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Phytochemicals and selected mineral constituents of *Phaseolus vulgaris* pods

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Abstract

The aqueous extract of *Phaseolus vulgaris* pods was screened for its phytochemical constituents. Selected mineral elements were also determined. Standard procedures were adopted for the phytochemical screening. Flame photometry and atomic absorption spectrophotometry was employed for mineral analysis. Alkaloids, cardiac glycoside, flavonoid, saponin, tannin and terpenoid were present in the *Phaseolus vulgaris* pods. Mineral analysis revealed the presence of potassium (23.25mg/L) as well as iron, magnesium, sodium and zinc in considerable quantities. Presence of some phytochemicals and mineral elements in *Phaseolus vulgaris* pods explains its antihyperglycemic activity.

Keywords: *Phaseolus vulgaris;* Antihyperglycemic activity; Mineral elements.

Introduction

Phaseolus vulgaris L. (Leguminosae), commonly known as kidney bean, is a food item in Asian and Eastern countries. The pods of *Phaseolus vulgaris L.* is used as vegetable in many parts of the world. These pods have been shown to possess antihyperglycemic activity by Roman-Ramos *et al*. in 1995. Insulin-stimulatory effect of *Phaseolus vulgaris* pods on existing β-cells in diabetic rats has been proven by Vankateswaran and Pari in 2001. Antioxidant effect of aqueous extract of *Phaseolus vulgaris* has also been reported in streptozotocin-induced diabetic rats (Vankateswaran and Pari, 2002). This present study was carried out to investigate the chemical constituents responsible for the antihyperglycemic activity of *Phaseolus vulgaris* pods.

Experimental

Preparation of plant extract. Fresh *Phaseolus vulgaris* pods were purchased from Abubakar Gumi Central market within Kaduna metropolis, in Kaduna State. The seeds were removed from the pods. 100g of the fresh *Phaseolus vulgaris* pods were extracted using 200ml of distilled water for 2 hours using soxhlet apparatus. The extract was concentrated using a water bath. The yield was 3.34%.

Mineral analysis. The pods of *Phaseolus vulgaris* were oven-dried at 60^0C and

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subjected to wet chemical digestion (wet ashing). The selected minerals; iron, magnesium, nickel, potassium, sodium and zinc were determined from resulting solution using Atomic Absorption spectrophotometry (Pye Unicam sp9, Cambridge, U.K) and flame photometry (Corning M410 Essex, U.K).

Phytochemical analysis. Phytochemical screening procedures carried out were adopted from the previous work on plant analysis (Harbone, 1973; Odebiyi and Sofowora, 1979; Sofowora and Odebiyi, 1978; Evans, 1996). Tests were carried out for alkaloids, anthraquinones, cardiac glycosides, flavonoids, phlobatannins, saponins, steroids and terpenoids.

Results and Discussion

The present study carried out on the pods of *Phaseolus vulgaris* revealed the presence of phytochemicals such as alkaloids, cardiac glycosides, flavonoids, saponins, tannins and terpenoids (Table 1). Iron, magnesium, potassium, sodium and zinc were detected in considerable quantities in *Phaseolus vulgaris* pods. Potassium is the most abundant while nickel was not detected (Table 2).

Table 1. Phytochemicals analysis of *Phaseolus vulgaris* pods.

Constituents	Result
Alkaloids	+
Anthraquinone (Free state)	-
Anthraquinone (combined state)	-
Cardiac glyloside	+
Flavonoids	+
Phlobatannins	-
Saponin	+
Steroid	-
Tannin	+
Terpenoid	+

Key; + Indicates presence; - Indicates absence of constituent.

Table 2: Mineral composition of *Phaseolus vulgaris pods.*

Minerals	Concentration (mg/L)
Iron	2.45
Magnesium	0.24
Nickel	ND
Potassium	23.25
Sodium	8.00
Zinc	1.30

Key; ND indicates not detected.

It is known that certain inorganic mineral elements (vanadium, zinc, chromium, copper, iron, potassium, sodium, magnesium and nickel) play an important role in the maintenance of normal glucose levels by activating the beta-cells of the pancreas (Narendhiran-Kannan *et al.*, 2005).

Saponins have been reported by Schneider and Wolfling, 2004 to inhibit Na^+ efflux, by blocking the entrance of Na^+ out of the cell. This leads to higher Na^+ concentration in cells, activating a Na^+-Ca^{2+} antiporter producing elevated cytosolic Ca^{2+}, which strengthens the contractions of heart

muscle and thereby reducing congestive heart failure.

Many antidiabetic plants, act at least in part through their fibre, mineral content or vitamins and some secondary plant metabolites (Day, 1998). The antihyperglycemic activity of the aqueous extract of *Phaseolus vulgaris* pods may be attributed to the presence of some phytochemical and mineral elements. These results suggest the pods of *Phaseolus vulgaris* as a potential source of useful therapeutics for the management of diabetes mellitus and its complications.

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