Modeling the power curve of bread dough during mixing

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The food industry has multiplied the number of flour references used, which have different behaviors during kneading. The physical changes of the flour biopolymers that occur during this stage depend on the mechanical energy delivered to the dough by the kneader, developing the gluten network. Tracking the power curve P(t) provides an indicator of the kneading time to reach the optimum network structure, for processing and bread quality. However, the curves are difficult to handle because the usual method involves reading a dozen parameters at specific points, such as the maximum power of value. The objective is therefore to adjust the curve P(t) by a mathematical model to extract the characteristic parameters. The power curves obtained by mixing dough at 67% hydration on a spiral mixe,r for 36 wheat flours, are fitted by a Gaussian law (R^2mean=0.97). Four parameters are then extracted: the power at the end of frasing, the standard deviation of the curve SD, the time to reach the maximum power and the power of the dough during its texturation. They are correlated to those from the initial method but they better explain the variability of the kneading curves of the flours (Adjustment: 91.2%; Initial method: 82.7%). Furthermore, the extensibility capacities of the dough (L and G from the Chopin alveograph) are correlated with SD, which provides information on the tolerance of the flour to kneading. These results underline the importance of the contribution of dough extension during kneading. They open prospect to enlighten the rheological behavior and its relation with the hydration of the flour components.