

Can enzymatic hydrolysis of starch be more sustainable?

Enzymatic Hydrolysis of Starch and Maltodextrins at High Substrate Concentrations

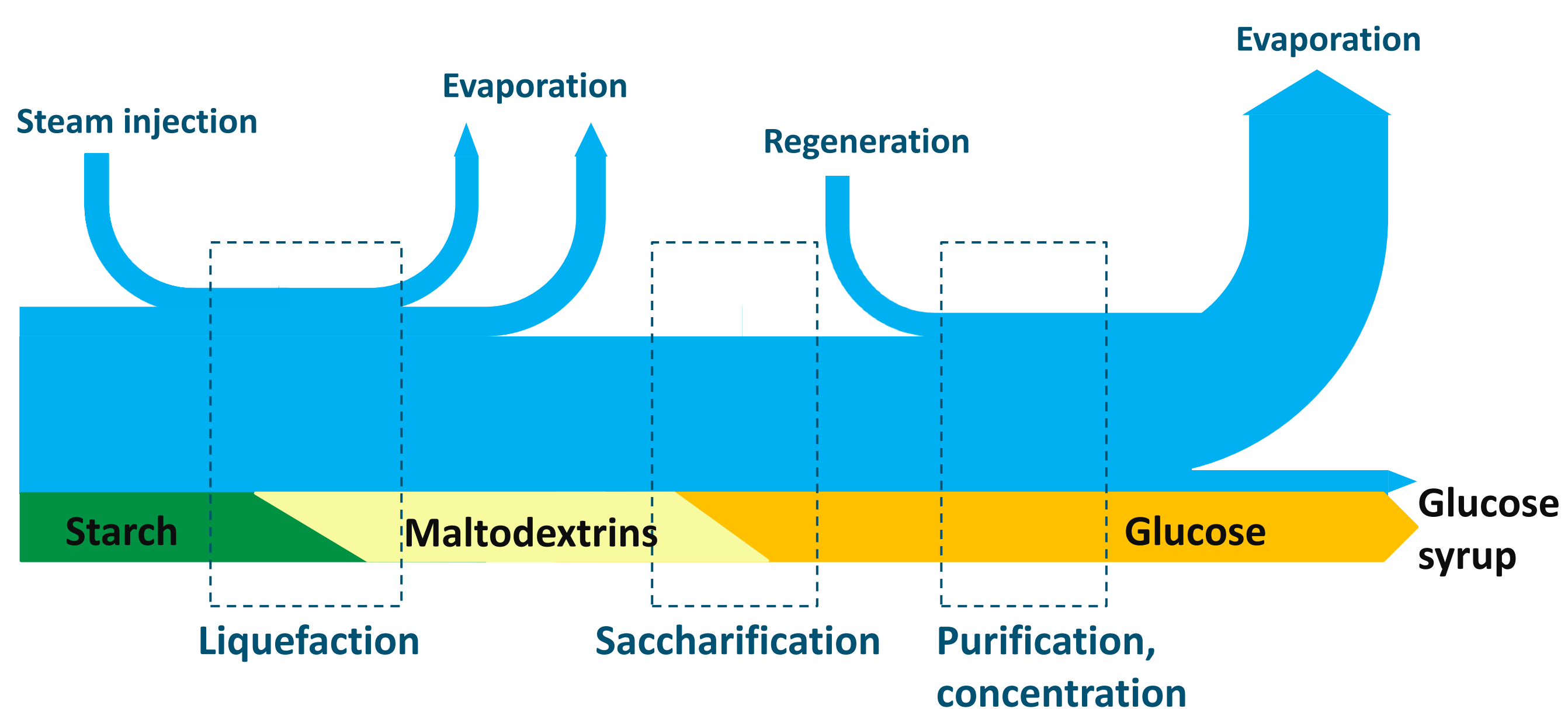
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Background

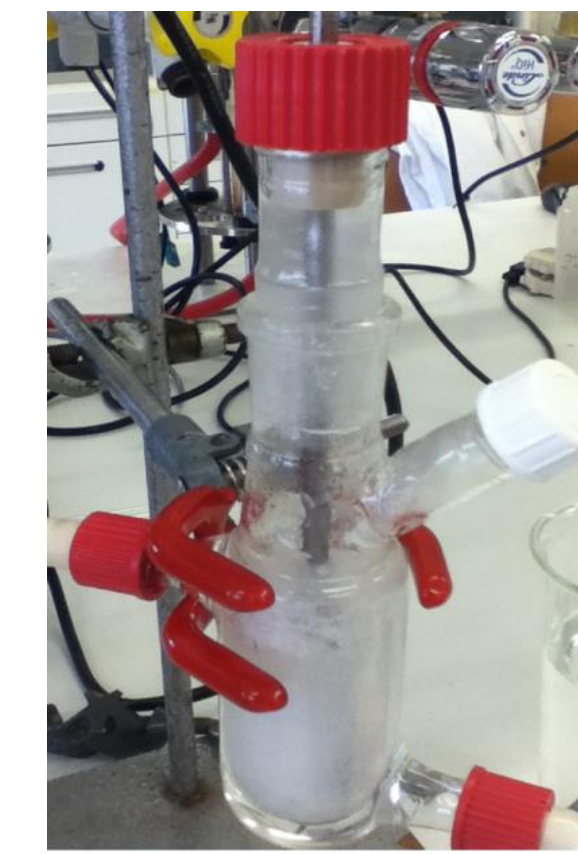
The current starch hydrolysis process: a scheme representing the mass flow of water and dry matter during hydrolysis¹.



Method



Starch gelatinization:
A combination of thermal and mechanical treatment in the shear cell (90°C, 1h, shear stress up to 10kPa).



Starch hydrolysis:
Liquefaction with *B. licheniformis* α -amylase (80°C, 5h, pH 5.6) followed by saccharification with *A. niger* glucoamylase (60°C, 24h, pH 4.5)



Carbohydrate analysis:
Size exclusion column Shodex KS803 at 80°C; water as eluent; RI detection

Objective of the research

The goal of this research was to investigate the possibility of intensifying the starch hydrolysis process by increasing dry matter content during liquefaction and saccharification of wheat starch. We present the comparison of samples hydrolysed at different substrate concentrations.

Results

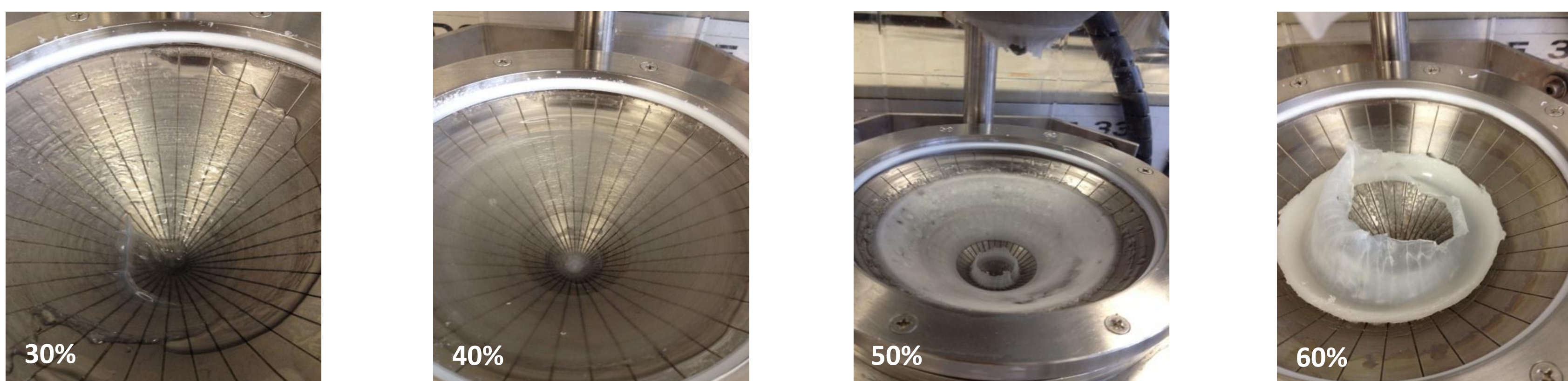


Figure 1. Differences in the appearance of gelatinized starch at increasing dry matter contents.

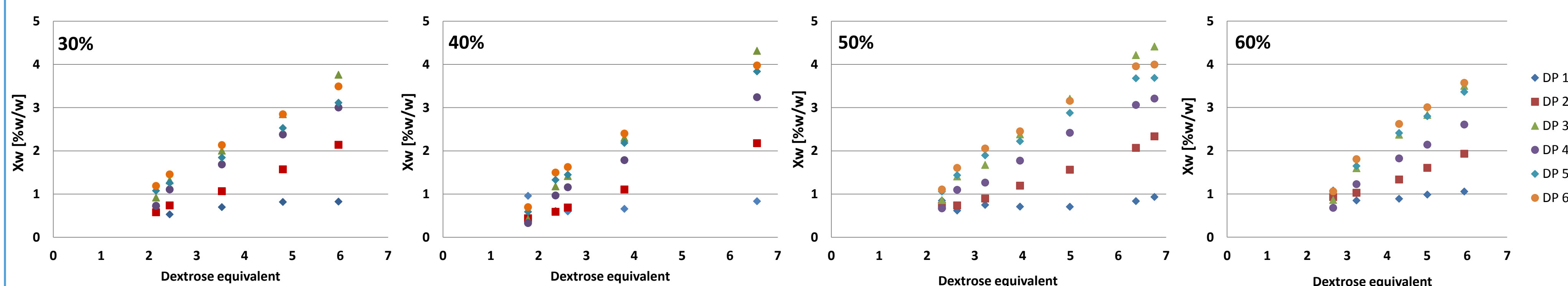


Figure 2. Composition of the liquefacts at increasing starch concentrations after α -amylase treatment.

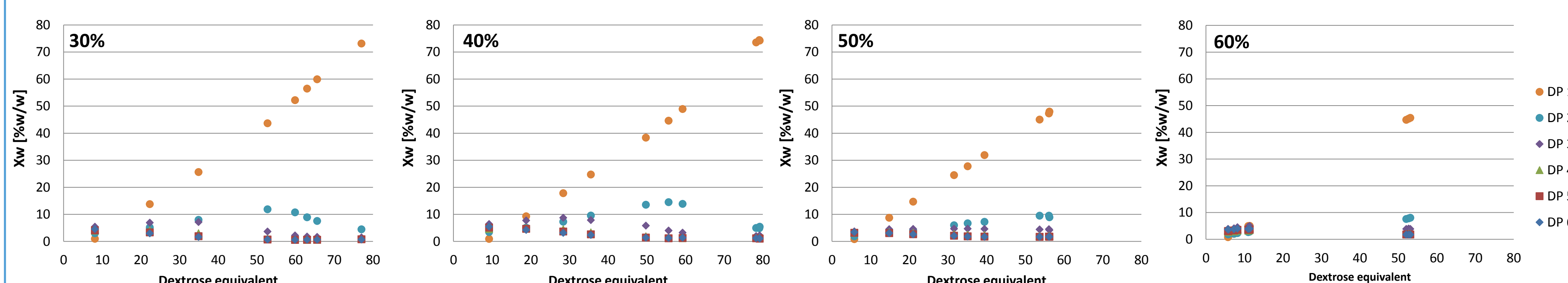


Figure 3. Composition of the saccharified starch at increasing dry matter content after glucoamylase treatment.

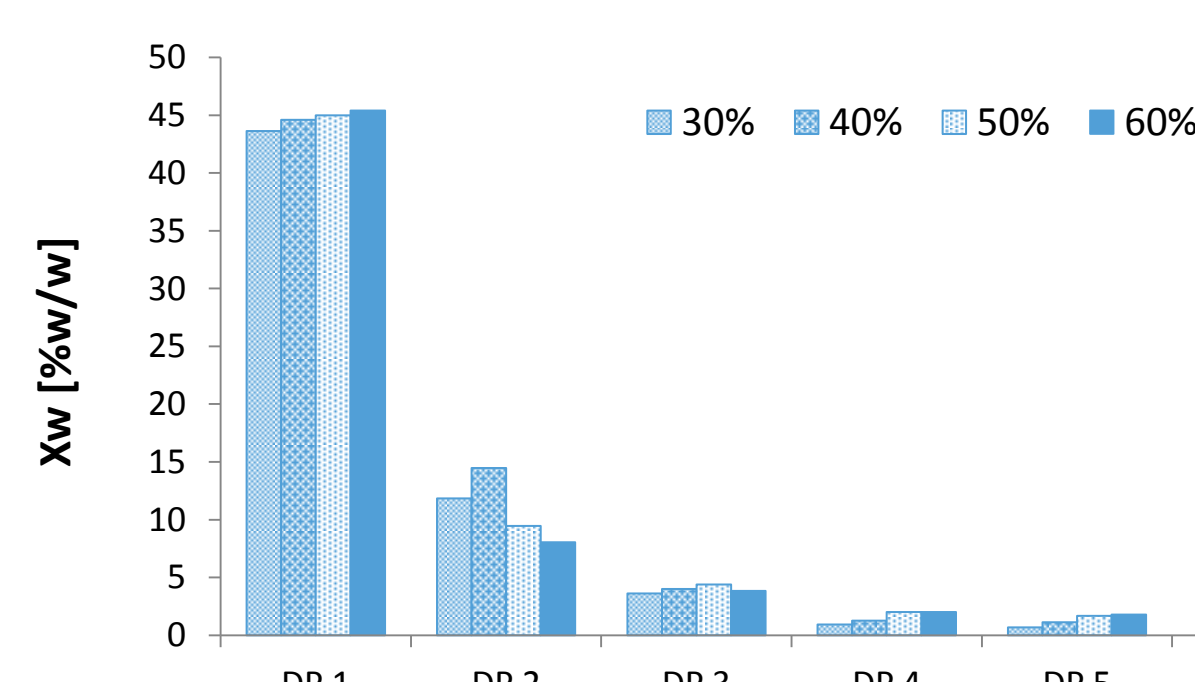


Figure 4. Composition of saccharified starch at around the same conversion stage (approx. DE 53) for different dry matter contents.

Conclusions

1. Increasing dry matter content causes only small fluctuations in the composition of the hydrolysis products.
2. During saccharification, at the same value of dextrose equivalent, maltose is the only saccharide clearly influenced by the dry matter content.
3. Decreasing the amount of water causes some processing issues, especially during mixing and adjusting pH, however it does not drastically change the composition of the products.
4. Hydrolysis of starch can be done at elevated dry matter content and therewith become more sustainable.

References

1. van der Veen, M.E. (2005) Towards intensification of starch processing. PhD thesis, Wageningen University, The Netherlands

Acknowledgements

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