Introduction

Biodegradable and compostable plastics, particularly those based upon renewable biomass resources, are a crucial innovation for the modern world. The contemporary society relies on the prevalent synthetic plastics, derived from the scarcely available fossil fuel crude oil. Planet Earth will have run out of crude oil in only a few decades and petroleum-based polymers are considered to be one of the worst pollutants on the globe. Hence, alternatives must be searched for.

This study analyses bioplastics composed of potato starch, one out of many renewable resources from the agricultural industry. Native and modified starch is very popular in the food industry, yet we were more interested in how differently modified starches would manifest in the bioplastics based on them.

Methodology

Through various experiments we have succeeded in making several types of bioplastics, using basic equipment from the school laboratory. The outcomes of these experiments strongly ratify our extensively carried our literary research.

Our scientific experimental research reveal the possibilities of modification concerning starch plastics. By modifying the starch it was possible to efface certain properties such as flexibility, brittleness and hardness.

Interesting Facts

The cooperative Avebe U.A. is one of the biggest potato starch manufacturers of the world and is located in the North of the Netherlands. On an annual basis, Avebe distributes more than a million tons of potato starch, which is then used in food, animal feed, paper, construction, packaging materials, textiles and adhesives.

Avebe provided us with three different types of starch: native potato starch, native corn starch and GMO-free amylopectin waxy potato starch. These starches were put into good use by spending a lot of time in the school laboratory making our bioplastics.

Thanks to the kindness of Avebe U.A., we were given the opportunity to enrich our knowledge by consulting the Starch Technology Manager (chemist).

Findings

The properties of our modified starch plastics resemble quite a few applications, with which the synthetic plastics provide us nowadays.

All biobased polymers are merely thermoplastic polymers. Consequently, all thermosetting petrobased polymers cannot be replaced by any biobased polymers (as of yet).

Bioplastics, based solely on starch, are fairly convenient for short-lived applications, as they are biodegradable and compostable.

Potato starch can also be combined with other biobased polymers to attain even more favorable properties.

Conclusion

On the basis of the results of this research, it can be concluded that bioplastics based on starch are plausible to be a partial replacement of the synthetic plastics.

“The polymer industry already needs to account the beneficent characteristics of starch polymers, especially on the green packaging market.”

“When replacing synthetic plastics by bioplastics, more time is given to scientists to search for more and better alternatives.”

“We are convinced that in the near future, a major breakthrough will be made in the realm of polymer science.”

Our Research Goal

The major objective of this study was to ascertain whether bioplastics based on starch are probable to be an alternative or a partial replacement of the polluting and finite petrobased plastics.

For a brittle piece of starch-plastic we simply heated up starch in suspension. As the natural polymers amylose and amylopectin absorbed the water when the temperature rose, the mixture turned viscous. Drying out the viscous “gel” at room temperature took a few days and eventually the bioplastic was obtained.

Through another experiment we have verified that all of our starch-plastics are biodegradable and compostable, most favorably (and rapidly) in humid medium environment.