Effects of micronisation on cowpea phenolic compounds and potential health promoting properties

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INTRODUCTION

Cowpea (Vigna unguiculata L. Walp) is mostly utilised as cooked whole seeds. This is often achieved after boiling for up to 2 h, resulting in extensive energy consumption and long food preparation times. Micronisation, an infrared heat treatment applied to pre-conditioned cowpeas reduces their cooking time[1]. However, micronisation like other heat processing technologies may affect bioactive components such as phenolic compounds, known to have potential health benefits.

OBJECTIVE

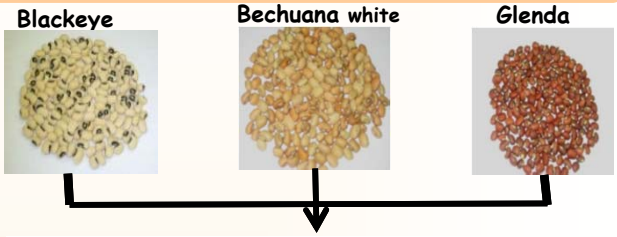
To determine the effects of micronisation of pre-conditioned cowpeas on total extractable phenolics, selected phenolic compounds, antioxidant activity and protective effect against LDL oxidation.

RESULTS & DISCUSSION

- Micronisation reduced total phenolics, ferulic acid and protection against copper induced LDL oxidation in all samples.
- Radical scavenging activities of micronised Blackeye sample were also significantly lower than the control samples.
- Heat processing may result in complexation of seed phenols with its macromolecules such as proteins thus reducing phenolic availability and extractability[2].
- Micronisation significantly increased protocatechuic acid in Blackeye and catechin in Glenda.
- Phenolic compounds are linked to various cell wall components; breakdown of cell structures during heat processing may release these compounds[3].

EXPERIMENTAL

Blackeye | Bechuana white | Glenda



Preconditioned (41% moisture) & micronised (153 C, 6 min)

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Micronised and unmicronised (Control) were cooked and freeze dried

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Phenolic compounds extracted with acidified methanol (1% HCl in methanol)

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Cowpea methanol extracts were analysed for:

- Total phenolic content[4], antioxidant activity (TEAC assay)[5], and protective effect of cowpea phenolic extracts against low density lipoprotein (LDL) oxidation (TBARS Assay)[6]
- Cowpea phenolic compounds determined by HPLC-MS

CONCLUSIONS

Though micronisation results in loss of some phenolic compounds and potential health benefits, micronised samples retain some bioactivity and therefore may offer some potential health benefits to consumers.

Table 1: Effects of micronisation of preconditioned cowpeas on total extractable phenolics, selected phenolic compounds (mg per 100 g sample) and antioxidant activity of cooked cowpeas (Dry basis)

	Blackeye		Bechuana white		Glenda	
	Unmicronised	micronised	Unmicronised	micronised	Unmicronised	micronised
Protocatechuic acid	80.0 a	93.8b	110.8c	83.0 ab	171.1d	109.8 c
Caffeic acid	17.2 bc	4.3a	15.9bc	11.8b	17.8c	24.5d
Ferulic acid	15.6 c	13.2bc	33.5d	5.9a	12.0 bc	10.8 b
Catechin	18.7 a	12.2a	310.2d	211.9b	227.3bc	242.0c
Total phenolics*	0.6b	0.4a	1.4d	0.8c	1.3d	0.9c
Antioxidant activity**	3.6b	2.3a	9.7 c	9.6c	9.6c	9.8c

abcd= mean values within a row with different letters differ significantly ($p<0.05$), Standard deviations are given in parentheses. *expressed as mg catechin equivalent per 100 mg sample and **expressed as micro molar trolox equivalent per 100 mg of the sample

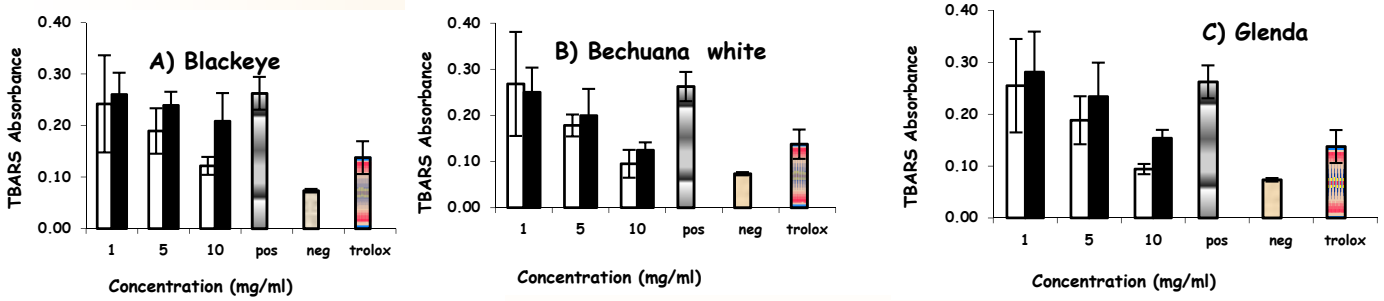

Fig1(a-c):Effect of micronisation of preconditioned and cooked cowpeas on protective effects of their extracts against copper-induced LDL oxidation Trolox (standard): LDL + CuSO4 + 100µM trolox; Positive control: LDL + CuSO4; Negative control: LDL without CuSO4; □: LDL + CuSO4+ extacts from Unmicronised cooked cowpeas samples and ■: LDL + CuSO4+ extacts from micronised cooked cowpea samples

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