

THE IMPORTANCE OF RHEOLOGICAL EXAMINATION IN THE DEVELOPMENT OF FOOD PRODUCTS

Josip Bebek^{1*}, Tanja Cvetković¹, Jasmina Ranilović¹, Hrvoje Trojak¹

¹Podravka d.d., Istraživanje i razvoj, Ante Starčevića 32, 48000 Koprivnica, Hrvatska

*Josip.Bebek@podravka.hr

Introduction

Consistency significantly affects the overall consumer acceptance of a food product. Although the characteristics of consistency (spreadability, mouthfeel, chewiness) are frequently evaluated subjectively by the consumer, measuring certain rheological parameters can contribute to the food development process, particularly in achieving a desirable consistency. Spreadability is one of the key characteristics of consistency in the development of fish pate. The goal of this study is to show the significance of the rheological examination of viscosity and yield point in the development of desirable fish pate spreadability.

Materials and methods

Four different laboratory fish pate samples were prepared for 2 types of rheological examination; measurement of viscosity and yield point. Both analyses were conducted on a rotational rheometer RheolabQC at temperatures of 25 °C and 7 °C. The following measuring systems were used; „CC27“ for viscosity measurement and „ST-22-4V-40“ for yield point measurement.

Viscosity is a rheological parameter that can be defined as a measure of the materials resistance to flow and deformation. It was measured using shear rates from 0.1 to 100 s⁻¹. Viscosity at the lowest shear rate, also called viscosity at rest is most important for evaluating consistency of fish pate in this research.

Yield point is a rheological parameter defined as the minimum amount of force required to initiate flow. It was measured using constant shear rate of 1 s⁻¹. When the force applied during measurement exceeds the yield point, the internal structure fails and the required force to turn the measuring system diminishes. The resulting peak on the graph shows the yield point.

Statistical analysis was conducted using a two-way ANOVA test in MS Excel. Statistical significance was considered at p<0.05.

Results

The results of viscosity and yield point measurement showed a statistically significant difference (p<0.05) in values between samples at both temperatures (Table 1,2). Higher viscosity and yield point values indicate a firmer consistency and harder spreadability. Sample 1 had the highest values of viscosity at rest and yield point at both temperatures (Table 1,2). This indicates that Sample 1 had the hardest spreadability and requires more force than other samples to initiate flow and spreading. At 7 °C viscosity (Fig 2) and yield point (Fig 4) values were higher than viscosity (Fig 1) and yield point (Fig 3) at 25 °C for each sample. These differences were also statistically significant (p<0.05). Additionally, these rheological measurements correlate proportionally at both temperatures.

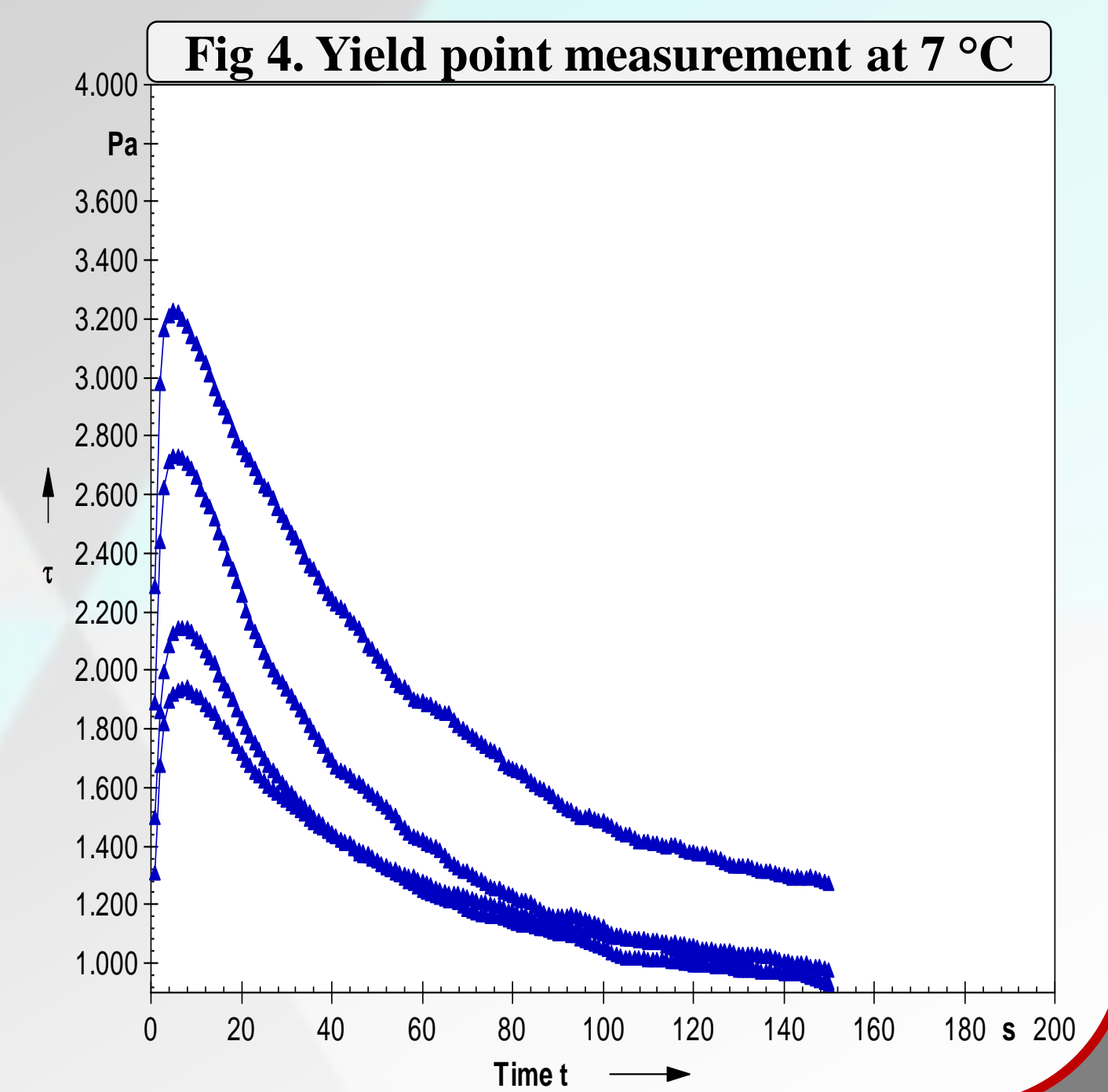
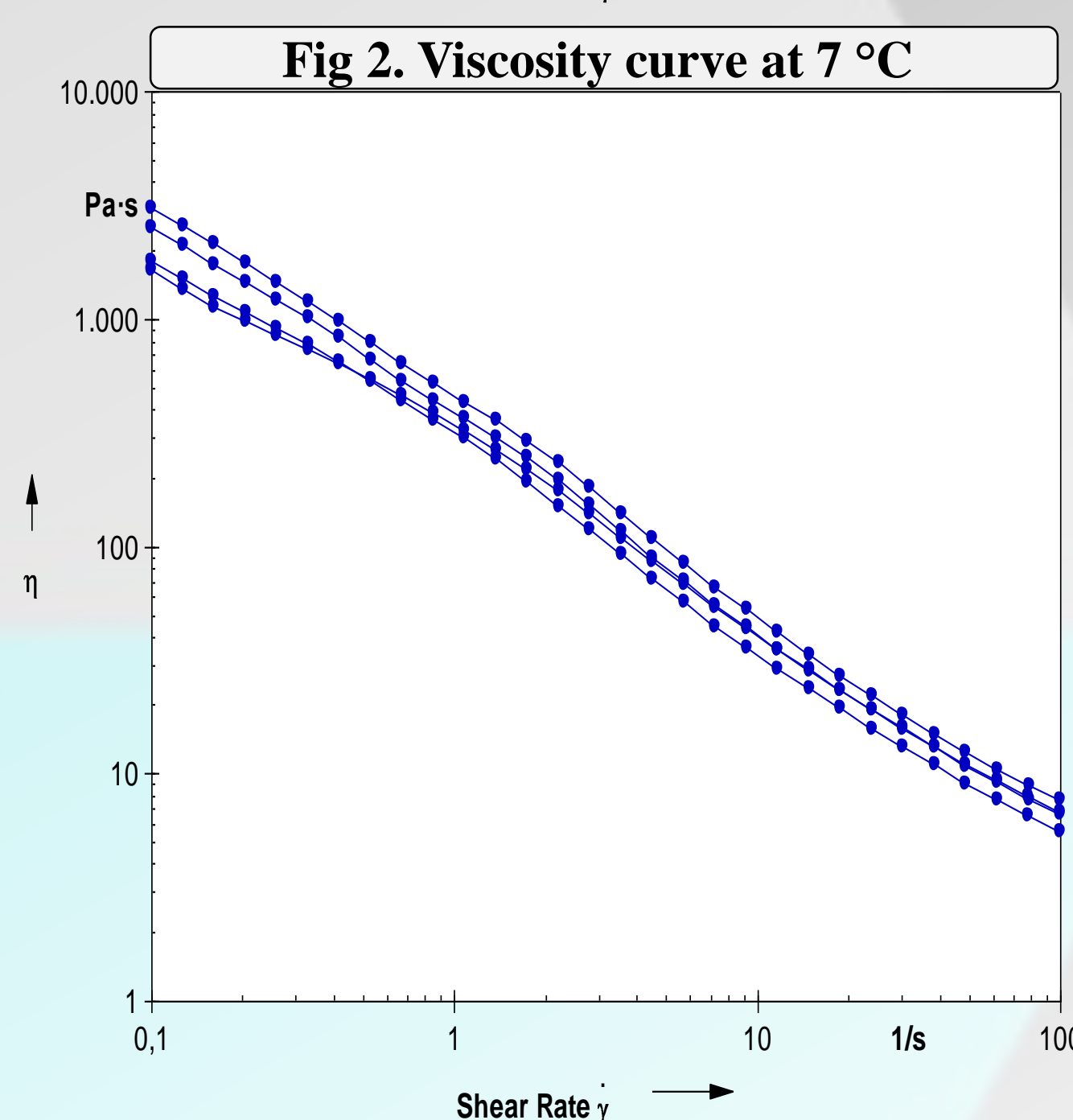
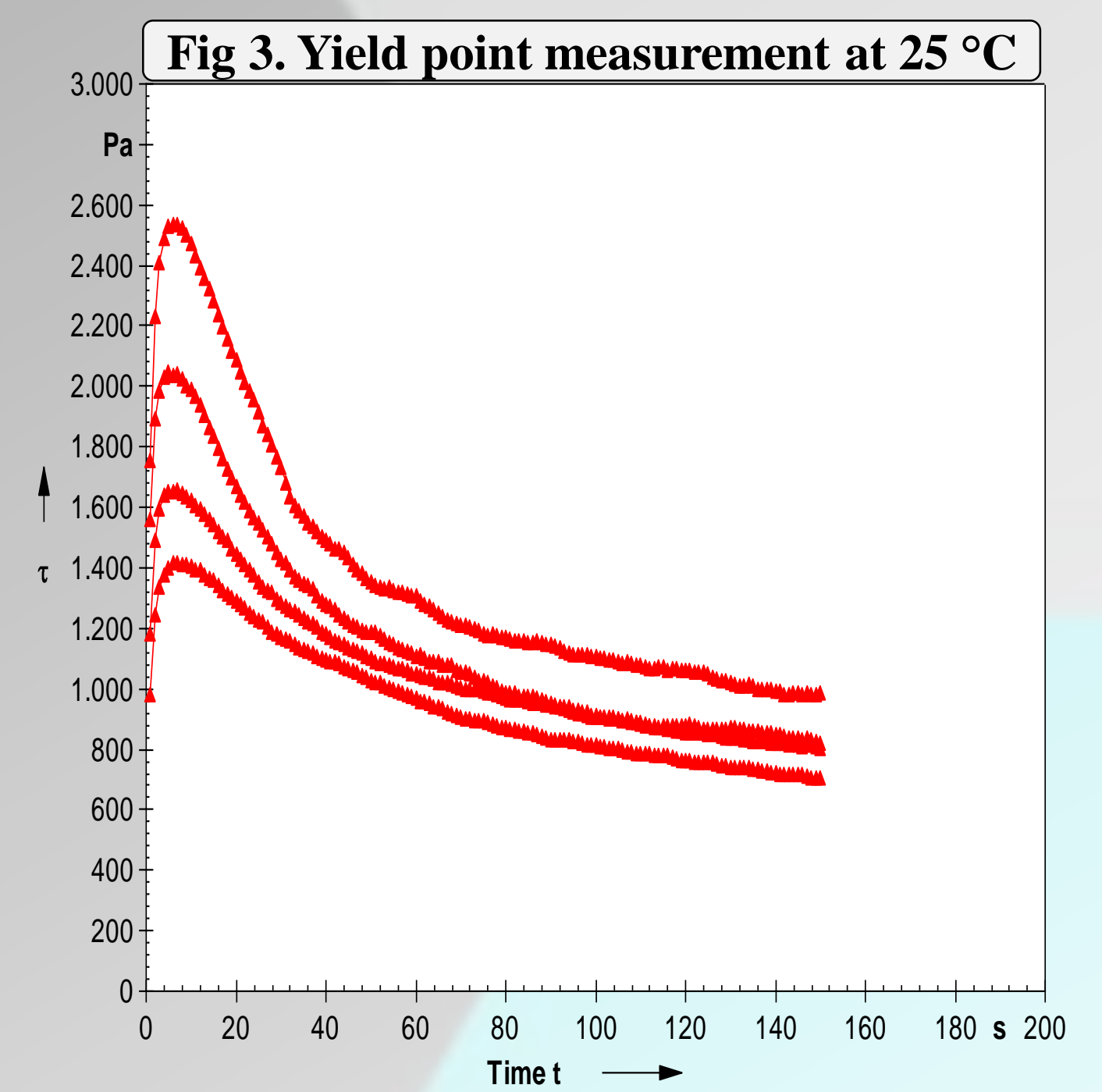
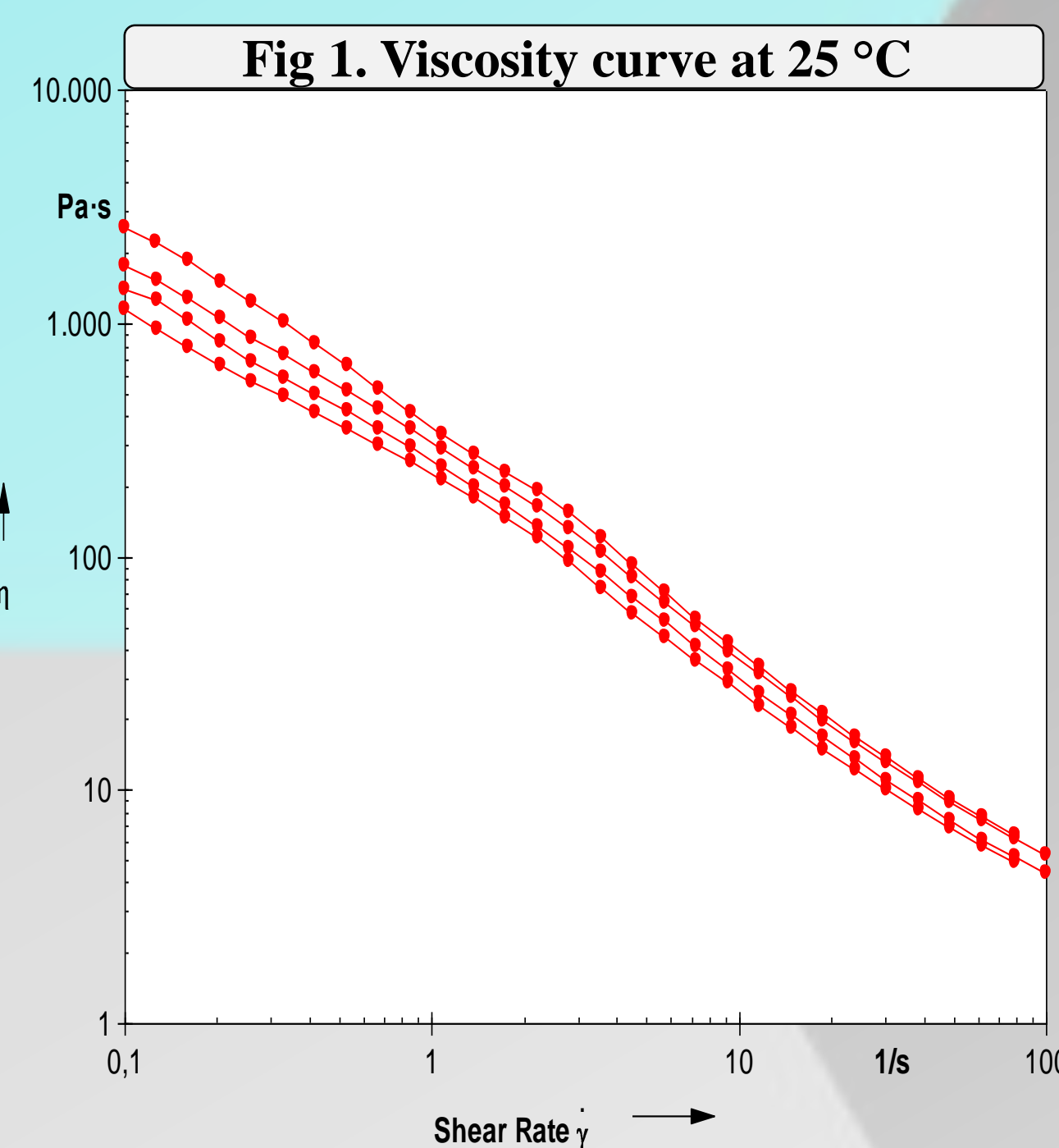


Table 1. Viscosity at rest at 25 and 7 °C

Sample no.	Viscosity at rest (Pa·s) (25 °C)	Viscosity at rest (Pa·s) (7 °C)
Sample 1	2570	3070
Sample 2	1770	2520
Sample 3	1410	1810
Sample 4	1160	1650

Table 2. Yield point measurement at 25 and 7 °C

Sample no.	Yield point (Pa) (25 °C)	Yield point (Pa) (7 °C)
Sample 1	2540	3230
Sample 2	2050	2730
Sample 3	1660	2150
Sample 4	1420	1940

References

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Conclusion

The rheological examination in this study has shown to be an important indicator for food product developers in adjusting the final food composition. Viscosity and yield point measurements can be used to precisely determine an individual ingredients effect on fish pate consistency. Depending on the desired storage conditions and overall sensorial quality of fish pate, the quantity and origin of ingredients can significantly influence the consistency of the final product.