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Physicochemical, techno-functional and hypoglycemic properties of selected wheat flour substitutes

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Wheat flour is one of the major refined carbohydrate sources consumed by Sri Lankans. However, long term consumption of such refined starch sources is linked with a high prevalence of various non-communicable diseases, such as obesity, heart disease, and type 2 diabetes. Therefore, the consumers are now concerned about the potential of using wheat flour substitutes for healthy food recipes. The present study was conducted to find the possibility of utilizing *Musa paradisiaca* (Ash plantain), *Cycas cricinalis* (Cycas) and *Caryota urens* (Kithul) flour types as wheat flour alternatives. The Cycas flour was prepared from the fruits of *C. cricinalis* and the fruits were sun dried for 3-4 days to remove toxicity before milling. The Kithul flour was extracted from the stem of *C. urens*. The Ash plantain flour was prepared using well ripened fingers of *M. paradisiaca*, followed by blanching, drying and milling. The proximate composition, techno-functional and hypoglycemic properties of prepared flour substitutes were determined and compared with wheat flour. The proximate compositions were determined using AOAC approved protocols on a dry matter basis. The pH, water activity, Water Absorption Capacity (WAC), Oil Absorption Capacity (OAC), and swelling properties were determined using appropriate physical and chemical methods. *In vitro* starch-hydrolyzation method was used to evaluate the Hydrolysis Index (HI), predicted Glycemic Index (GI), and Glycemic Load (GL). Among the flour types considered, the lowest crude fat content was observed in *C. urens* (1.96 ± 0.23%) while the lowest total carbohydrate content was observed in *C. cricinalis* (33.15±0.75%). All flour substitutes showed significantly (at $P<0.05$) less carbohydrate contents compared with that of wheat flour. Further, *M. paradisiaca, C. cricinalis, C. urens* showed significantly ($p<0.05$) high fiber contents compared to wheat flour. The WAC and OAC of the three flour substitutes were significantly higher than the wheat flour (at $p<0.05$). The highest WAC and OAC were observed in *C. urens* and *C. cricinalis*, respectively. Although wheat flour reported the highest swelling capacity, it was not significant (at $p<0.05$) compared to that of other flour types. The lowest predicted HI and GI was observed in *M. paradisiaca*. However, the HI and GI values (143.93±0.88, 118.73±0.48) of *C. urens* were higher than that of wheat flour (100±4.55, 94.61±2.5), respectively. The GL values of alternative flour types were significantly (at $p<0.05$) lower than wheat flour (63.48±1.68) and the value of *C. cricinalis* (26.68±0.63) obtained the least. Accordingly, *C. cricinalis* and *M. paradisiaca* have great potential to be used as a substitute for wheat flour. However, further investigations are to be done to find the best proportions of flour composites to formulate different food items.

Keywords: Glycemic index, Glycemic load, Hypoglycemia, Type 2 diabetes, Wheat flour substitutes

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