Understanding and optimization of rapid and small-scale germination process on the nutritional quality of lentil and cowpea

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Seed germination and seedling growth are traditional practices and an emerging trend in the food industry and consumer demand, as it is considered to be an effective process for improving the nutritional quality and functionality of cereals and pulses. Excepted for barley malting and for fresh seedlings production, germination process is rarely conducted at an industrial scale due to the difficulty to set optimum conditions for producing germinated seeds and seedlings. This project aims to implement a rapid (with lower health risk), small-scale germination process on lentil and cowpea seeds and to analyze the process and germinated products by a multidisciplinary approach. Using a multivariate experimental design, this study considered different germination conditions (temperature, light, and water content) and different germination duration (0h, 3h or 5h, 12h, and 24h) for lentil and cowpea. The germination process was created at small-scale with a temperature-humidity chamber integrating a misting system controlled by a software through the weighing of seeds. This process allows to control the water supply and thus the water content in the seed during the germination process. The nutritional changes for B9 and B1 vitamins, and the antinutritional modifications for ?-galactosides and phytate were quantitatively analyzed under the different germination conditions of the experimental design. In addition, immunohistochemistry techniques were used to localize the vitamins B9 and B1, and phytate in lentil during germination. The kinetic of increase in vitamin B9 and B1 and of decrease in antinutritional factors during germination, combined with the localization of these metabolites allows providing transformation path to produce new food products and ingredients rich in B vitamins and poor in antinutrient compounds. The low-tech germination process created can be implemented by any food industry worldwide, as it is simple and not expensive. This opens the opportunity for new ways of processing pulse and can encourage the development of plant-based food, that can be a meat substitute, produce gluten-free products and enhance the food nutrient content.