

All-Soy-One-Component Bioplastics for Food Packaging

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Research conducted

Being expanded over the past few decades, industry of food packaging targets maintaining food quality, improving food shelf-life, providing safe environment for food storage and transportation. Both consumers and regulatory agencies indicate the demands to less polluting, more environmentally friendly, renewable plastic materials, particularly, for food packaging. For specific applications, compostable or biodegradable plastics (either naturally derived or made from sustainable resources) could replace traditional petroleum-based polymeric food packaging materials. By degrading with microorganisms, such plastics help to reduce the solid waste environmental concerns.

One of the targeted renewable raw materials to be used for bioplastics manufacturing are plant proteins (including soy protein), natural polymers formed from amino acids linked by peptide bonds in long chains. Plant proteins-based films are considered as a great alternative in food packaging industries. In this work, we demonstrate feasibility of using soy protein (in combination with soybean oil) in synthesizing bioplastic films which can be applied for food packaging.

Why the research is important to ND soybean farmers

The proposed research aims to provide the feasibility of using soybean protein and soybean oil produced in the state of North Dakota for high value and high profit food packaging materials. The proposed technology has the ability to add more value to the crop and make it more profitable for farmers. Newly developed materials can diversify soy-based products with increased demand for soy protein and soybean oil in manufacturing of bioplastics.

The market will be given soy-based food packaging materials. This will also help the state of North Dakota economy to attract new investors and other new soy processing industries.

Final findings of the research

We show that bioplastic films from all-soy-one component bioplastics (soy protein/soy oil *grafted* copolymers) are not only feasible and provide decent film-forming ability, but also possess mechanical properties which can be attractive in achieving enhanced material performance in variety of applications. Overall, new materials, in combination with recently developed by us “two-component systems” (where soy protein was modified by soybean oil-based latexes), can be considered as versatile biobased platform, alternative to the traditional petroleum-based plastics.

Benefits/Recommendations to North Dakota soybean farmers and industry

This work benefits the North Dakota soybean farmers and industry by establishing additional uses for multiple derivatives of the soybean, including soy protein and soybean oil.

This technology focuses on the use in food packaging applications, however, advances may be turned to other agricultural applications as well (in particular, agricultural mulch, other bioplastic films), thus benefitting the farmers and industry even further by providing a sustainable biodegradable, environmental friendly options for various agricultural technologies and products.