

Desirability-based optimization of bakery products containing pea, hemp and insect flours using mixture design methodology

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Simplex lattice design was used to design 15 sponge cakes formulations combining pea (PP), hemp (HP) and insect (IP) flours representing 15% of dough composition. Moisture, protein content, baking loss, specific volume, texture and cost of the 15 samples plus the control (0% added protein) were analysed. Results showed that the effect of PP, HP and IP on cake properties could be modelled with linear regressions ($96.80\% < R^2 < 99.96\%$). Ternary diagrams showed the effect of the combination of the three proteins in each response. The desirability function was used to obtain a multi-response optimization of the samples with maximum protein, maximum specific volume and minimum incremental cost. Sensory results of the 5 optimised samples showed that by combining 3.75% pea, 3.75% hemp and 7.5% insect it was possible to obtain a dairy- and egg-free sponge cake without significant differences from the control with animal-derived proteins.