

Wheat starch variability in characteristics and rheological properties: the influence of varieties, harvest years and phytotechny

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Summary

This paper deals with the results of a project financed by Ministry of agriculture of the Walloon regional Government (Région wallonne – Ministère de l'agriculture- DGA).

The objectives of this research are:

- to understand the influence of the intrinsic properties of wheat starch and the alpha-amylase activities on the functional characteristics (mainly rheological properties) of flours and extracted starches,
- to identify the factors influencing the structure, composition and techno-functional properties of starch (harvest years, varieties, phytotechny, climate...),
- to propose production and collecting strategies in relation with possible end-uses.

The wheats were grown at the same place under controlled growing conditions (varieties, date of seedlings, phytotechny ...) for several harvest years. The starch was extracted from these wheats according to a Batter semi-pilot process. The intrinsic properties of these starch samples were studied using different analytical techniques:

- Particule size distribution (small -large granules ratio),
- Amylose/amyopectin ratio,
- Starch damaged,
- Viscosity profile(Brabender micro-viscoamylograph, Newport Rapid Visco Analyser).

Several effects on the wheat starch properties were studied: harvest years, varieties, date of seedlings, fungicide treatments, nitrogen fertilisation.

Some of the starch properties were correlated to corresponding flours or to the initial ground wheats.

On ground wheats, beside the intrinsic properties of the starch, endogenous enzymes (alpha-amylases) also play a major role on the viscosity profile. This enzymatic contribution could be distinguished from the intrinsic property of the starch by 2 measurements of the viscosity profile: one using water (measuring the starch and the enzymes effects) and one using a silver nitrate solution (AgNO_3 2mM) to block the enzymatic activities and isolate the intrinsic properties of starch.

First trials achieved on the addition off amylolytic enzymes from *Bacillus sp.* showed that starches have different sensibility to enzymatic hydrolysis. This could be of a major importance for the speed of hydrolysis in processes like bio-ethanol production.

As a conclusion, this study demonstrates that we have to consider the wheat starch variation, that harvest years and varieties play a major role. According to the desired viscosity profile we could select a given variety and orient the phytotechny. Of course, we have to deal with the year to year affect and pay attention to endogenous amylolytic enzymes.