

The Rapid Visco Analyser as a rheological tool to determine the potential brewing quality of barley and malt

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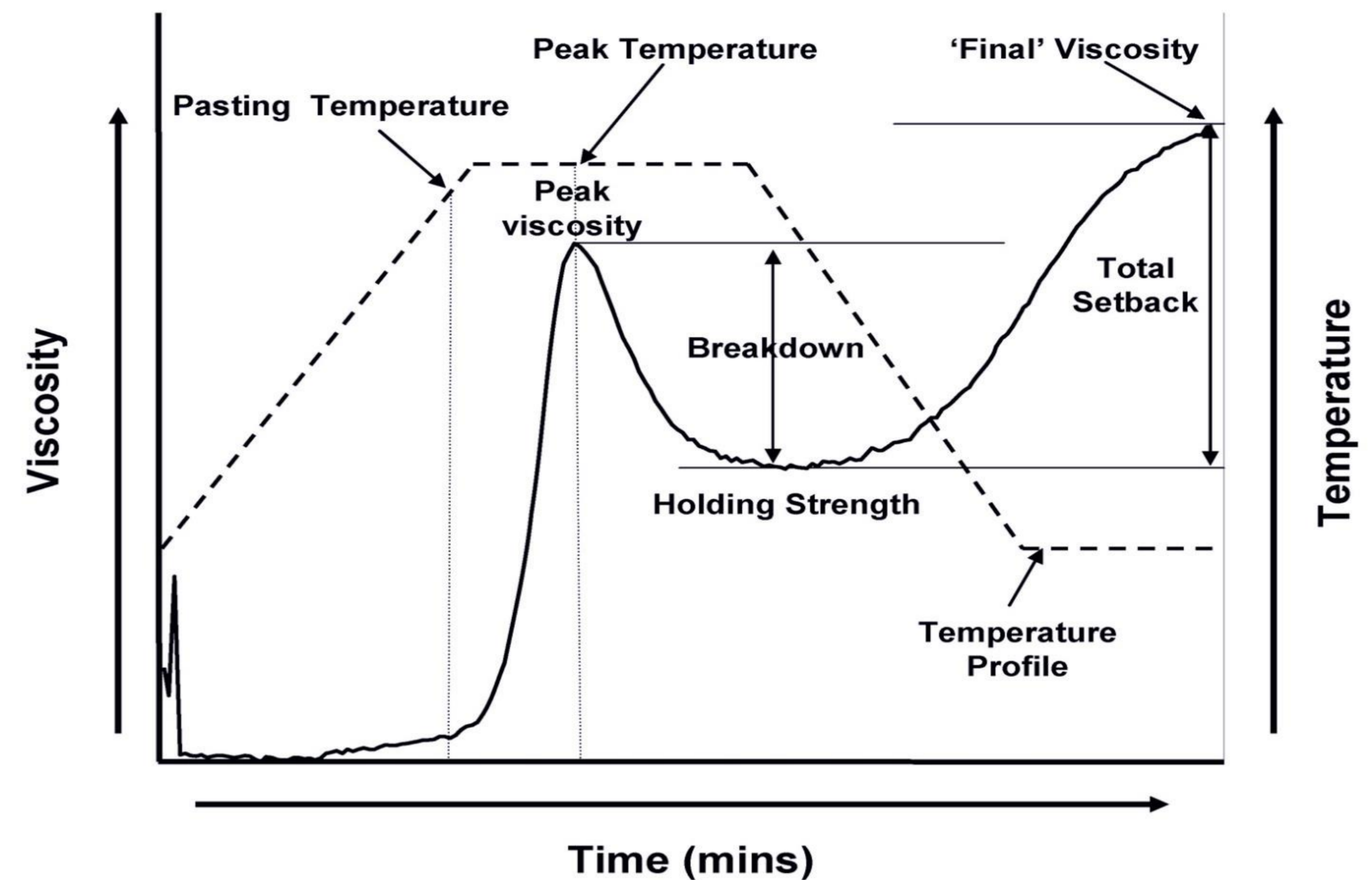
Context

• To meet expectations of brewer and microbrewers promoting local and craft production of barley and malt, it is necessary to have a **fast and efficient tool to easily determine their potential brewing quality**. It was with this in mind that the application of the **Rapid Visco Analyzer (RVA)**, a rheological tool which is commonly used to determine **pre-harvest sprouting** (alpha-amylase activity) and **pasting properties of starch** in cereals (mostly wheat) was evaluated.

Material and method

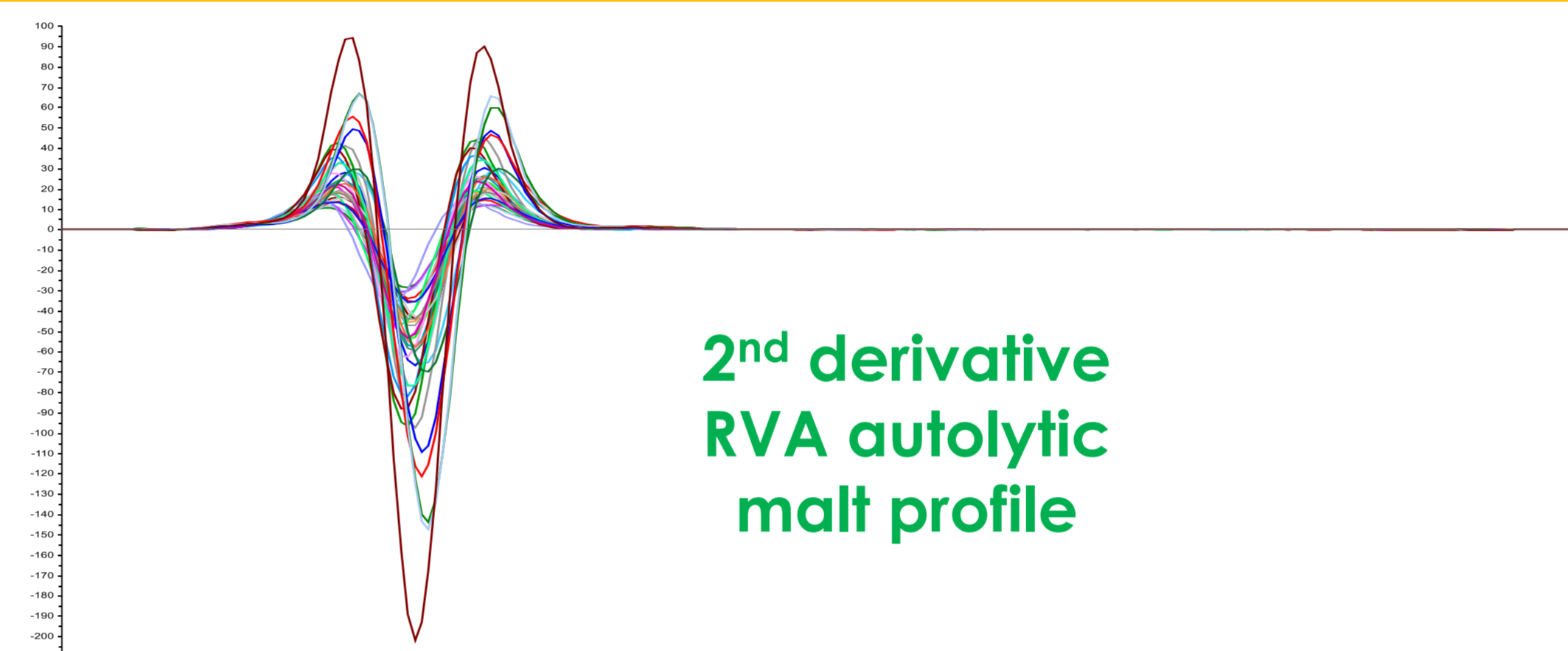
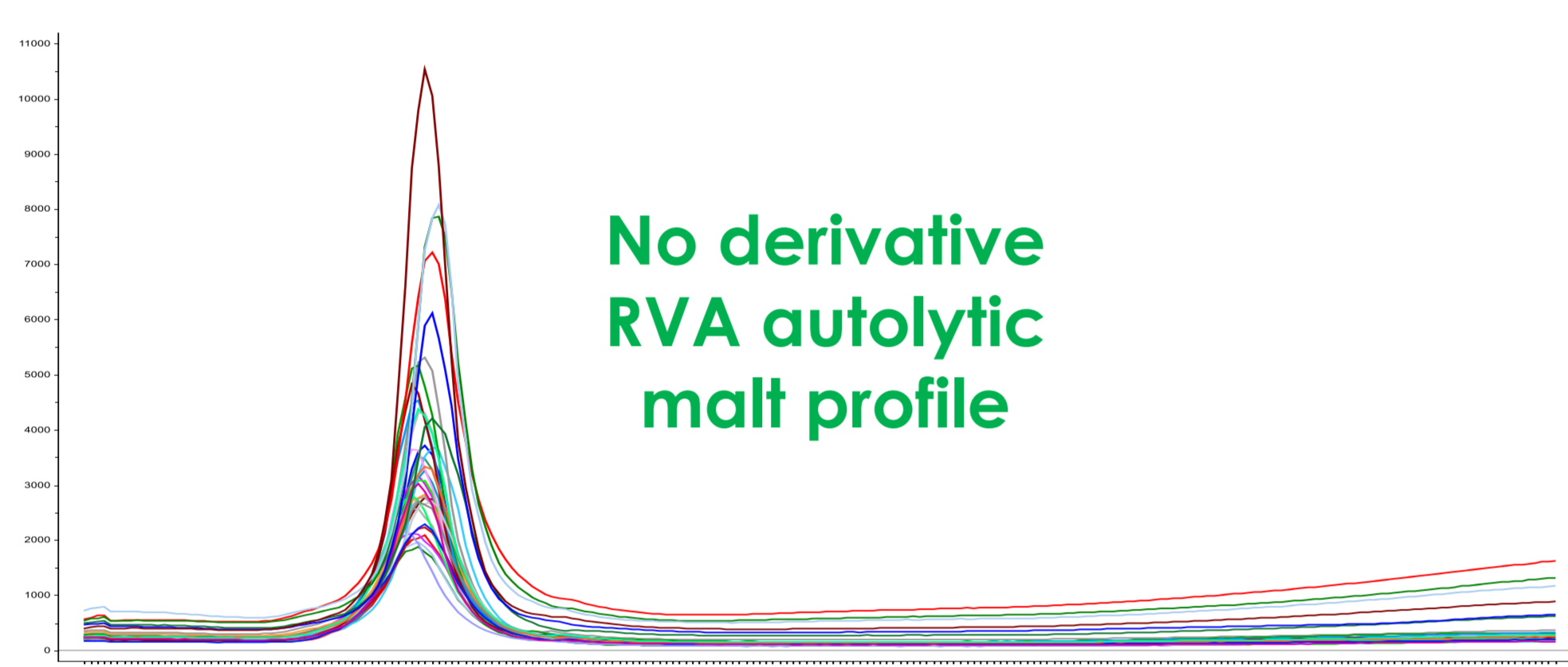
• **34 barleys** were harvested in 2017 in Belgium. They were selected for their **high degree of diversity**: several varieties, various pedoclimates and different cropping methods. The barley samples and their corresponding malts were **evaluated for usual brewing parameters** (EBC mash extract yield, viscosity, etc...).

• The **RVA measurements** were performed under both **autolytic and enzyme-inhibited** (with AGNO_3) conditions on barley (Malting Barley Method from Perten ; 4 g of sample ; 15 min run) and adapted for malt to have higher degree of viscosity and clearer viscosgrams (Adapted Kilned Malt Method from Perten ; 11.2 g of sample ; 15 min run). The **whole viscosgram profile** was taken into account to **get more information** of the RVA data. The **second derivative of the viscosgrams** was used to build prediction models with a **higher degree of accuracy**.



Usual RVA profile (Mason et al., 2012)

Prediction of malt quality based on the malt autolytic RVA profile

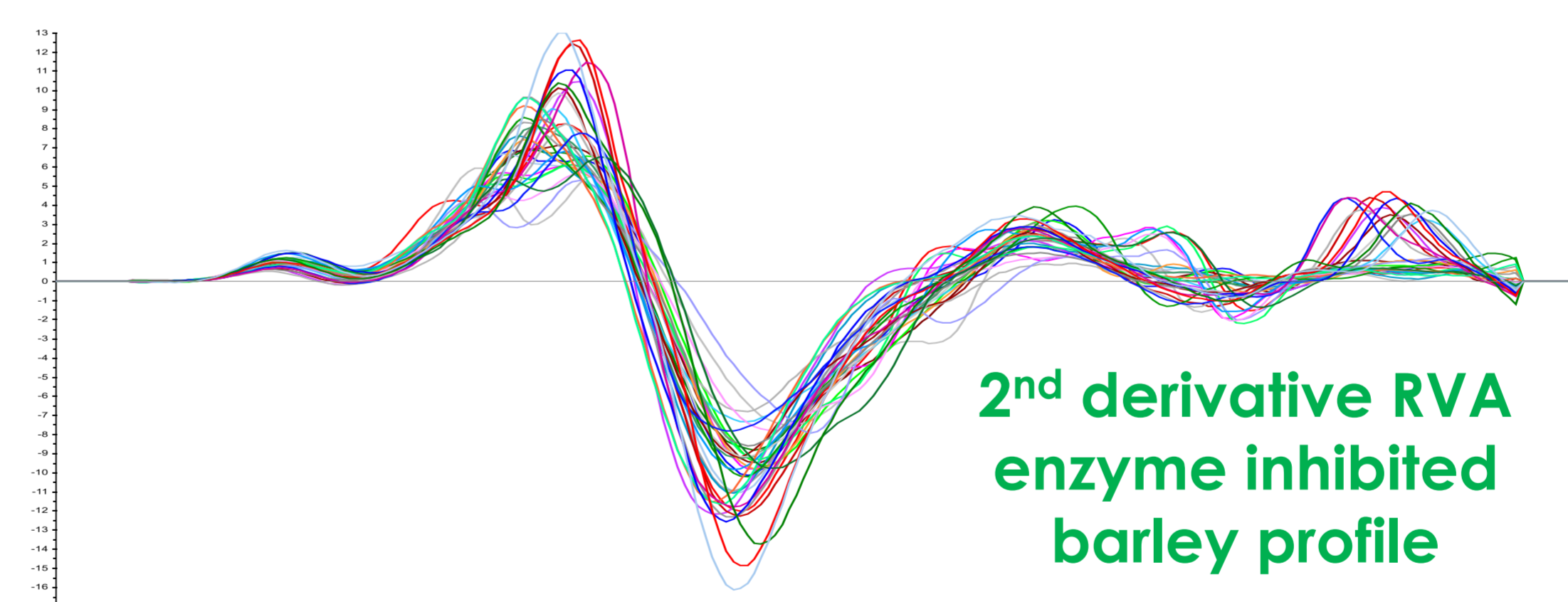
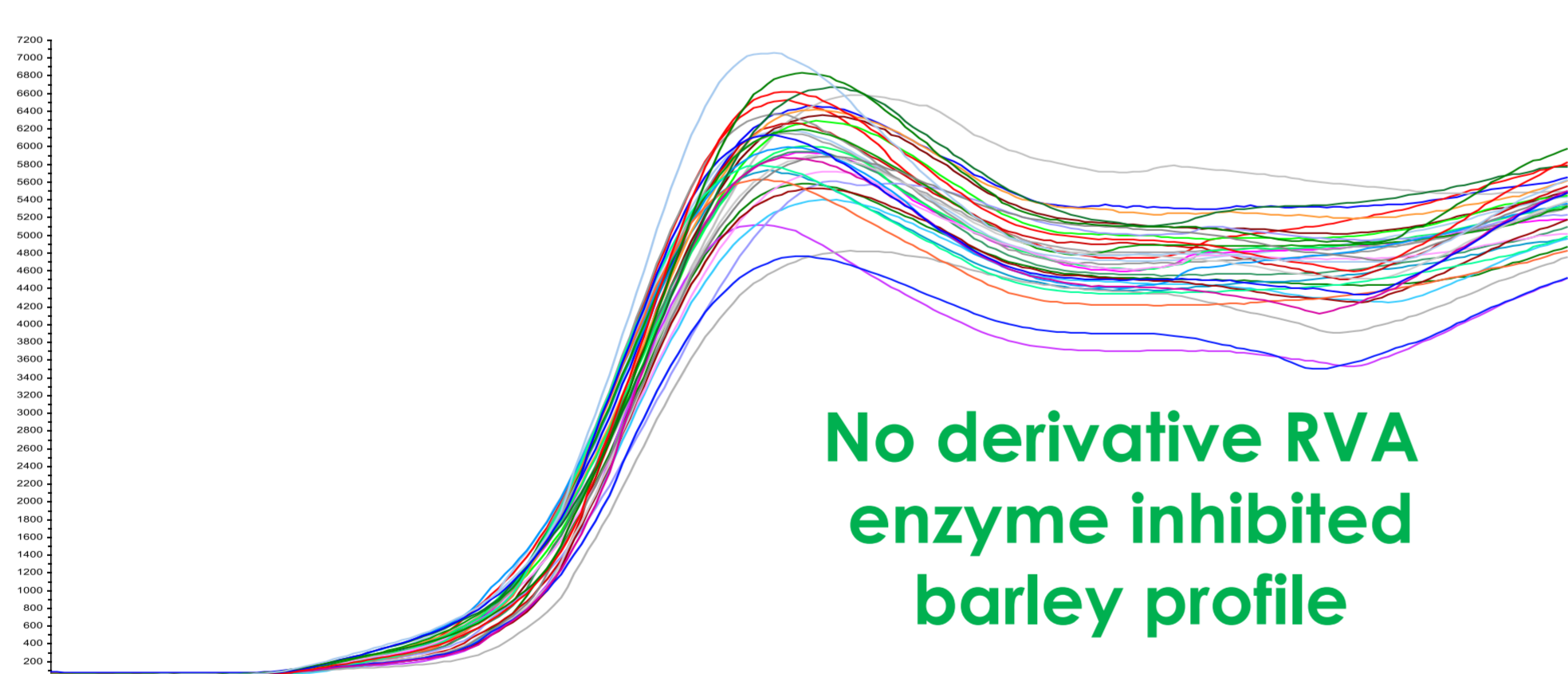


Variable	Mean	SDy	R ² of calibration	R ² of cross-validation	Prediction error of calibration	Prediction error of cross-validation
EBC friability	82.0	12.1	0.972	0.911	2.0	3.5
EBC mash extract yield	81.78	1.82	0.995	0.778	0.13	0.85
EBC mash viscosity	1.573	0.191	0.950	0.797	0.043	0.085
EBC mash α-amylase activity	201	49	0.818	0.479	21	35

→ Prediction with a high degree of performance

→ Robust except for α-amylase activity

Prediction of malt quality based on the barley enzyme inhibited RVA profile



Variable	Mean	SDy	R ² of calibration	R ² of cross-validation	Prediction error of calibration	Prediction error of cross-validation
EBC friability	82.0	12.3	0.957	0.526	2.5	8.3
EBC mash extract yield	81.77	1.85	0.977	0.589	0.28	1.17
EBC mash viscosity	1.576	0.193	0.960	0.560	0.040	0.126

→ Prediction with a high degree of performance without having to malt the barley

→ Needs more samples to be robust

Conclusion.

- The **RVA could be very helpful for maltsters, brewers and breeders to have rapid and reliable prediction of barley and/or malt quality**. This would also be useful for craft malting plants and breweries.
- The prediction **models** should be **enhanced** by building them with **more samples**.