

## RESEARCH ARTICLE

# Mathematical modeling of moisture loss, oil uptake and colour kinetics during deep fat frying of onion slices

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### ABSTRACT

Effects of frying temperature, frying time and pre-fry-drying time on kinetics of moisture loss and oil uptake during frying were studied. Colour development during frying were also measured in terms of Hunter L, a, b parameters. Onion slices of 3 mm thickness were used for frying at 135, 150 and 165°C. The experimental data on moisture loss and oil uptake were fitted to a first order exponential model and kinetic co-efficients for mass transfer were calculated. Kinetic co-efficients were found to increase from 0.595 - 0.803 min<sup>-1</sup> for moisture loss and from 0.38 - 0.563 min<sup>-1</sup> for oil uptake with increase in frying temperature. Temperature dependence of kinetic co-efficients for moisture loss and oil uptake values were described by Arrhenious type equation with activation energies of 1.88 x 10<sup>3</sup> KJ/kg mol for moisture loss and 2.3 x 10<sup>3</sup> KJ/kg mol for oil uptake, respectively. As the pre-fry-drying time increased from 0 to 60 min, kinetic co-efficients were found to decrease from 0.71 to 0.617 min<sup>-1</sup> for moisture loss and 0.442 to 0.326 min<sup>-1</sup> for oil uptake. 60 minutes pre-drying reduced the oil content by 22.88 per cent. The mathematical modeling of colour parameters with respect to time and of frying and pre-fry drying time shown best fit with polynomial equation of third order. Two distinct periods (colour development and degradation) of colour changes observed as indicated by Hunter a and b values. During colour development period Hunter a and b values increased with temperature indicating golden surface colour.

**KEY WORDS** : Colour kinetics, Deep fat frying, Mass transfer, Modelling, Onion slices

**How to cite this Article** : Ramesh Babu, D. (2017). Mathematical modeling of moisture loss, oil uptake and colour kinetics during deep fat frying of onion slices. *Engg. & Tech. in India*, 8 (1&2) : 39-48; DOI : 10.15740/HAS/ETI/8.1&2/39-48.