Foods 2025 Conference
The 6th International Electronic Conference on Foods
28–30 October 2025 | Online
MDPI

Optimization of tray and microwave drying conditions of sustainable extruded lentil analogue

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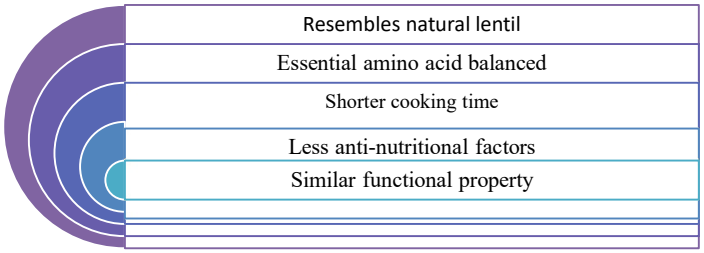
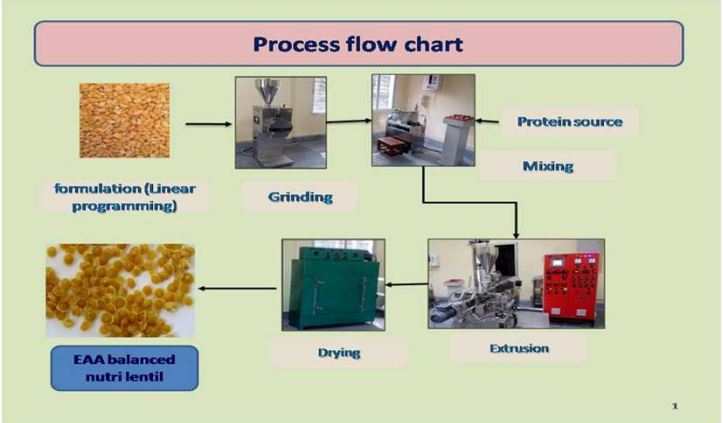
INTRODUCTION & AIM

The challenges of the expanding global population have necessitated the exploration of plant-based protein sources to minimize animal product consumption. Protein quality in a single lentil does not reach the same level as animal products due to unbalanced essential amino acid (EAA) composition. To address this problem, an EAA balanced lentil is developed which is formulation was made using legume lentil flours along with a protein isolate, and optimum moisture was added. The mixture was then extruded in an optimized condition and further dried to produce extruded lentil analogues (ELAs). The present investigation studies the optimise the microwave drying (MWD) and tray drying (TD) of ELAs.



METHOD

Four combinations containing chickpeas/lentils/mung beans/protein isolate at different ratios were formulated using MATLAB's linear programming. The mixture was extruded using a twin screw extruder at die temperature (100 to 115 °C) with a screw speed of 100-200 rpm at a constant feed rate of 12 rpm and a feed moisture of 22%. Two different drying techniques viz., hot air drying (HAD) and microwave drying (MWD) were applied with variation in processing conditions except for FAD and FD. The drying kinetics using thin-layer models were done



RESULTS & DISCUSSION

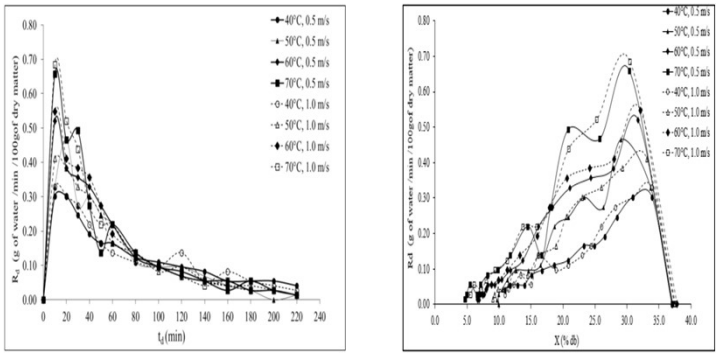


Figure.1. rate of drying (Rd) for Nutri dal under the different drying conditions was calculated and plotted against drying time (td) and moisture content (X) %db

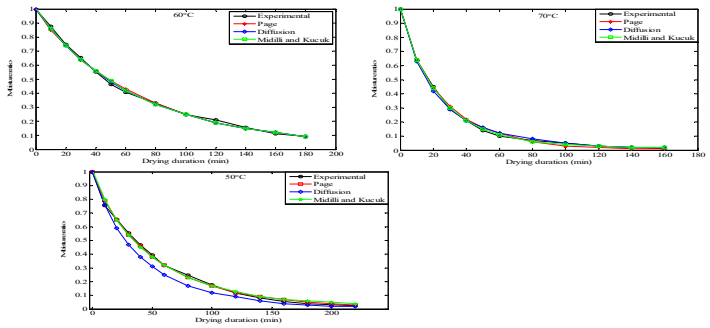


Figure. 2. Comparison of experimental and predicted moisture ratios using the three different drying models under the conditions of air velocity 1.0 m/s

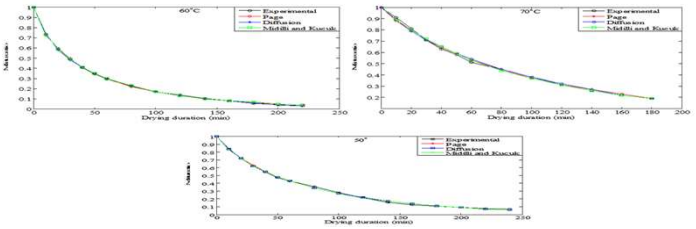


Figure. 2. Comparison of experimental and predicted moisture ratios using the three different drying models under the conditions of air velocity 0.5 m/s

CONCLUSION

Microwave drying emerged as the most efficient drying technique, yielding reduced drying duration, negligible color alteration, and enhanced rehydration properties

FUTURE WORK / REFERENCES

1. Adedeji AA, Joseph MV, Plattner B, Alavi S. Physicochemical and functional properties of extruded sorghum-based bean analog. Journal of Food Process Engineering. 2017 Apr;40(2):e12401. 2.Ghumman A, Kaur A, Singh N, Singh B. Effect of feed moisture and extrusion temperature on protein digestibility and extrusion behaviour of lentil and horsegram. LWT. 2016 Jul 1;70:349-57. 3.Natabirwa H, Muyonga JH, Nakimbugwe D, Lungaho M. Physico-chemical properties and extrusion behaviour of selected common bean varieties. Journal of the Science of Food and Agriculture. 2018 Mar;98(4):1492-501.