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**Food value and some
antinutritional components of
Canavalia gladiata (Sinha - awara)**

by

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ABSTRACT

The bean of the leguminous plant *Canavalia gladiata* (Sinhala- *awara*) is consumed as a vegetable when the pod is tender. The mature seed is also utilised in a variety of ways but not very frequently. However, in spite of desirable agronomical features the seeds are not extensively utilised as a food. This study focussed on the determination of food value and the anti-nutritional factors of mature seeds with an aim at increasing utilisation.

The study included the investigation of chemical composition and nutritional value of raw whole material and cotyledon fraction of *Canavalia gladiata* seeds. The determination of the chemical composition included moisture, ash, crude protein and crude fat by the AOAC methods. All values are given on dry weight basis. Flour of the whole mature seed and cotyledon contained, crude protein 26.79 and 29.18%; fat 2.76 and 3.11% and ash 3.95 and 4.32 respectively.

The soluble and insoluble dietary fibre determined by the method of Asp *et al.* of whole seed and cotyledon was 33.16 and 10.23% while carbohydrate content determined by difference was 33.34 and 53.16% respectively. In the whole seed and cotyledon flour, the energy content was 1,108.3 and 1,492.3 kJ/100g (263.9 and 355.3 kcal/100g) respectively; starch content (by enzymatic colourimetric method) was 30.73 and 39.6% respectively and low molecular weight carbohydrate content (determined

by TLC and high performance anion exchange chromatography) was 27.7 and 34.6 mgg^{-1} respectively. Sucrose represents the highest fraction of low molecular weight carbohydrates with fructose being the lowest in both types of flour.

The mineral content, using an analyser with induction coupled plasma emission spectroscopy and amino acids following protein hydrolysis were also determined. Mineral analysis showed K, Mg, Ca, P and S to be present in high quantities. The essential amino acid profile compared well with FAO/WHO recommended pattern except for low sulphur containing amino acids, cysteine and methionine.

The nutritional quality of protein was evaluated by biological assay using a rat model and also by *in vitro* digestibility also by the method developed by Satterlee *et al.* for comparison. Evaluation of the biological value (BV), net protein utilisation (NPU) and true digestibility (TD) of raw and processed samples of cotyledon and whole seed flour was carried out with Sprague-Dawley rats. The weight gain during the biological assay of the raw whole seed and cotyledon fed groups were significantly lower ($p < 0.05$) than the reference group. The weight gain was higher with autoclaved and roasted cotyledon than raw seed diets. The NPU of both raw and processed seed diets were significantly lower ($p < 0.05$) than the reference group.

Similarly, BV of processed samples were significantly lower ($p < 0.05$) than that of raw cotyledon. In contrast, TD increased with processing. However, the *in vitro*

protein digestibility for the whole seed sample and cotyledon was 71.73% and 70.08% respectively. *In vitro* starch digestibility of raw (whole seed and cotyledon) roasted and autoclaved cotyledon flour was carried out by the method of Holm *et al.* The autoclaved sample had the highest digestibility.

A trypsin inhibitor and an α -amylase inhibitor were present in the seed coat and phytate content was higher in the cotyledon fraction. The approximate molecular weight of the trypsin inhibitor was found to be 90 kD.

Testing of the effect on pregnancy by consumption of a *Canavalia gladiata* whole seed flour diet (20% substitution of protein in the normal diet) was carried out using a mouse model. The effect on pregnant mice fed a raw *Canavalia* whole seed flour diet showed a significant lowering ($p = 0.016$) of the gestation period.

Scanning electron micrographs of raw seed showed that the starch granules are covered with a protein capsule. The gel permeation chromatogram of cotyledon flour starch using Sepharose CL-2B indicated the presence of both high molecular weight and low molecular weight carbohydrates.

The study indicates that the cotyledon seed flour may be a good supplement for cereal based diets. Processing and removal of the seed coat reduces trypsin and α -amylase inhibitor activity. Though there was a significant reduction ($p = 0.016$) in the gestation

in the study the litter were healthy. However, it cannot be concluded that there is no effect on pregnancy without more intensive studies.

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ABSTRACT

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