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**Starch Digestibility of Porridges from Unrefined and Refined Maize,
Pearl Millet and Sorghum**

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**Starch Digestibility of Porridges from Unrefined and Refined
Maize, Pearl Millet and Sorghum**

By

Salvatory Theobald Kundi

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I declare that the dissertation herewith submitted for the degree MSc Food Science at the University of Pretoria, has not previously been submitted by me for a degree at any other university or institution of higher education.

ABSTRACT

STARCH DIGESTIBILITY OF PORRIDGES FROM UNREFINED AND REFINED MAIZE, PEARL MILLET AND SORGHUM

by

Salvatory Theobald Kundi

Leader: Prof J.R.N. Taylor
Co-leader: Mrs B. van der Merwe
Department: Food Science
Degree: MSc Food Science

The incidence of diabetes mellitus in Tanzania, as in many developing countries, appears to be increasing among people living in urban areas, as compared to rural areas. The major carbohydrate staple of most of the people living in the rural areas of Tanzania is stiff porridge prepared from unrefined maize, sorghum or pearl millet, while in urban areas it is stiff porridge prepared from refined maize. This change from unrefined to refined porridge and from sorghum and pearl millet to maize could have contributed to the apparent increasing incidence of diabetes among urban people.

An *in vitro* assay involving pre-chewing of the porridge, followed by digestion with pepsin and α -amylase in dialysis tubing was used to determine the rate of starch digestibility. The rates of starch digestibility of porridges prepared from unrefined and refined maize, sorghum and pearl millet using white wheat bread as a standard were determined. Hydrolysis Indices (HIs) were calculated and used to predict the Glycaemic Indices (GIs). The effects of species, variety and refinement on the rates of *in vitro* starch digestibility of the porridges from the three cereals were determined.

All the porridges prepared from the three cereals, except that from refined sorghum variety NK 283, had a lower rate and extent ($p < 0.05$) of *in vitro* starch digestibility than that of bread.

Cereal species did not affect the rates of *in vitro* starch digestibility of the stiff porridges. The probable reasons are that all three cereals are C4 crops and the proximate compositions, endosperm structures, gelatinisation temperatures and the shape of their starch granules are similar.

Apparently, due to the higher proportion of amylopectin in the starch, porridge from refined sorghum NK 283 was more digestible than the porridges from other varieties. However, the stiff porridge made from the unrefined flour did not show this effect.

Refinement of cereal grain flours did not in general improve the rates of *in vitro* starch digestibility of the stiff porridges prepared from non-tannin low polyphenol grains. However, it did increase the rate of digestibility of sorghum variety NK 283 and pearl millet variety SDMV 91018, both of which contained relatively high levels of non-tannin polyphenols in the grain and much lower levels in the refined flour. It is possible that high levels of non-tannin polyphenols inhibit starch digestibility.

Since porridges from maize, sorghum and pearl millet in unrefined or refined forms did not in general differ significantly in-terms of GI, the three cereals in unrefined or refined forms can probably be used without discrimination by diabetic people. None of the three cereals can be claimed as more suitable than the others in diabetes management. However, if there are varieties known to have a high amylopectin/amylose ratio in their starches, like sorghum variety NK 283, they should be avoided as a diet for diabetic people, because this type of starch is associated with higher rate of starch digestibility and hence higher GI which is unsuitable for diabetics. On the other hand, varieties known to contain high levels of non-tannin polyphenols may be useful for diabetics in the unrefined form, as these grains have shown both lower starch digestibilities and GIs.

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For their great vision in education and their relentless efforts in educating their children.
It is through this vision and efforts that has made me what I am today.

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**The fear of the Lord is the beginning of wisdom.
(Psalm 111 : 10a)**

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