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MICROWAVE DRYING VERSUS HOT-AIR DRYING OF MIXED APPLE AND GINGER POMACE

BiFTec-FOOD4S

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INTRODUCTION & AIM

Apple and ginger pomace is a by-product that can be valorised by drying and further grinding it into flour to be used in cakes, for example, adding fibre and phenols, with antioxidant and antimicrobial properties, to their composition. Drying is one of the most energy- and time-consuming processes and must be optimised to be more sustainable.

METHODS

The pomace was subjected to drying (2.5 mm thickness) through two different methods: hot-air drying (HAD) at 45, 62, and 70 °C, and microwave drying (MWD) at 100, 180, and 300 W. Mathematical models were tested to fit the kinetics of the moisture ratio (MR); the drying time was predicted through the models and the specific energy consumption was calculated for each experiment.

RESULTS & DISCUSSION

Crank's model presented a good fit ($R^2 > 0.977$; $\chi^2 < 13.5E-03$ RMSE < 11.0E-02) of the HAD kinetics, with an apparent diffusivity coefficient between **2.28E-10 and 4.83E-10 m²/s** and an energy of activation of **23.9 kJ/mol**; meanwhile, Midili et al.'s model presented a good fit ($\chi^2 < 12.8E-05$; RMSE < 10.0E-03) of the MWD kinetics.

Figure 1. Experimental data and the fit of Henderson and Pabis' model for HAD experiments

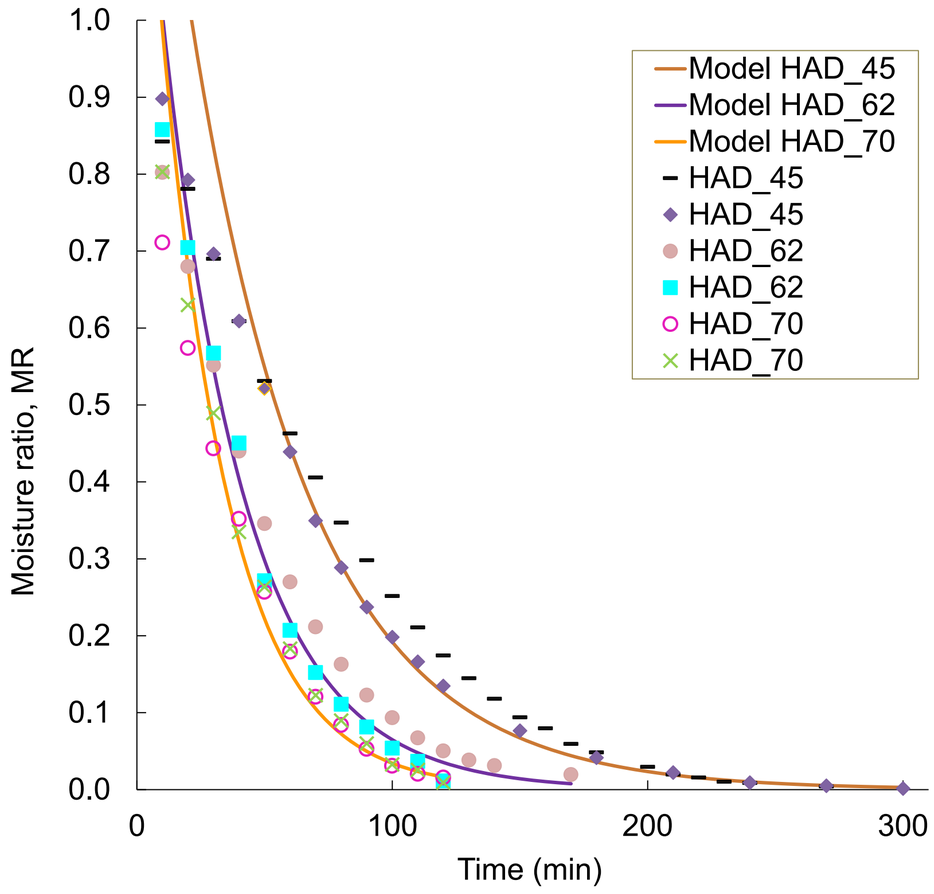

Figure 2. Experimental data and the fit of Midilli et al.'s model for MWD experiments

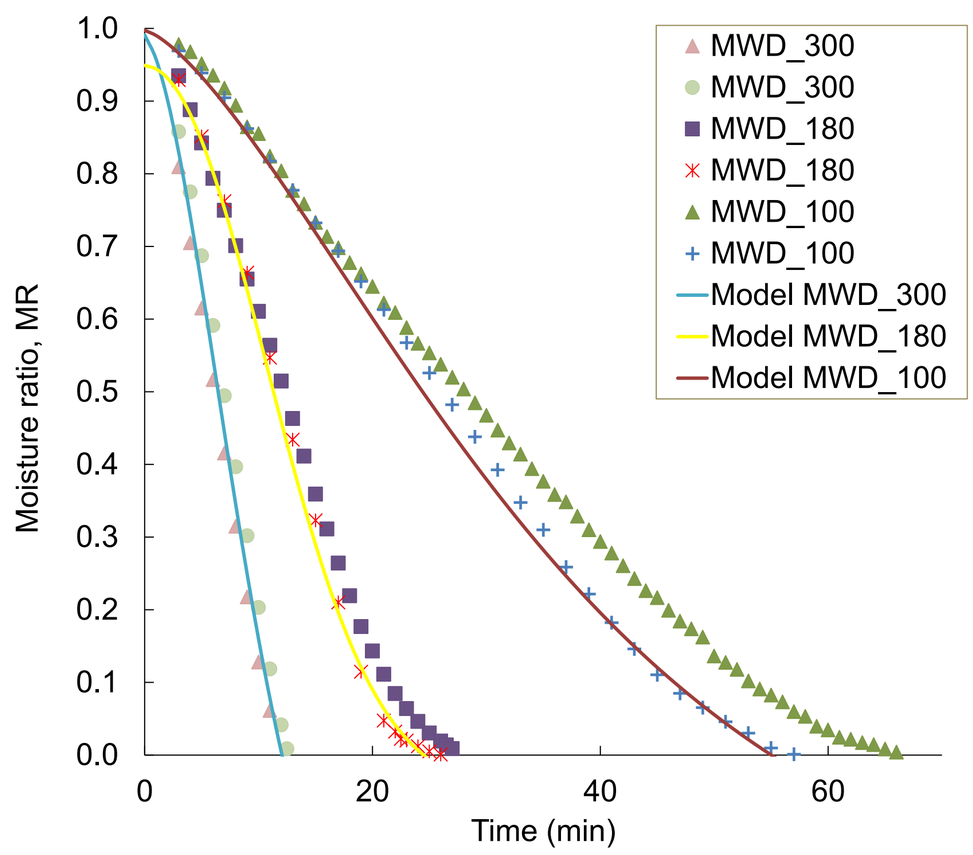

Table 1. Calculated drying time and specific energy consumption for HAD experiments.

Experiments	HAD_45	HAD_62	HAD_70
Drying time (min)	236.4±3.6	136.6±4.9	125.0±9.2
Specific energy (kWh/kg)	410.78±6.30	417.26±15.11	453.75±33.48

Table 2. Calculated drying time and specific energy consumption for MWD experiments.

Experiments	MWD_100	MWD_180	MWD_300
Drying time (min)	61.5±6.0	28.3±2.1	14.6±0.1
Specific energy (kWh/kg)	1.86±0.18	1.54±0.12	1.32±0.01

CONCLUSION

Due to its low energy consumption and short drying time, the MWD is more promising for drying apple and ginger pomace than HAD, reducing the environmental impact of the drying process.

FUTURE WORK

Quality parameters, such as total polyphenols content and antioxidant activity should be assessed to observe the impact on quality. Other drying technologies, including hybrid ones, could be studied for comparison. Cost needs to be determined to understand MWD viability.

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