**Title** Post-harvest preservation and modelling of drying on an inert sphere for sea buckthorn berries (*Hippophae rhamnoides* L. ssp. sinensis)

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**Abstract**

The production of uniform, safe, and effective plant-based functional foods and nutraceuticals is dependent on the optimization or preservation of biologically active (bioactive) compounds throughout the value-added cycle. The scope of this research was to address the quality preservation of sea buckthorn berries ( *Hippophae rhamnoides* L. ssp. *sinensis* ) in the development of sea buckthorn oils. This was achieved in three phases: (I) evaluation of the influence of time of harvest on physical characteristics (moisture content, size, and colour) and bioactive quality (carotenoids, fatty acids, tocols, and sterols) on whole berries; (II) evaluation of the influence of forced air drying conditions (50°C at 30.6 and 58.7% RH; 60°C at 24.4 and 57% RH, and 70°C at 20.8 and 57% RH) on colour and bioactive quality of the pulp and peel fraction, and (III) development, solution, and validation of a semi-empirical temperature prediction model (based on simple heat and mass transfer theory) for the simulation of thin layer drying on an inert sphere.

Within phase I, berries collected at maturity yielded highest values for berry size, CIELab factor *a*,* and total carotenoid content in the fruit fraction. Early maturity berries yielded higher levels of α-tocopherol and β-sitosterol in the fruit fraction. Post-maturity resulted in the lowest quality fruit fraction oil. Seed characteristics and bioactive compounds did not vary significantly with respect to harvest time. In phase II, total carotenoid and phytosterol concentrations remained relatively stable over the range of drying conditions. Fatty acid composition exhibited only minimal changes to palmitoleic acid at 70°C. The lowest colour degradation, occurred at drying conditions of 60°C at 24.4% RH, whereas highest concentrations of major tocols occurred at 50°C. Significant darkening occurred at the higher relative humidity level for each temperature. Although the darkening did not represent a loss in carotenoids, it did coincide with a retention or regeneration of tocols. Within phase III, predicted temperatures were within ~10% of experimental, with a higher accuracy at lower temperatures (i.e. 55 and 65°C) and later stages of drying. Overall, the model showed potential for the prediction of temperature for a material dried in a thin layer on an inert sphere.