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# Xanthan gum as a component of starch-based bioplastic

Mankind uses plastic everywhere, so the production capacity of this important material is only growing every year. There is an environmental risk, that is based on a huge amount of plastic wastes, which are not disposed of but only released into the environment. So, alternative sources of this material have been developed for some time, which will be more environmentally friendly. In fact, the use of starch in this industry has been going on for a long time, for example, this component is added to existing plastic formulations to improve performance or reduce toxicity.

Therefore, this investigation was performed to demonstrate of production starch-based bioplastic with xanthan gum on a laboratory scale.

The aim of the work was the evaluation of xanthan gum influence on the parameters of starch-based bioplastic.

During this investigation, we used previously created formulation of bioplastic from starch [1] and replaced some amount of starch with the corresponding amount of xanthan gum. The main purpose of xanthan gum application was its thickening, stabilizing, suspending, and emulsifying properties. Xanthan gum is a high molecular weight polysaccharide produced by the bacterium *Xanthomonas campestris*. It may be degraded, but it is not readily biodegradable, but for application in relatively small quantities it can't be harmful and can degrade during some time [2].

The experimental part of the production of the starch-based bioplastic with xanthan gum is demonstrated on Figure 1.

After the preparation of different formulations, three samples of starch-based bioplastic with xanthan gum (one without) can be used for the production of covering films and whole small bioplastic items. Therefore, they can be used in the cosmetic, food, chemistry, and agriculture industries.

On Figure 2 are presented ready starch based bioplastics with xanthan and control one without this substituent.

The formulation where 5 % of starch content was substituted by xanthan gum has the best characteristics in strength and flexibility.

It was investigated that after 3 days of biodegradation in water the starch-based bioplastic with xanthan gum loses up to 35–40 % of its volume. However, the biodegradation of xanthan gum requires future investigation, it should be noted that the small amount of xanthan gum used in bioplastic formulations is not toxic to the environment and the such product starts to actively biodegrade after 24 hours. Also, it can be reported that the application of thermostation at 50°C for the acceleration of drying time in comparison to drying at room temperature at 14–18°C could reduce the time of drying by 2 times (from 7–8 days to 3–4 days).

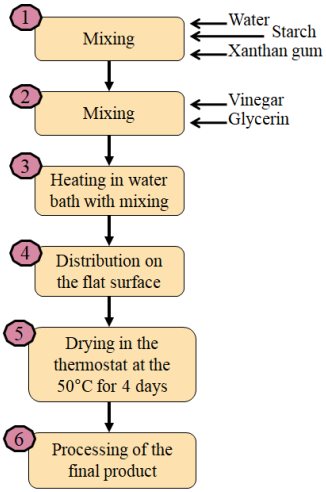


**Fig. 1.** The scheme of laboratory scale production of starch-based bioplastic with xanthan


**Fig. 2.** Final bioplastics after 4 days drying in the thermostat (xanthan, g : starch, g)

In a conclusion, it can be said that xanthan gum has a positive influence on the flexibility and strength of starch-based bioplastic. The addition of xanthan gum hasn't negative consequences for biodegradation of the final product due to the small amount of substance in the formulation. The starch-based bioplastic with xanthan gum can be used for cosmetic, food, and agricultural industries.

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