

# Effect of hydrothermal treatments and initial alpha-amylase activities on wheat flour functional properties

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## 1 Introduction

Flour heat treatment (FHT) is an effective process that aims to modify the functional properties of flour. These processed flours are considered as natural ingredients and are not classified in the food additives category.

Besides, many wheat flour lots harvested with excessive amylase activities are rejected and cannot be used in food applications as such.

Wheat flour steam treatment can be used to normalize endogeneous  $\alpha$ -amylase and generate functional wheat flours.

## 2 Objectives

Using an effective pilot-scale process, the present study aimed to assess the effect of the injected steam volume and the endogeneous amylase activity on wheat flour functional properties.

Steam: 5, 10, 20%

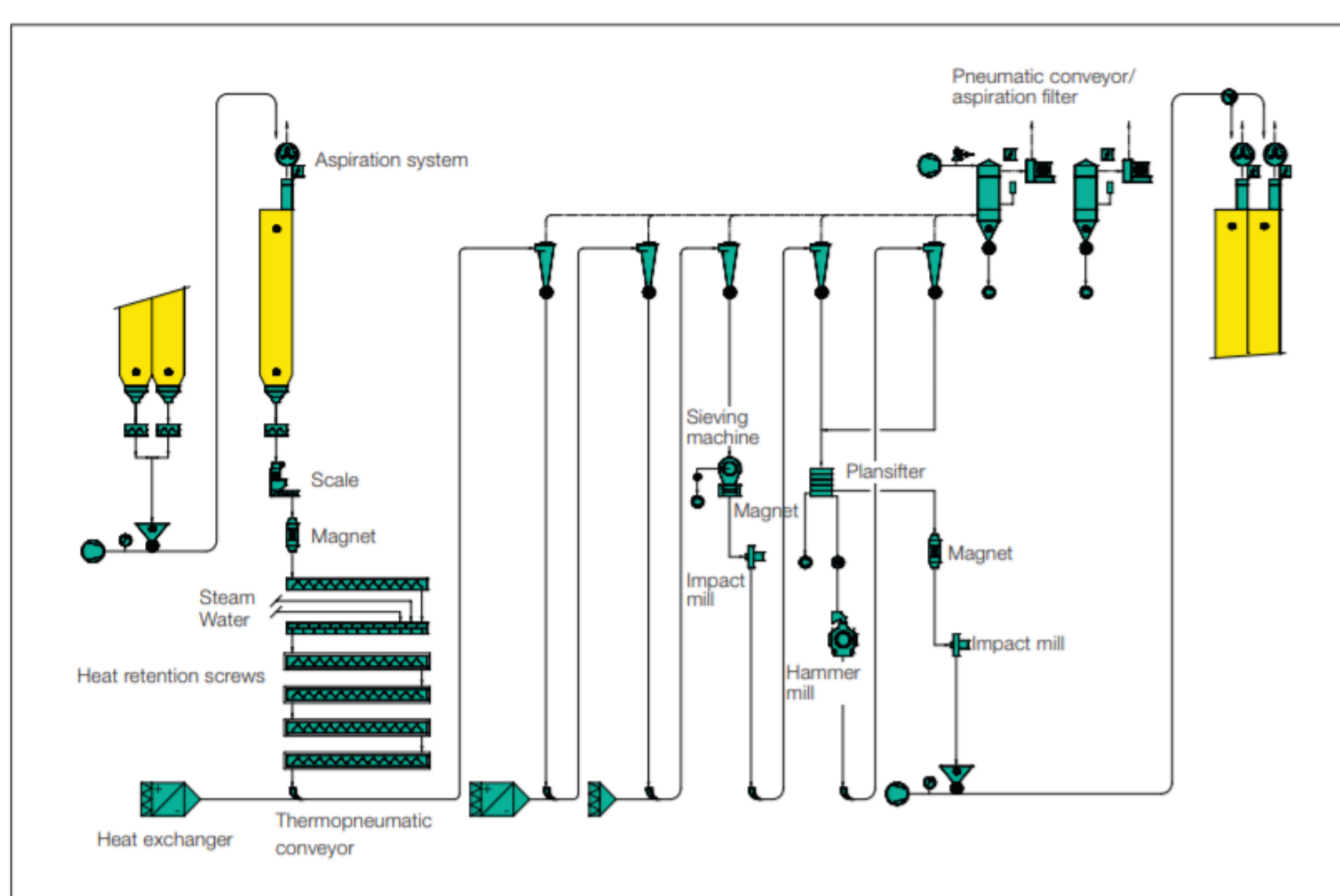
Flours V1 & V2  
(low and high  $\alpha$ -amylase activity)

- $\alpha$ -amylase
- Pasting prop
- Thermal prop
- WSI, WAI

## 3 Materials & Methods

Materials: Wheat flours V1 (low  $\alpha$ -amylase activity) and V2 (high  $\alpha$ -amylase activity)

Flour heat treatment (FHT) – Bühler AG (Switzerland)

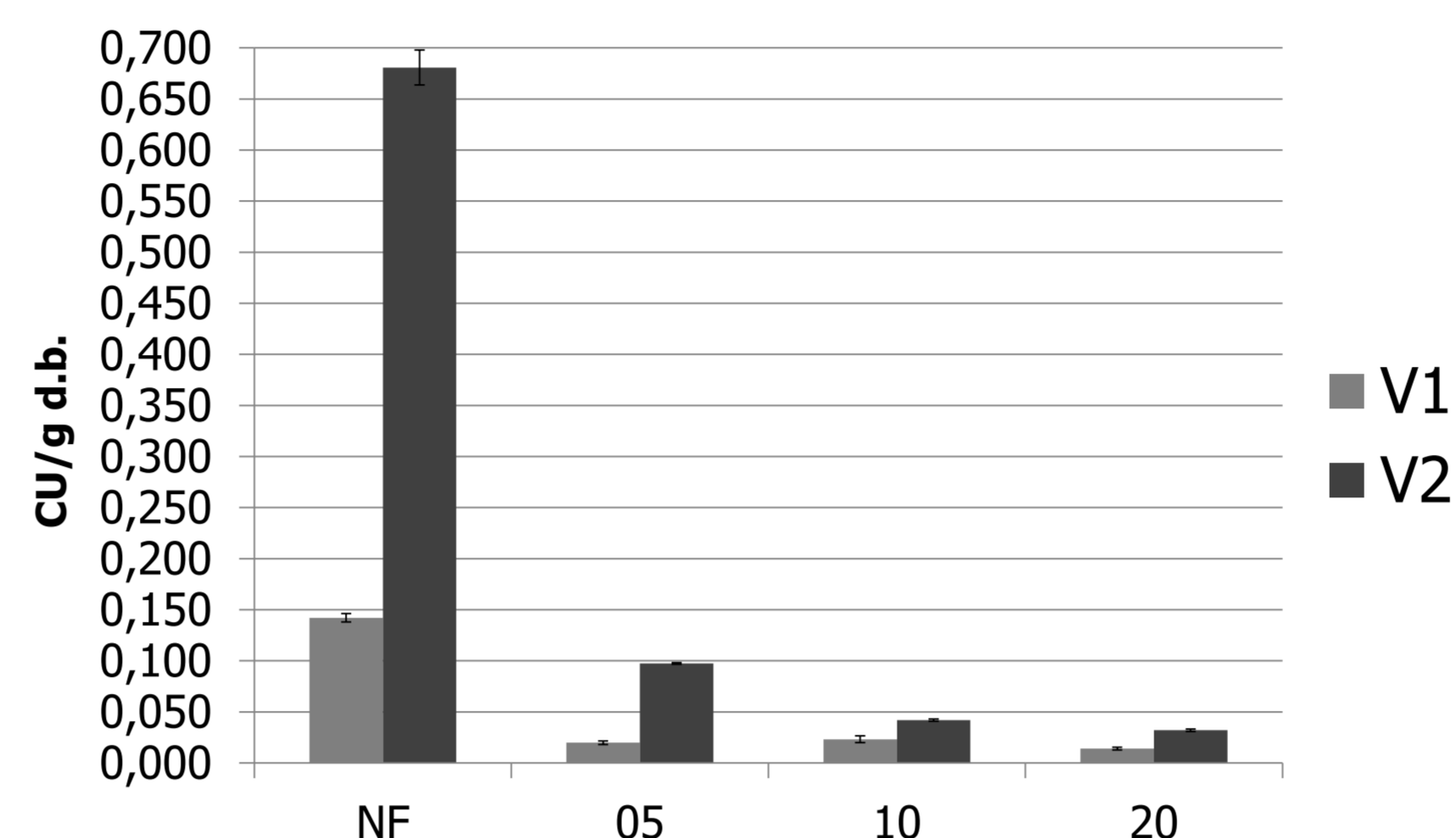


Methods:

- $\alpha$ -amylase activity (Megazyme kit)
- Pasting profiles: H<sub>2</sub>O and AgNO<sub>3</sub> (RVA)
- Thermal properties (DSC)
- Water absorption index (WAI) at 30°C and after gelatinization
- Water solubility index (WSI) at 30°C and after gelatinization

## 4 Results

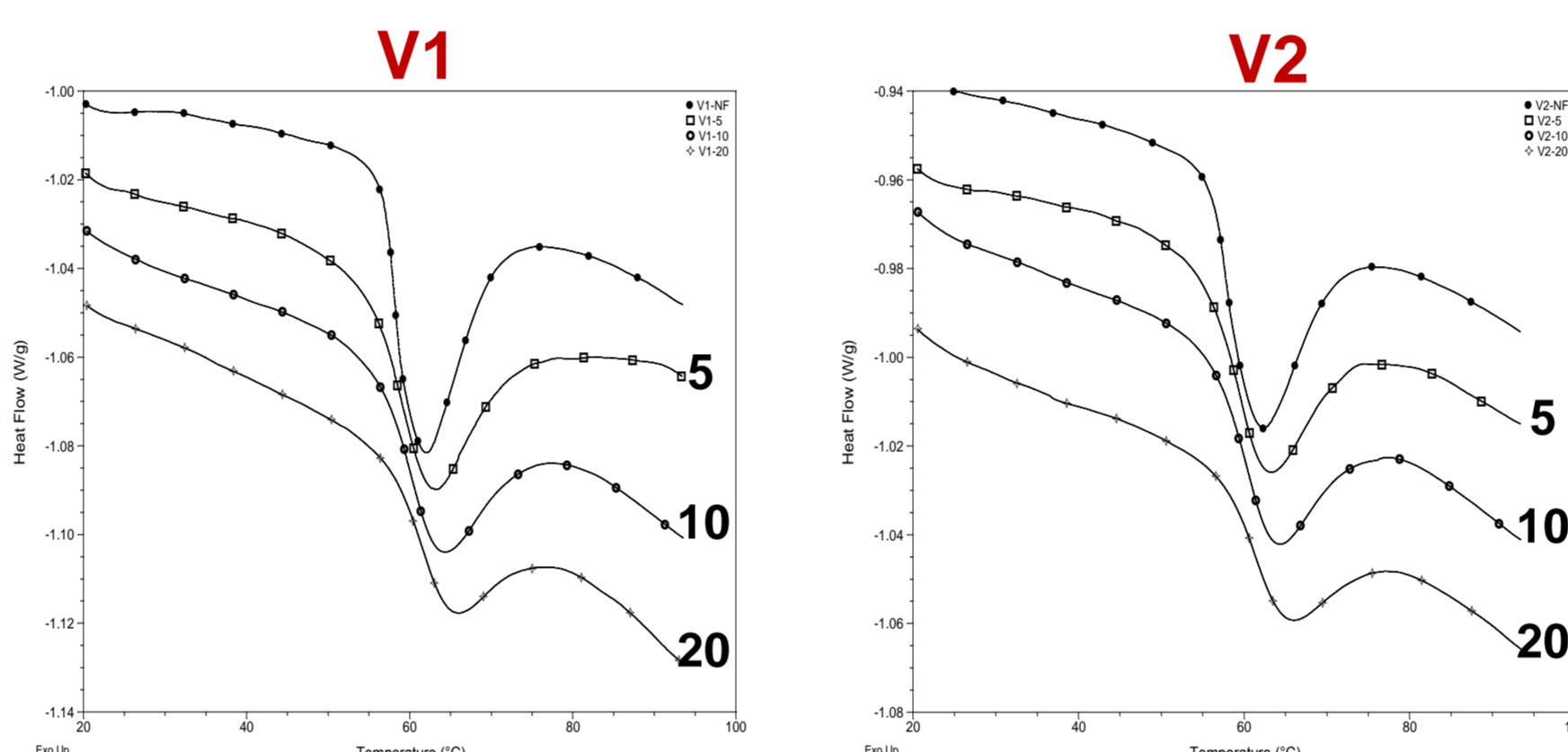
### $\alpha$ -amylase activity



Drastic reduction (7X) of  $\alpha$ -amylase activity with 5% of injected steam volume.

As the injected volume increased, the residual  $\alpha$ -amylase activity of the flour decreased.

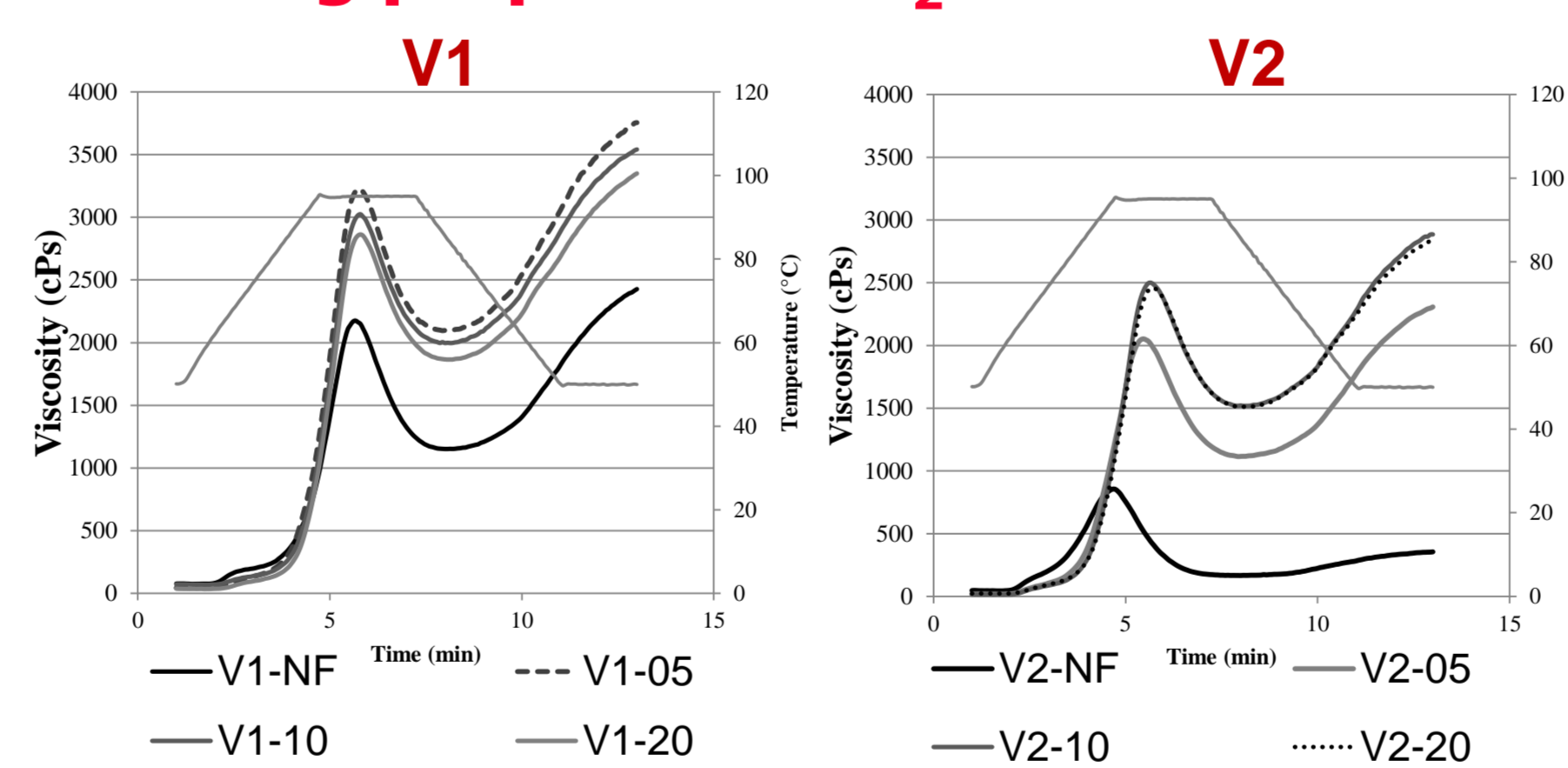
### Thermal properties



$\Delta H$  of treated flours decreased with increase of steam volume => partial gelatinization of starch granules.

Gelatinization endotherms shifted to higher temperatures with increasing steam percentage.

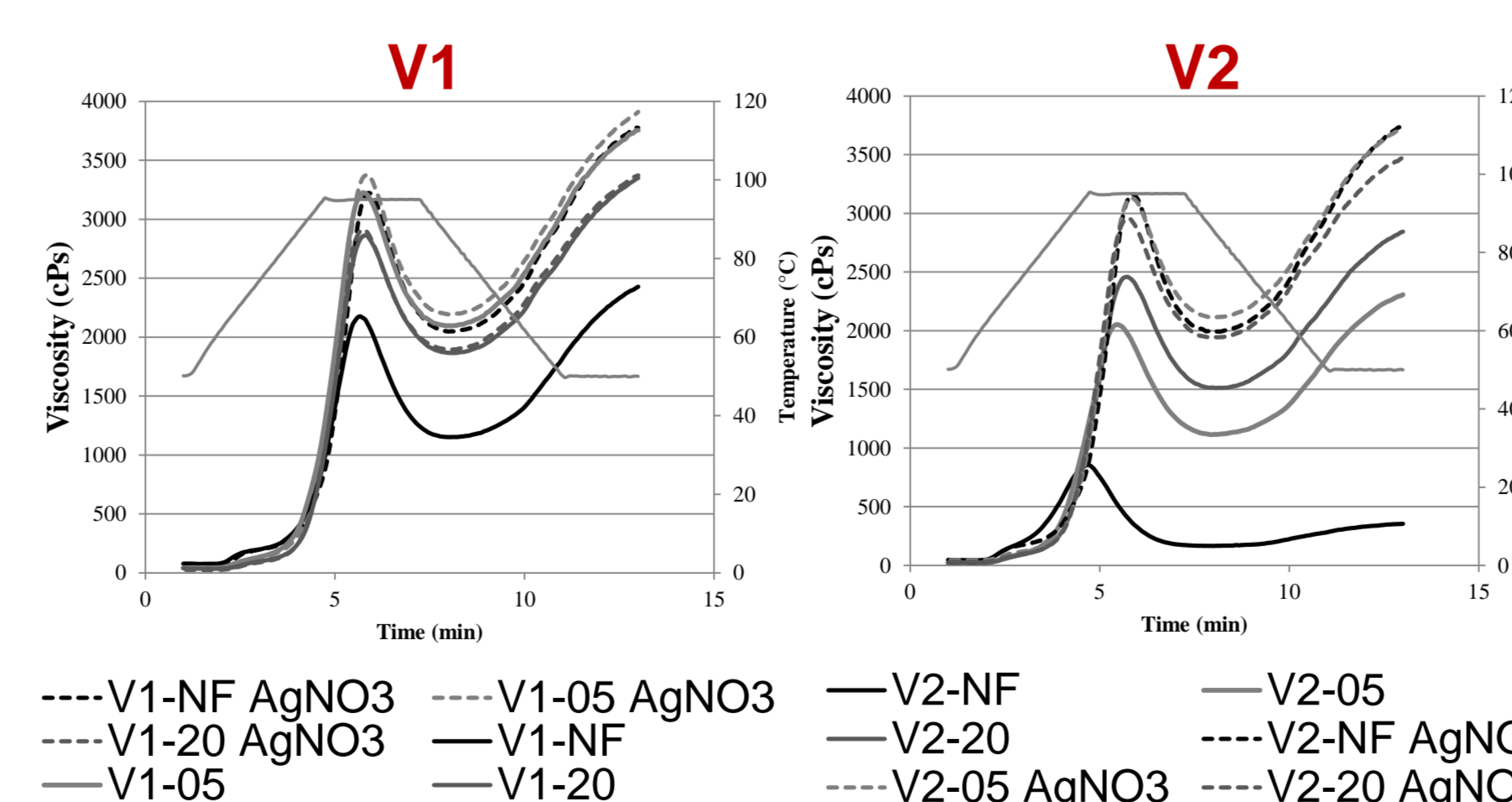
### Pasting properties – H<sub>2</sub>O



Higher viscosity profiles for treated flours compared to native ones

What is the impact of endogeneous amylase activity on RVA profiles?

### Pasting properties – AgNO<sub>3</sub>

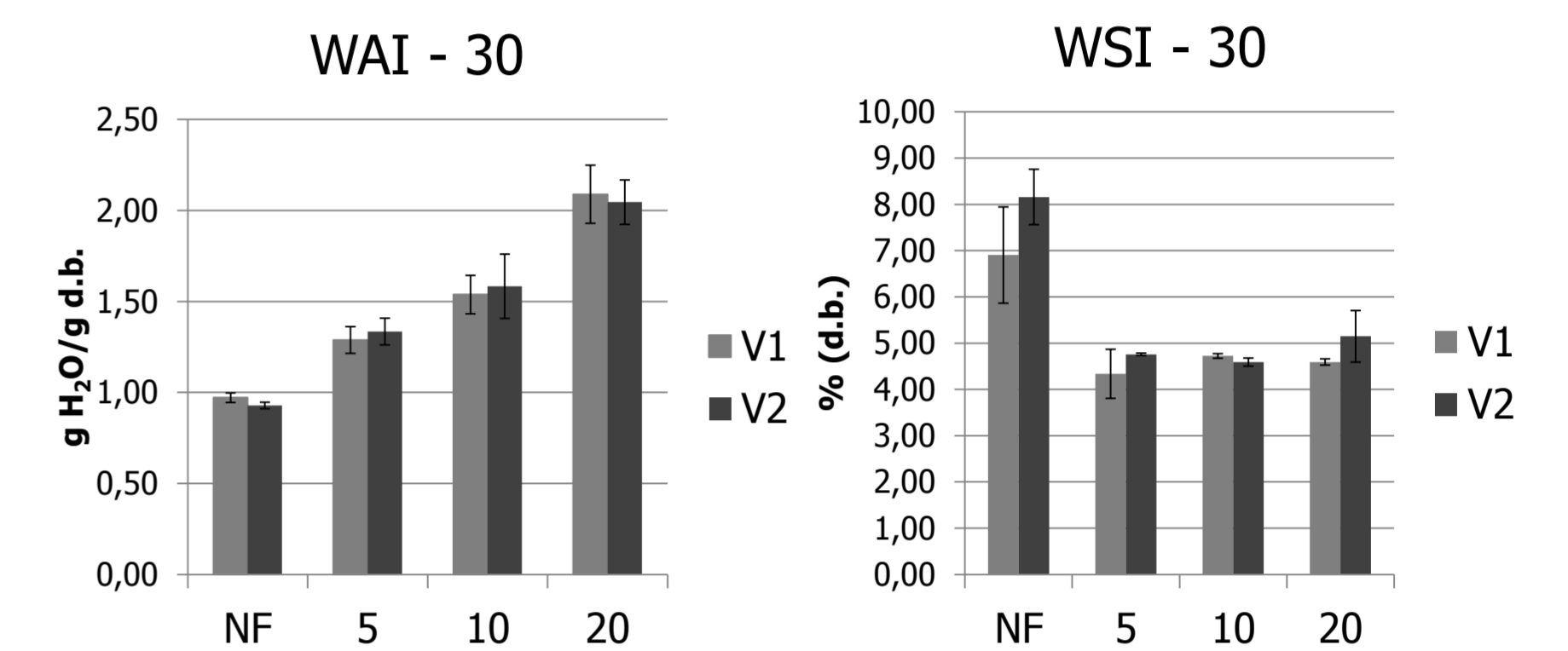


The presence of endogeneous  $\alpha$ -amylase strongly affected the pasting profiles of the native and treated flours.

Positive correlation between the  $\alpha$ -amylase activity and the increase of peak viscosity due to enzyme inactivation with AgNO<sub>3</sub> => Even at very low values (< 0,050 CU/d.b.),  $\alpha$ -amylase activity has a significant effect on viscosity profiles.

Breakdown values decreased as the steam percentage increased.

### WAI – WSI at 30° C

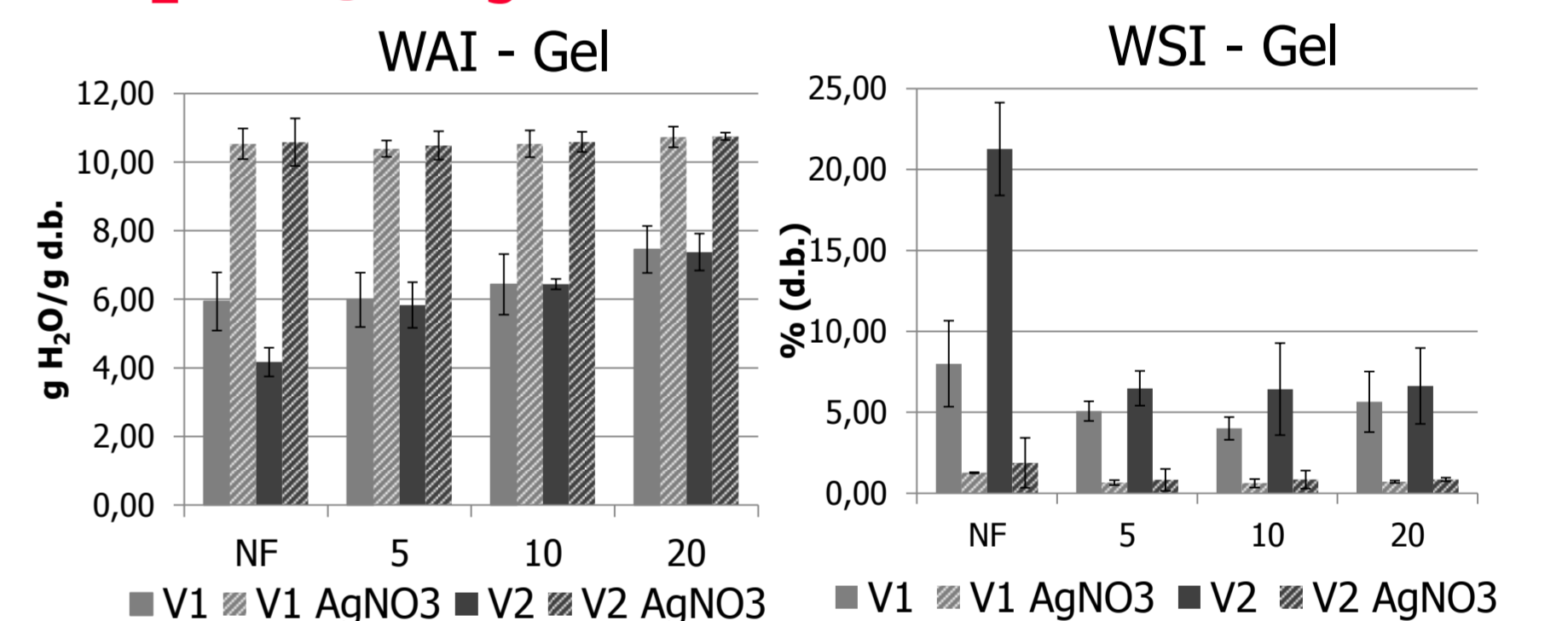


As the injected steam volume increased, WAI increased for both flours (V1 and V2) => positive correlation between WAI and gelatinization percentage.

Decreased in WSI of treated flours compared to the native ones.

All treated flours showed similar WSI values.

### WAI – WSI after gelatinization : H<sub>2</sub>O/AgNO<sub>3</sub>



WAI (H<sub>2</sub>O) increased with the steam volume percentages.

With AgNO<sub>3</sub>, WAI values were similar for samples => impact of  $\alpha$ -amylase activity.

WSI (H<sub>2</sub>O) decreased with hydrothermal treatment.

With AgNO<sub>3</sub>, WSI values were even lower => impact of  $\alpha$ -amylase activity even at very low level.

## 5 Conclusion

Steam treatment significantly decreased the initial  $\alpha$ -amylase activity.

Pasting profile and WAI after gelatinisation were affected by residual  $\alpha$ -amylase activity.

A safe control of the setting parameters of this technology can lead to ingredients with different functionalities.

Flour heat treatment can valorize wheat harvested with excessive  $\alpha$ -amylase activity.

## Acknowledgement

This work was supported by the Walloon government through the project entitled « Startech »