Hydration effect on dough behaviour during mixing by assessing the power curve

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The breadmaking quality is highly governed by the properties of wheat flour because it is the main component in dough, and its hydration capacity is crucial to determine dough properties. Understanding this phenomenon would allow to predict dough rheological properties during its mixing at several hydration levels. This behaviour was characterised by following the mixing power curve P(t), modelled by a Gaussian law. The purpose of this work is to study the effect of the dough hydration level on the dough behaviour during mixing by assessing P(t). So, the mixing behaviour of wheat flour doughs prepared with different hydrations was compared.

Two commercial wheat flour, discriminated by their protein content and known to have distinct mixing behaviour were selected. Doughs were prepared in the laboratory spiral mixer (Diosna Gmbh) for 15 min, at five different hydration levels (from 50% to 66% by weight of flour, with a step of 4%). The power curve was fitted to determine the four coefficients of the Gaussian model: *Pmax – P0* (W), *P0* (W), *ST* (s) and *TPmax* (s).

For the two flours, *Pmax – P0* (W) and *ST* (s) linearly increased from 30 W to 80 W and from 10s to 35s respectively ($R^2 = 0.99$), and *P0* (W) linearly decreased from 300 W to 230 W ($R^2 = 0.96$) with the dough hydration level. These results were consistent with the physical observation. However, *TPmax* (s) follows a saturation model reached at 58% of hydration.

Since these two flours were selected for their extreme mixing behaviour, these results show that the models established can describe the dough mixing behaviour of any flours. Therefore, this model can be used to apply the necessary settings of hydration level to reach the expected dough behaviour in real processing.