ABSTRACT

Global diabetes epidemic balloons to > 350 million thus it is worthwhile to explore the possibility of developing extruded ready-to-eat snack with judicious formulation of millet-legume for its antidiabetic potential. Twin screw extrusion of kodo millet (KM), defatted soy (DS) and debittered fenugreek (DF) composite flour at constant process conditions was carried out to formulate the ingredients (D-Optimal mixture design) based on physical attributes. Optimum formulation was subjected to extrusion process parameter optimization (central composite rotatable design) to arrive at optimum quality (physical) extrudates which was further investigated for nutritional, functional and sensory quality; and also *in-vitro* starch hydrolysis rate, *in-vivo* (normal human) glycaemic index (GI), glycaemic load (GL), hypoglycaemic effect on diabetic rat model, finally sorption characteristics and evaluation of shelf life.

KM (80–100%), DS and DF (0 – 20%) at fixed moisture content (20% db) and process parameters yielded quality extrudates at optimum formulation of 82:8:10 (KM:DS:DF). Extrusion process parameters viz., barrel temperature ($80 - 150^{\circ}$ C), screw speed (100 - 300rpm) and feed moisture (14 - 18% db) yielded extrudates with product moisture 6.71%, expansion ratio 10.1, bulk density 0.11 g/cm³, hardness 9.87 N, porosity 0.92, crispiness 21 fractures and color (ΔE) 11.12 at optimum conditions of 94.2 °C, screw speed 259 rpm and feed moisture content 14.8%. There was 22.5%, 46.7%, 16% reduction and 40% increase in 4hydroxyisoleusine, phytic acid, amylose content and soluble dietary fiber content, respectively, in snack after extrusion. Sensory panel rated the spice coated snack as liked slightly to like moderately according to 9-point hedonic scale. Starch in snack hydrolyzed at a reduced rate (50%) compared to that of reference food (80%) at the end of 3 h. Snack belonged to low to medium GI (55.58 \pm 2.01) and medium GL (13.89 \pm 0.50) food category. Snack diet had restorative effect on the body weight of diabetic rats (3.27%) and reduced the blood glucose level (17.26%). Critical water activity of 0.42 and critical moisture content 0.07 kg kg⁻¹ dm was attained on 20th and 34th day by the packaging materials HDPE and MP, respectively, in accelerated storage condition (40 °C temperature and 90% RH).

Key words: kodo millet, defatted soy, debittered fenugreek, extruded RTE antidiabetic snack, 4hydroxyisoleusine, *in-vitro* starch hydrolysis, *in-vivo* glycaemic index, glycaemic load, mixture design, hypoglycaemic rat model study