

VARIETAL DIFFERENCE AND THE EFFECTS OF DOMESTIC
PROCESSING AND STORAGE ON NUTRIENTS AND
ANTI-NUTRIENTS IN YAMS (DIOSCOREA)

By

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Thesis

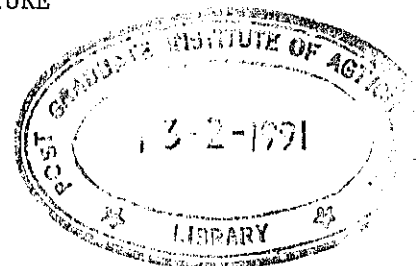
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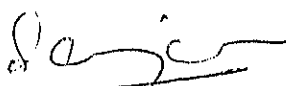
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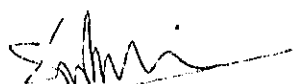
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ABSTRACT

Six cultivars of Dioscorea alata and one cultivar of Dioscorea esculenta were investigated for their nutritional composition and some antinutrients. The effect of varietal difference, domestic cooking methods (boiling, steaming and baking) and storage time of these tubers on nutritional components, phytic acid and oxalates were also evaluated.

Significant differences were observed between varieties with regard to moisture, starch, crude protein, crude fibre, vitamin C, minerals, phytic acid, oxalate contents and polyphenol oxidase activity. The moisture content of the seven cultivars ranged between 65-75% of the fresh weight. The ranges for various nutrients of the dry flour were as follows; starch, 75.6 - 84.3%; total sugar content, 0.9 - 1.5%; crude protein, 6.7 - 7.9%; crude fat, 0.9 - 1.2% and crude fibre, 1.2 - 1.8% of the dry weight. Vitamin C content ranged from 13.0 - 24.7 mg/100g of the fresh weight except for "Raja ala" (D. alata). The calculated total energy content was 80 - 120 kcal/100g edible portion. Potassium was the most abundant mineral (1157 - 2016 mg/100 g dry matter) followed by phosphorus (116.8 - 194.0 mg/100g), sodium (52.0 - 78.7 mg/100g), magnesium (64.0 - 74.6 mg/100g), calcium (62.5 - 72.8 mg/100g), iron (9.9 - 10.8 mg/100g), copper (6.3 - 6.9 mg/100g), zinc (3.4 - 4.3 mg/100g) and manganese (3.1 - 4.3 mg/100g). Of the cultivars studied, "Hingurala" (D. esculenta) had the highest energy and starch contents, the lowest phosphorus and iron contents.

The phytic acid content ranged between 58.6 - 198.1 mg/100g dry weight. The range for water soluble oxalates and total oxalates were 79.6 - 141.1 mg/100g and 129.7 - 184.6 mg/100g fresh weight, respectively.

The total polyphenol oxidase activity of the cultivars were 12.5×10^3 - 99.9×10^3 enzyme units / 100g fresh weight. The highest enzyme activity was observed in "Kombuwalli" (D. alata) and the lowest in "Rata ala" (D. alata).

The moisture content increased by 5.8 - 7.9% during boiling for all the cultivars. Steaming the yams reduced the moisture content by 0.5- 3.8 %, except in "Ini ala" (D. alata). Baking also reduced it by 1.8 - 6.5 % for all the cultivars. The starch content was reduced by 0.8 - 1.5 % during boiling, 0.02 - 1.03% during steaming and 1.1 - 3.3% during baking. Total sugar content was increased and, crude protein and crude fat contents were decreased by all three cooking methods. Processing reduced the vitamin C content by 42 - 57 %. The loss of potassium was higher than other minerals during boiling. The loss of calcium was comparatively low and the loss of copper, iron, manganese and zinc were lower than those of other minerals.

Less than 20% of the phytic acid was lost during cooking. The loss of water soluble oxalates was greater during boiling (11-38%) than steaming (5-28%) or baking (2-27%). The loss of total oxalates showed a similar pattern.

The moisture content was decreased linearly with the storage time (60 days, 0.6-3.9%; 90 days, 1.0-4.5%; 120 days, 1.7-10% and 150 days, 5-16%). Starch, crude protein and ash showed a decreasing trend upto 150 days. The total sugar content increased by 0.01 - 0.3% during this period. Almost 50% of the vitamin C content was lost during storage in most cultivars. All yam cultivars except "Raja ala" and "Hingurala", sprouted after 60 days. The loss of vitamin C, potassium, phosphorus, calcium, magnesium and sodium during storage was parallel to the degree of sprouting. The change of phytic acid content was negligible. The total oxalate content during storage increased but showed no statistical significance.

