Phenolic Compounds and Antioxidant Activities of Commonly Consuming Legume Varieties in Sri Lanka

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Abstract

Legumes play a vital role as a functional food by providing several health benefits in addition to a source of proteins in the human diet. Number of bioactive compounds, namely phenolic acids, flavonoids, saponins, dietary fiber and bioactive peptides present in legumes can exert beneficial effects against the excessive free radical damages protecting the biological macromolecules. Commonly consumed Sri Lankan legume varieties include green gram, soybean, chickpea, cowpea and black gram. Further, there are several cultivars of the respective species adding more diversity to the diet. In general, legumes are to be cooked prior to consumption mainly to improve the palatability in addition to reduce any anti-nutritional, toxic factors there in. However, the application of thermal heat alters the antioxidant profile of the legumes. The aim of the present study was to determine the total phenolic contents and the antioxidant activities in the soluble phenolic fractions of legume varieties and cultivars subjected to different cooking practices.

Fifteen varieties of commonly consumed legumes belonging to six different types, namely *Vigna radiate* (Green gram; cultivar: Ari, MI5 and MI6), *Vigna mungo* (Black gram; cultivar: Anuradha and MI1), *Cicer arietinum* (Chickpea; cultivars: Red and Yellow), *Vigna unguiculata*(Cowpea; cultivar :Varuni,MICPI,MI35,Dawala,Bombe and Vijaya), and *Glycine max*(Soybean; cultivar: PBI and PM13) were used in the study. Chickpea samples were purchased from a local market in Sri Lanka. All the other samples were purchased from the Palwehera Seed Collection Center, Department of Agriculture Sri Lanka. Samples were subjected to three different hydrothermal cooking treatments, namely open-lid boiling, pressure cooking and steaming. Cooked samples were freeze dried and defatted with hexane. The soluble phenolic fraction of those samples was extracted using 50% acetone (V/V).

The soluble phenolic extracts were analyzed for the total phenolic content (TPC) and total flavonoid content (TFC). The antioxidant capacities of the samples were evaluated using 2,2-

diphenyl-1-picrylhydrazil (DPPH) radical scavenging activity and ferrous ion chelating activity (FICA). All the experiments were conducted in triplicates and the values were reported as mean ±SD. Statistical analysis were performed using SPSS software version16.0.

The TPC of legume cooked samples were ranged from 2.21-72.31 µmol gallic acid equivalents (GAE) per gram of dry matter (/g DM). The highest TPC was reported for cultivar Anuradha of black gram which was pressure cooked. Further, the lowest TPC was reported for chickpea yellow boiled. The TFC of the samples were ranged from 0.40-35.17 µmol catechin equivalents (CE/g of DM). The capability of the legume extracts to chelate ferrous ions ranged from 0.21 to 31.57 µmol EDTA equiv/g of DM.

Table 01 represents the legume cultivars which showed the highest TPC within the respective legume species.

Table 01: TPC values of different legume cultivars exhibiting the highest TPC.

Legume cultivar	TPC(µmoles of gallic acid equi/g of dry matter)		
	steaming	open boiling	pressure cooking
Cowpea Varuni	25.41 ± 0.69^{a1}	16.65 ± 0.46^{b1}	$18.65\pm0.92^{a,b2,1}$
Green gram Ari	26.75 ± 1.04^{a1}	$16.07\pm1.15^{a2,3}$	14.45 ± 0.90^{a3}
Soybean PBI	22.09 ± 0.91^{a1}	7.83 ± 0.76^{a2}	$14.01\pm0.90^{a,b3}$
Blackgram Anuradha	53.39 ± 0.77^{b1}	31.63 ± 0.37^{c2}	72.31 ± 0.28^{c3}
Chickpea Red	9.16 ± 0.24^{c1}	5.54 ± 0.12^{d1}	$7.96\pm0.38^{a,d2}$

$^{a-d}$Means in a column with different superscript letters differ significantly ($p\leq0.05$).

^{123}Means in a row with different superscript numbers differ significantly ($p\leq0.05$).

Application of different cooking methods has exerted an impact towards the fluctuations of the TPC and AO. Among three cooking methods used steaming and pressure cooking showed a positive impact towards the enhancing of TPC and AO. Results show that application of steaming and pressure cooking is important in order to preserve the potential bioactive compounds.

Keywords: Antioxidant activity; Cooking methods; DPPH; FICA; TPC

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