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Phytochemical screening of guar (*Cyamopsis tetragonoloba*) seeds extract

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Abstract
The paper deals the chemical composition of guar (*Cyamopsis tetragonoloba*) seeds. The antibacterial activities of the guar seeds crude extract were determined against *Mycoplasma bovis* and *Mycoplasma gallisepticum*. The chemical constituents were determined by quantifying ash, fat, fibers, moisture, protein and minerals. The results showed that the seeds contained 4.53% ash, 3.32 % fat, 11.06% fiber, 10.0% moisture and 33.25% protein. The most abundant minerals and fatty acids detected in guar seeds were iron (465 ppm) and *cis*-linoleic acid (53.89%), respectively. Essential and non-essential amino acids were present in guar seeds

Keywords: Phytochemical, screening, guar, seeds

I. Introduction
Legume seeds have received attention as functional foods, because of their nutritive values including amino acid, fiber, trace elements, vitamins, flavonoids, and phenolic acids (Bouchenak and Lamri-Senhadji, 2013) [1]. The guar or cluster bean (*Cyamopsis tetragonoloba*) is basically a legume and the source of guar gum (Khare, 2007) [2]. Several phytochemical works has been carried out on this plant (Daniel, 1989)[3]. The polyphenol composition of the plant included gallotannins, gallic acid, gallic acid derivatives, myricetin-7- glucoside-3-glycoside, chlorogenic acid, ellagic acid, 2,3,4-trihydroxy benzoic acid, texasin-7-O-glucoside and p-coumaroylquinic acid (Ali, *et al.* 1977) [4]. The sterols of guar seeds included campesterol, avenasterol, stigmasterol, sitosterol and traces of Delta-7-avenasterol, stigmast-7-enol, brassicasterol and cholesterol (Mukhtar, *et al.* 2006)[5]. *Cyamopsis tetragonoloba* is a well-known traditional plant used in folklore medicine and acts as an appetizer, digestive aid and laxative. Additionally, it is useful in dyspepsia anorexia, anti-secretory, hypolipidemic and anti-hyperglycemic effects (Wang and Morris, 2007)[6]. In addition, Guar seeds are potentially a high source of different natural compounds (Badr, *et al.* 2013) [7]. In the course of our studying program of medicinal plants with nutritional values (Vichai and Kirtikara, 2006) [8], we investigated the *Cyamopsis tetragonoloba* seeds. The aim of this study is to determine the chemical composition of guar (*Cyamopsis tetragonoloba*) seeds.

2. Material and Methods
2.1 Collection of samples and extraction
Guar seeds (*Cyamopsis tetragonoloba)* were obtained from the Crops of Agriculture Research Center, Khuthulia Rewa (M.P.). The collected seeds (1 Kg) are washed with tap water, dried and then crushed to very fine powder with crusher at the Botany Department of Govt. Girls P.G. College, Rewa. For the biological assay, 10.0 g of the powdered guar seeds was macerated in methanol: water (1: 1) for 72 hours. After filtration and concentration under vacuum, the crude extract was kept in the refrigerator.

2.2 Chemical composition
Guar seeds powder were analyzed for chemical composition (ash, fat, fibers, moisture and protein) according to the reported method (AOAC, 1995 and Iva, *et al.* 2003) [9-10]. Estimation of minerals (calcium, phosphorus, sodium, potassium, iron, zinc and copper) in guar seeds was done by inductive coupled plasma ICP "optima 2000" (Morrison and Smith 1964) [11].

Estimation of the fatty acids was carried out in accordance with the method of Morrison and Smith (1964) [11]. Amino acid profiles of the guar seeds were determined by AOAC (2006 & 2012) [12-13] protocol.

2.3 Determination of total phenolic and tannin Contents

Phenols were determined by the colorimetric method using Folin-Denis' reagent as described by Snell and Snell (1953) [14]. Quantitative estimation of tannin was carried out using the modified vanillin–HCl in methanol method by Price *et al*. (1978) [15].

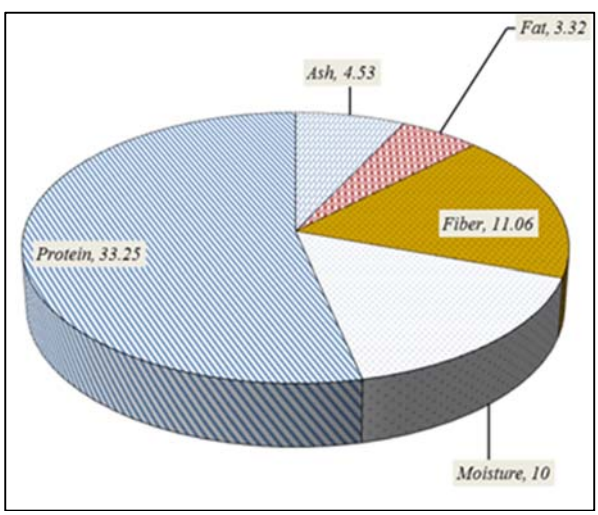
3. Observation and Discussion

3.1 Chemical composition

The chemical composition of guar (*Cyamopsis tetragonoloba*) seeds is summarized in Table 1. Percentage of ash, fat, fiber, moisture, protein and minerals is calculated based on dry weight of seed. The results showed that guar seeds are rich with protein (33.25%), fiber (11.06%) and fat content (3.32%). Our results showed that guar seeds are a good source for protein. The guar seeds are suitable for animal consumption as a rich source of the protein (Murwan, 2008) [16]. Additionally, the seeds are an effective replacement of fish meal protein up to the level of 50% diets without any adverse effects on growth and feed conversion ratio (Kobeasy, *et al.* 2011) [17]. The moisture and ash content of the guar seeds were found to be 10.0 % and 4.53%, respectively. The higher percentage of ash content reflects that guar seeds are a rich with minerals. These data are in a good agreement with literature (Lonnerdal, 2009) [18].

Table 1: Chemical composition of guar seeds

S. No.	Components	% (based on dry weight basis)
1.	Ash	4.53
2.	Fat	3.32
3.	Fiber	11.06
4.	Moisture	10.00
5.	Protein	33.25
	Minerals	(ppm)
1.	Fe^{+2}	465.90
2.	Zn^{+2}	73.31
3.	Cu^{+2}	11.17



Graph 1: Graphics analysis Chemical composition of guar seeds

The contents of Fe, Zn and Cu in the seeds were measured by inductivity coupled plasma-optical emission spectrometry ICP optima 2000 as shown in Table 1. Iron (465.90 ppm) seems to be predominant elements in the investigated sample. The results suggested that, guar seeds are an important source for iron. Some of the leguminous crops such as soybean are also a rich source of iron (Isidoros, *et al.* 2011) [19]. Other elements in the guar seeds turned out to be zinc (73.31 ppm) and copper (11.17 ppm). The presence of zinc and copper may play an important role in the functioning of various enzymes (e.g., copper is incorporated into metalloenzymes involved in hemoglobin formation, drug/xenobiotic metabolism, carbohydrate metabolism, catecholamine biosynthesis and cross-linking of collagen, as well as in the antioxidant defense mechanism (Harris, *et al.* 2009) [20]. The presence of these mineral elements could thus indicate that guar seeds could be useful in the management of diseases.

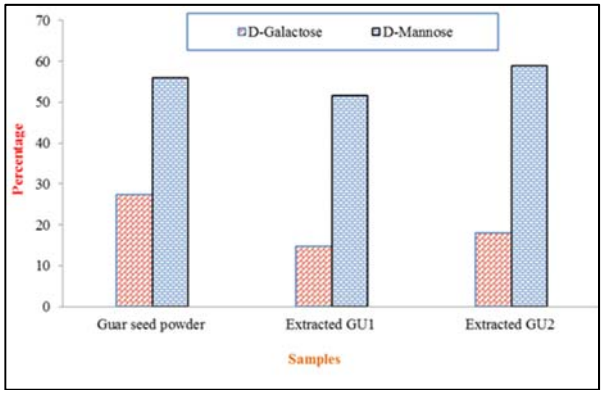
3.2 Carbohydrate profile of guar seeds

The sugar profile of guar seeds, based on dry weight**,** is shown in Table 2. Two sugars named D-galactose (27.45%) and D-mannose (56.04%) are detected in the seeds. The mannose to galactose ratio is found to be 2:1 and that matches with literature values (Murwan, *et al.* 2012) [21]. The high galactose and mannose contents of the guar seed make it a good source of food industries and other non-food industries. In case of GU1, there is a decrease in ratio of D-galactose 14.79%, and D-mannose 51.65%. The GU2 has a moderate ratio of D-galactose 17.99%, and D-mannose 58.90%. The variation in sugars percent is due to the formation of galactomannan, which confirm the insertion of cationic moiety on guar backbone. This result is in a good agreement with McCleary *et al* (1985) [22].

Table 2: Carbohydrate profile of guar seeds (%)

S. No.	Sample	D-Galactose	D-Mannose
1.	Guar seed powder	27.45	56.04
2.	Extracted GU1	14.79	51.65
3.	Extracted GU2	17.99	58.90

GU1: 1.0 g Guar gum was dissolved in 85 ml distilled water (1:85)
GU2: 2.0 gram was dissolved in 60 ml of distilled water (2:60).



Graph 2: Graphics analysis of Carbohydrate profile of guar seeds (%)

3.3 Phenols of the guar seeds

The total phenolic compounds (2.47 mg/g) and tannins (2.85 mg/g) of guar seeds are shown in Table 3. The results are agreed with the literature values (Kobeasy, *et al.* 2011) [17]. From our results, the toxicity of guar seeds extract may be

due to the presence of phenolic compounds and tannins. The tannin content of guar seeds can be reduced by physical removal of testa, since most of tannins are found in the outer layer of the seed.

Table 3: Phenols of guar seeds (mg/g), based on dry weight

S. No.	Constituent	Results
1.	Total phenols (mg gallic acid/g)	2.47
2.	Tannins (mg catechin/g)	2.85

4. Conclusion

In conclusion, guar seeds were investigated for their chemical composition. The potential of guar seeds as a source of proteins, minerals (e.g. iron, zinc and copper), fatty acids (c*is*-linolenic acid, *cis*-oleic acid and palmitic acid) and amino acids (e.g. glutamic acid, arginine and aspartic acid) is being realized. The sugar profile of guar seeds was D-galactose (27.45%) and D-mannose (56.04%). We recommended more *in vivo* studies along with detailed phytochemical investigation using hyphenated techniques in natural products such as ultra-performance liquid chromatography quadrupole time of flight mass spectrometry (UPLC–qTOF-MS/MS) to scientific all underpin the perspective use of guar seeds (crude extract, fractions, sub-fractions or pure compounds) for the prevention or therapy of diseases.

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