EFFECT OF TEMPERATURE ON FUNCTIONAL PROPERTIES OF STARCH SEPARATED FROM SORIZ (SORGHUM ORYZOIDUM)

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Abstract: Starch is a functional ingredient used to prepare a wide variety of food products. Sorghum Oryzoidum or soryz is a cereals raw material with a high potential of the recovery as a source of starch. In this way, of interest is research of functional properties of soriz starch, which are important in the formation of food manufactured texture. Have been studied swelling power and solubilityof soriz starch in the range of temperatures 70 ... 100 °C, as well as for corn and potatoes starches as reference materials. Solubility and swelling power determined for the three types of starch were directly influenced by the temperature. While the temperature is increasing, swelling power and solubility have been on the rise as a result of intermolecular hydrogen bridge rupture in the amorphous areas of starch granules, which allowed irreversible and progressive water absorption.
Key words: starch, soryz, functional properties

1. Introduction

Starch is one of the most important functional food biopolymers. As a natural component, it contributes to the characteristic properties of food products made from cereals, rice, potato and maize. It is also added as a functional ingredient to many products such as sauces, puddings, confectionery, comminuted meat and fish products and a variety of low-fat products. The demands for functionality may vary from product to product [1].

Sorghum Oryzoidum or soryz is a new annual cereal of hybrid origin obtained in the Republic of Moldova. Soryz grains contains about 10,5-13,4% of proteins, the fat content is in the range of - 3,70-4,05%, and *65,0-75,6% of starch*. Taking into account the large utilization of starch as a functional ingredient in food, it presents interest to study its properties. Functional properties of starch, such as - specific viscosity, gel texture, clarity, opacity, swelling and resistance to swelling, etc., play a key role in its diverse applications in food and nonfood industries.

In present work, it ware determined two functional properties: solubility and swelling power of soryz, corn and potato starch.

Swelling power indicates the water-holding capacity of starch and it is generally used to demonstrate differences between various types of starches [2].

2. Materials and methods

2.1 Materials

Grains of Sorghum Oryzoidum – Piscevoi – 1 cultivar, 2011-year harvest, yellow color.

Flour of soryz grains - flour of cream color, cereal smelt and taste, slightly sweet. Flower was prepared on the laboratory grounding mill, 20000 rotation /minute.

2.2 Methods

Swelling power was determined as described by Schoch [2]. Starch was accurately weighed (2 g) into a pre-weighed 250 ml centrifugal bottle. Distilled water was added to give a total volume of water equivalent to 180g. The starch was completely suspended by stirring at 200 rpm using a magnetic stirrer. After taking out the stirrer, the bottle was immediately placed in a temperature controlled water bath at 85°C with continuously shaking at 200 rpm for 30 min. The centrifugal bottle was then dried and placed on a balance followed by the addition of distilled water to bring to a total weight of 200 g. After capping, the bottle was centrifuged for 15 min at 1000*g. to measure solubility, 50 ml of the supernatant was transferred into an evaporating petri dish and dried overnight in a hot air oven at 105°C. The dried residue was then cooled in desiccators and weight for soluble starch. To measure the swelling power, the residual supernatant was carefully removed and discarded. The bottle with sediment paste was then weighed to give the weight of swollen starch granules. The result was expressed by the calculation as : Swelling power (%) = weight of sediment paste *100 / weight of sample on dry basis * (100 - % solubility).

3. Results and discussions

Heating an aqueous suspension of starch granules results in their hydration and eventually swelling with consequent leaching of material into the liquid. The study of swelling and solubility patterns gives an indication of the associative forces within the granule [3]. The swelling power and solubility of the soryz, corn and potato starch over a range of temperature were determined (Fig. 1, 2).

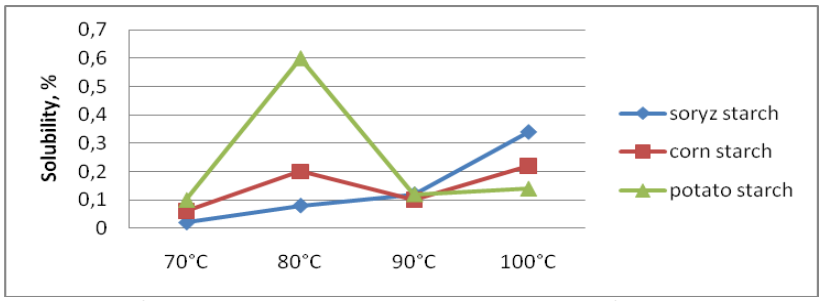

Fig. 1 Solubility of soryz, corn and potato starches over the range of temperature 70 –100 ºC.

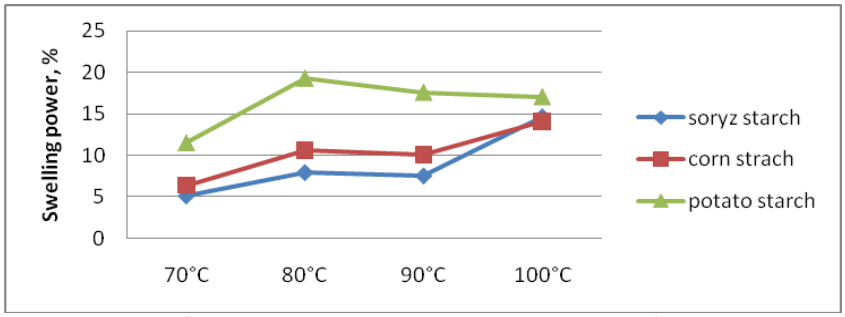

Fig. 2 Swelling power of soryz, corn and potato starches over the range of temperature 70 –100 ºC.

Data shows that both swelling power and solubility of studied cereal types of starches increase with the raise of temperature but for potato starch both functional properties increase up to 80°C followed by a decrease, because of different raport of amylose and amylopectine in potato and cereal starch and different size of starch granules.

The behavior of granules during the heating led to the division of the temperatures range into 2 categories. The first, which covered 60, 65 and 70°C, was not able to induce starch gelatinization during the 30 min of heating; the second, which covered 75, 80, 85 and 90°C, inflicted a thermal aggression inducing the complete gelatinization of starch before the first 25 min of heating [4]. A similar observation was made by Bhavesh and Koushik (2006).

From 70 to 90°C, the granules of soryz starch (cereal type starch) gradually swelled as temperature increased, as a result of intermolecular hydrogen bridge rupture in the amorphous areas, which allowed irreversible and progressive water absorption.

Conclusions

Variations in fonctional properties determinated for tree types of starch soryz, corn and potato starch were observed. Solubility and the swelling power determined for the soryz, corn and potato starch were directly influenced by the temperature. Swelling power and solubility values which showed an increase with increasing temperature making it potentially useful in food products treated at high temperatures, such as canned foods, baby food, sauces, bread products, jellies, candies and sausages.

So if soryz starch shows a good results for functional properties along with other types of starch it could be a valuable functional ingredient for food industry.

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