# ABSTRACT

Onion (*Allium Cepa*), one of the main crops under Allium family, has potential use in the world food preparations specially in the tropical countries. Besides imparting a characteristic taste and flavour to food it also has a significant medicinal value. The gradually increasing production status of onion itself speaks of its high demand. However, the lack of proper post harvest processing of this crop leads to the losses amounting to 20-50%. Onion is normally dehydrated by solar drying or hot air drying methods which are not as effective in retaining the qualitative traits. To offer an effective process technology for production of good quality dehydrated onion slices, vacuum drying process was studied. Onion slices were dried in a single layer of thickness varying from 1 to 5 mm in the temperature range of 50 to 70 °C in a laboratory scale contact vacuum dryer under 50 mm Hg absolute pressure level. The effect of pretreatment, drying temperature and slice thickness on the drying kinetics of onion slice was analysed. Numerical modelling of the temperature profile and moisture concentration inside a single slice during vacuum drying was done using finite element based CFD software COMSOL Multiphysics 3.3. Both temperature and moisture profile were obtained for a representative sample of 3 mm thick onion slice dried at 60 °C under 50 mm Hg vacuum and validated with experimental data. Quality analyses of the dried onion slices were carried out on the basis of final moisture content, colour development in terms of non enzymatic browning, flavour retention in terms of thiosulfinate content and rehydration ratio. The optimum process condition emerged from the study was 58.66 °C drying temperature and 4.95 mm thickness of slice with treated sample sets. Sensory analysis was performed using fuzzy sensory analysis for vacuum dehydrated onion slices and the market available fresh onion. Characterization of the vacuum dried product was also done based on microstructural and texture studies followed by true density and thermal conductivity determination. Finally, the storage study of vacuum dried onion was done based on quality degradation kinetics and suitable shelf life was determined.

**Keywords:** vacuum drying, onion, numerical modelling, optical index, thiosulfinate concentration, rehydration ratio, optimization, sensory analysis, storage study.