins; Protein storage vacuoles