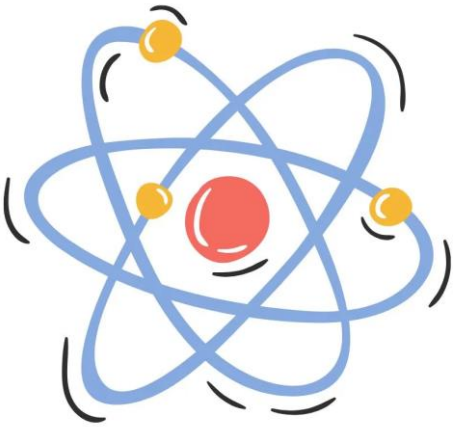

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ABSTRACT: Functional soup is one of the possible goods that could be turned into an immediate meal. Dried soups are essential for meeting societal standards from consumers. Food that has been dehydrated, particularly dry soup mixes, has several benefits. These include resistance to oxidative and enzymatic deterioration and the capacity to maintain flavour for extended periods of time—up to a year at ambient temperature. Because it is easy to prepare, takes little time to serve, and provides the body with the necessary energy and nutrients, functional soup may replace traditional morning fare. For dried soups to be of high quality, added additives, their useful qualities, and their ratio are important considerations. Legumes and vegetables are added to it to preserve its nutritional content. Out of these few have been evaluated for the medicines. From many plants only extract have been prepared and evaluated for their usefulness and it tested diabetes in animals. This article may act as tool to abreast with the Phytochemical, Antioxidant, Antidiabetic test for dried bean powder and Proximate Analysis for soup powder. The IC50 value for antioxidant activity and anti-diabetic activity of ethanolic bean extracted from Cyamopsis tetragonoloba was found to be 415.986 µg/ml, 540.137µg/ml, and 389.354 µg/ml respectively. The Proximate analysis which includes Carbohydrate, Protein, Lipid, Moisture content and Ash was found to be 7.42 mg/ml, 3.54 mg/ml, 0.85 mg/ml, 82%, 0.79%. The soup mix formulation in the present study reported higher antidiabetic activity as compared to those reported in the literature.

KEYWORDS: Antioxidant activity, Antidiabetic activity, Cyamopsis tetragonoloba, Proximate analysis, Sensory analysis.

1. INTRODUC TION

Cluster beans, known as Cyamopsis tetragonoloba, are sold under various names such as Goraksha/Dridhabija in Sanskrit and Guar in Hindi within the local markets of southern India. Goraksha has botanical synonyms, including C. Psoralioides (Lamk.) DC. and Psoralea tetragonoloba L., both belonging to the Fabaceae family, specifically under the Subfamily Papilionaceae. This moderate-sized annual herb is cultivated throughout India for its pods, serving as a source for vegetables, seed-gum, forage, and green manure. The plant features grooved stems, generally 3-foliolate leaves (sometimes simple), and elliptic leaflets with hair on both sides. Its small, white or purple papilionaceous flowers form in axillary clusters with close racemes. The linear pods are stiff, erect, and exhibit double ridge compression on the dorsal side and a single ridge below. Recognized for its nutritional value, the plant offers proteins, fats, fiber, carbohydrates, minerals (calcium, phosphorus, iron, fluoride, zinc, molybdenum, manganese, copper, cobalt, etc.),

vitamins (thiamine, riboflavin, niacin, vitamin C, carotene, β-carotene, folic acid, ascorbic acid, nicotinic acid, etc.), amino acids (methionine, cystine, tryptophan, valine, arginine, aspartic acid, etc.), polyphenols (kaempferol, quercetin, chrysene, 1,2,5,6-dibenzanthracene, etc.), and globulin. Traditionally used as a vegetable, it enhances appetite and alleviates biliousness and night blindness. It helps to keep blood pressure in check while also preventing other problems. It also has anti-estrogenic activity. Ayurveda attributes various properties to Goraksha, including a sweet taste (madhura rasa), qualities of being heavy (guru), dry (ruksha), and mobile (sara). Its doshakarma involves increasing kapha and decreasing pitta, and it is associated with actions like enhancing taste (ruchikara) and providing strength (balya). Indeed, goraksha showcases diverse therapeutic activities, including anti-hypercholesterolemic, anthelmintic, hypolipidemic, and hypoglycemic effects, as well as antiulcer and cytoprotective activities. Traditional literature suggests the pods of this plant as a remedy for diabetes treatment. The antihyperglycemic effect of the aqueous extract of C. tetragonoloba beans is believed to be attributed to the presence of tannins, coumarin, and flavonoids (Shantha Thirumalai Ramasheshar *et al.*,2016). The plant is cultivated as a vegetable for human consumption, utilized as a cover crop, green manure, and serves as forage for cattle. Its deeper root system and reduced transpiration rate make it valuable in bridging the gap between forage supply and demand, particularly in drought-prone areas. The young pods are consumed similar to string beans, either eaten fresh or dried, salted, or fried in oil until crisp. Mature pods, when cooked as a vegetable, are rich in protein, fat, fiber, carbohydrates, calcium (Ca), phosphorus (P), iron (Fe), vitamin A, and vitamin C. Cluster beans have versatile applications in industries such as cosmetics, gum, textile, explosives, papers, and food processing. Recognizing their significance, there is a need to enhance the productivity of cluster beans. The primary objectives include evaluating cluster beans through PA treatment and studying its impact on growth characteristics (Nagendra prasad. K *et al.,* 2020). Guar is a course, upright, bushy, drought-resistant summer annual plant ranging from 2-4 feet in height. Its trifoliate leaves, adorned with pointed, saw-toothed edges, accompany small purplish-white flowers aligned along the spikelet's axis. Clusters of hairy pods, measuring 3-4 inches, characterize this plant, with both dwarf and tall cultivars existing. Guar flowers exhibit self-pollination, and the mature unopened bud undergoes a transition from white to light pink as its petals unfurl. These plants are rich in both macro and micronutrients, as well as bioactive compounds, making them a significant source of antioxidants (Catherine *et al*., 2011). The mode of action of capsaicin in inducing hypolipidemic and weight-reducing effects differs from that of dietary soluble fiber. Consequently, there is a potential for an additive or even a synergistic effect when consuming this spice in combination with dietary soluble fiber. The study evaluated the potential synergistic effect of capsaicin, known for promoting fat oxidation in the body, when fed in combination with tender cluster beans (Subhra

pande *et al.*, 2012). The seed extract underwent preliminary phytochemical investigations, utilizing solvents such as n-Hexane, Ethyl Acetate, Acetone, Ethanol, and Methanol. Qualitative analysis revealed the presence of Phenol, Quinone, Steroid, Flavonoids, and Terpenoid in the plant extract.

2. MATERIALS AND METHODS

2.1. Plant material

The Cluster beans were collected from *Cyamopsis tetragonoloba* plants inRasipuram, Namakkal District, Tamil Nadu. Additionally, locally sourced raw materials, including onion, ginger, garlic, tomato, pepper, and others, were obtained from a nearby supermarket.

2.2. Preparation of Cluster bean powder

The fresh and good quality of beans were selected and washed thoroughly using water. Then the cluster beans were drained and cut into small pieces, shade dried for 3-4 days. Then the dried beans were roasted. About 100 grams of beans were powdered using a mixer grinder.

2.3. Preparation of tomato powder

Fresh tomatoes were procured from a local supermarket, thoroughly washed with tap water, and sliced for making tomato powder. The slices were cooked, and the resulting pulp was dried in an oven dryer for 4 hours at 60˚C. The dried pulp was ground, packed in an LDPE bag, and stored at room temperature.

2.4. Preparation of Garlic powder

Fresh garlic was acquired from a local supermarket, with peels removed. The garlic cloves underwent blanching in 100˚C hot water for 5 minutes, followed by drying in an oven at 65˚C for 6 hours. The dried garlic cloves were ground using an electric grinder, and the resulting powder was packed into an LDPE bag, then stored at room temperature.

2 . 5 Preparation of Ginger powder

Fresh ginger was bought from a local supermarket, thoroughly washed, and peeled. The raw ginger was blended with an electric blender and then dried in a thin layer in an oven at 65˚C for 6 hours. The dried ginger was ground using an electric grinder, and the resulting powder was packed into an LDPE bag and stored at room temperature.

2.6. Preparation of Onion powder

Fresh onions, obtained from a local supermarket, had their peels removed, were washed to eliminate dirt, and then were blended with an electric blender. The raw onion mixture was dried in a thin layer in an oven at 65˚C for 6 hours. Subsequently, the dried onions were ground using an electric grinder, and the resulting powder was packed into an LDPE bag and stored at room temperature.

2.7. Preparation of Pepper powder

Pepper procured from Kolli Hills, Namakkal, was sun-dried for several days. The dried pepper was then ground using an electric grinder, and the resulting powder was packed into an LDPE bag for storage at room temperature.

2.8. Preparation of Spice mix

Various spices, including dried cinnamon, cumin, coriander, cardamom, cloves, nutmeg, fennel, and star anise, were purchased from the local market and measured using an electric balance. The spices were subsequently roasted and ground with an electric grinder to create a spice mix. The resulting ground spice mix powder was then packed into an LDPE bag and stored at room temperature.

2.9. Preparation of Dehydrated vegetables

Carrots and beans, purchased from the local market, were washed and blanched in 100˚C hot water for 5 minutes. After blanching, the vegetables were chopped into small pieces and subjected to shade drying for 3 days. Following that, the dried vegetables underwent further dry in a hot air oven at 65˚C for 6 hours.

3. ABTS radical cation scavenging activity

The ABTS (2,2-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) radical-scavenging activity of the extract was assessed following the method outlined in (Re *et al*., 1999). The ABTS positive (+) cation radical was generated by the reaction between 5 ml of 14mM ABTS solution and 5 ml of 4.9 mM potassium persulfate solution, stored in the dark at room temperature for 16 hours. Prior to use, this solution was diluted with ethanol to achieve an absorbance of 0.700 ± 0.020 at 734 nm. The plant extract at various concentrations was mixed with 1 ml of ABTS solution, homogenized, and its absorbance was recorded at 734 nm. Ethanol blanks were included in each assay, and measurements were taken after a minimum of 6 minutes. The reaction mixture for the standard group was prepared by combining 950 µl of ABTS solution and 50 µl of BHT. The antiradical activity, expressed as IC50 (µg/ml), was determined based on the ABTS scavenging ability.

4. Antidiabetic activity

There are two types of antidiabetic assays: Alpha Amylase inhibitory assay and Alpha Glycosidase inhibitory assay. The in vitro Alpha amylase inhibitory assay involves creating a 1% w/v starch solution by stirring 1g starch in 100 ml of 20 mM phosphate buffer (pH 6.9) with 6.7mM sodium chloride. Additionally, a enzyme solution is prepared by mixing 27.5 mg of porcine pancreatic amylase α-amylase (PPA) in 100 ml of 20 mM phosphate buffer (PBS, pH 6.9) with 6.7mM sodium chloride. For each of the plant extract concentrations (50, 250, 500, 750, and 1000µg/ml), 1000 µl was taken, and 200 µl of porcine pancreatic amylase was added. The mixture was then

incubated at 37 ºC for 20 min. Following that, 100 µl of 1% starch solution was introduced to the reaction mixture, and the sample was further incubated at 37 ºC for 10 min. The reaction was halted by adding 200 µl of di nitro salicylic acid (consisting of 1g of 3,5 di nitrosalicylic acid, 30g of sodium potassium tartarate, and 20 ml of 2N sodium hydroxide). Subsequently, the solution was adjusted to a final volume of 100 ml with distilled water and placed in a boiling water bath for 5 minutes. Afterward, the mixture was diluted with 2.2 ml of water, and the absorbance was measured at 540 nm. Blank tubes were prepared for each concentration by substituting the enzyme solution with 200 µl of distilled water. A control representing 100% enzyme activity (diluted water) was prepared without extract, following a similar procedure. The experiments were conducted three times using the same protocol (Ali *et al*., 2006). For the In Vitro Alpha-Glucosidase Inhibitory assay, -glucosidase activity inhibition was determined using a modified published method (Kim *et al*., 2011). One mg of -glucosidase was dissolved in 100 ml of phosphate buffer (pH 6.8). For each concentration (50, 250, 500, 750, and 1000µg/ml) of plant extracts, 1000 µl was taken, and 200 µl of -glucosidase was added. The mixture was then incubated at 37ºC for 20 min. To the reaction mixture, 100 µl of 3mM -nitrophenyl -D glucopyranoside (p-NPG) was added and incubated at 37 ºC for 10 min. The reaction was stopped by adding 2ml of 0.1M Na2CO3, and -glucosidase activity was determined spectrophotometrically at 405 nm using a UV-VIS spectrophotometer (Shimadzu UV-1800). This measurement involved quantifying the amount of -3 nitrophenol released from p-NPG. Acarbose served as a positive control for both -amylase and -glucosidase inhibition. The concentration of the extract needed to inhibit 50% of -amylase and -glucosidase was determined.

Statistical analysis

The determinations were conducted in triplicates, and data analysis was performed using ANOVA followed by Tukey's multiple comparisons test for significant differences through SPSS 14.0 software. Significance was established at $p \leq 0.05$.

Proximate analysis

The proximate Analysis which includes Carbohydrate, Protein, Fat, Moisture and Ash teat were determined.

5. RESULTS AND DISCUSSION

5.1. Phytochemical Analysis

Seed extract underwent preliminary phytochemical investigations using n-Hexane, Ethyl Acetate, Acetone, Ethanol, and Methanol solvents. Qualitative analysis revealed the presence of Phenol, Quinone, Steroid, Flavonoids, and Terpenoid in the plant extract. The diverse Rf (Retention factor) values of various phytochemicals offer insights into their polarity, aiding in solvent selection for phytochemical separation (Priyanka Srivastava *et al*., 2014).

TABLE 1. Phytochemicals Analysis of *Cyamopsis tetragonoloba*

Phytochemical	Observation	Ethanolic extract
Alkaloids	Cream colour	+
Flavonoids	Yellow orange, reddish brown / Orange colour precipitate	+ -
Steroids	Violet to blue or Green colour formation	+
Terepenoids	Reddish brown precipitate	-
Anthraquinone	Pink colour	+
Phenol	Deep blue to Black colour formation White precipitate	-
Saponin	Stable persistent	-
Tannin	Brownish green / Blue black	+
Carbohydrate	Yellow / brownish / blue / green colour	-
Oil and resins	Filter paper method	-

5.2. Antioxidant Assay

TABLE 2. Antioxidant assay of *Cyamopsis tetragonoloba*

S. No	Concentration	OD	% IC_{50}	IC_{50}
1	50	0.201	37.67	
2	250	0.214	46.58	
3	500	0.221	51.37	415.98

4	**750**	**0.237**	**62.33**	
5	**1000**	**0.243**	**66.44**	

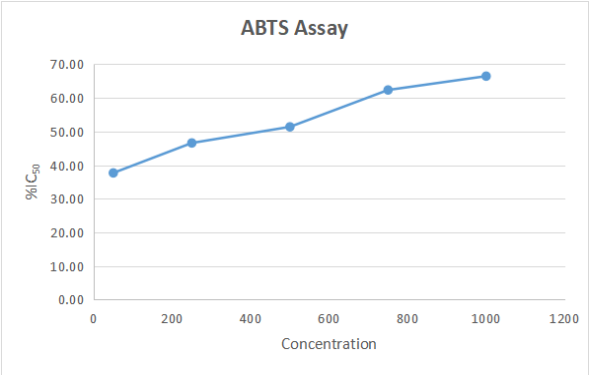

FIGURE 1.OD value and % inhibition by ABTS assay

TABLE 3. Alpha amylase assay of *Cyamopsis tetragonoloba*

S. No	***Concentration***	***OD***	***% IC_{50}***	***IC_{50}***
1	***50***	***0.205***	***33.99***	***540.137***
2	***250***	***0.210***	***37.25***	
3	***500***	***0.229***	***49.67***	
4	***750***	***0.237***	***54.90***	
5	***1000***	***0.258***	***68.63***	

TABLE 4. Alpha glycosidase assay of *Cyamopsis tetragonoloba*

S. No	**Concentration**	**OD**	**% IC_{50}**	**IC_{50}**
1	50	0.203	33.55	

2	250	0.220	44.73	389.354
3	500	0.235	54.61	
4	750	0.256	68.42	
5	1000	0.267	75.66	

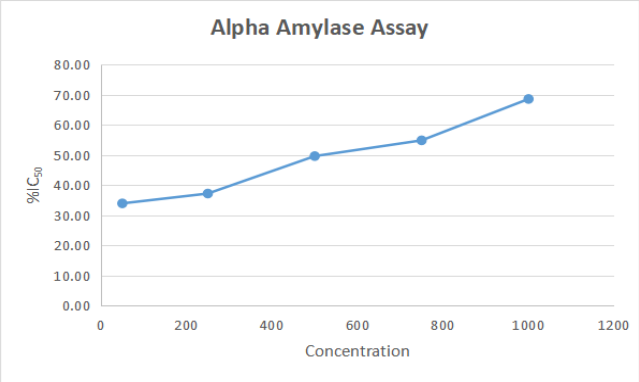

FIGURE 2. OD value and % and % inhibition by Alpha Amylase Assay

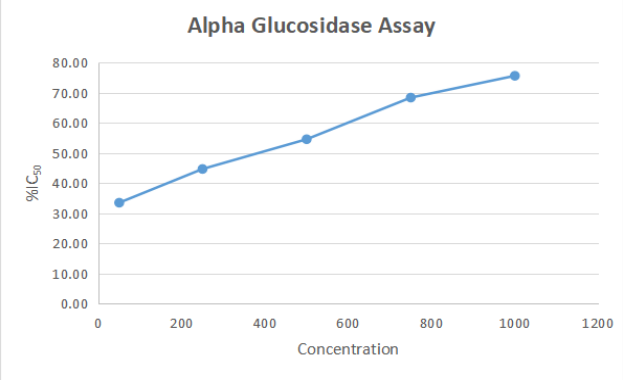

FIGURE 3. OD value & % inhibition by Alpha glycosidase Assay

5.3. PROXIMATE ANALYSIS

5.3.1. CARBOHYDRATE

Carbohydrates undergo dehydration with concentrated H2SO4 to produce furfural. The active form of the reagent, anthranol, reacts by condensing with the carbohydrate furfural derivative. This reaction results in green color in dilute solutions and a blue color in concentrated solutions, which can be determined calorimetrically. The blue-green solution exhibits an absorption maximum at 620 nm. The total carbohydrate content in the extract sample (CB-10) was measured to be 7.42 mg/ml.

TABLE 5. OD and mean value of Carbohydrate content

Glucose mg/ml	OD at 620 nm (triplicates)			Mean value
5	2.796	2.728	2.71	2.744

2.5	1.453	1.475	1.485	1.471
1.25	0.999	0.989	0.954	0.98
0.625	0.645	0.644	0.61	0.633
0.312	0.471	0.456	0.472	0.466
0.156	0.469	0.454	0.442	0.455
0.078	0.444	0.429	0.42	0.431
0.039	0.304	0.388	0.392	0.361

TABLE 6. Total Carbohydrate content

Name of the sample	OD value at 620 nm	Total carbohydrate content(mg/ml)	Mean value(mg/ml)
CB 10	**3.853**	**7.4**	**7.42**
	3.847	**7.39**	
	3.886	**7.47**	

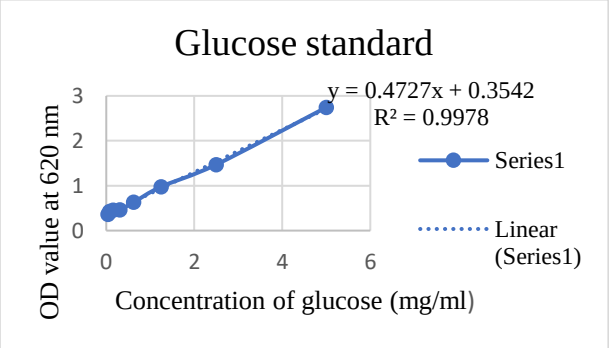

FIGURE 4. Carbohydrate Assay

5.3.2. PROTEIN

The most widely used Bradford method was developed by M. Bradford. It is based on the observation of a shift in wavelength from 465nm to 595nm for Coomassie Brilliant Blue G-250 dye in an acidic solution as it binds to a protein. When the dye is bonded to the protein it is in the anionic form and has a maximum absorbance around 595nm. When the dye is not bound, it is in the cationic form and has a maximum absorbance around 470nm. With increasing protein concentration, the dye changes colour brown to blue to darker shades of blue. The absorbance of light by the dye-protein complex at 595 nm is directly proportional to the amount of bound protein, showing a linear relationship within a limited range. In the extract sample (CB-10), the total protein content was determined to be 3.54 mg/ml based on this relationship.

TABLE 7. OD and mean value of protein

BSA mg/ml	OD at 595 nm (triplicates)			Mean value
5	2.342	2.225	2.214	2.26
2.5	1.214	1.214	1.206	1.211
1.25	1.223	1.242	1.201	1.222
0.625	0.984	0.987	0.988	0.986
0.312	0.775	0.767	0.799	0.78
0.156	0.644	0.662	0.632	0.646
0.078	0.566	0.533	0.537	0.545
0.039	0.423	0.441	0.431	0.431

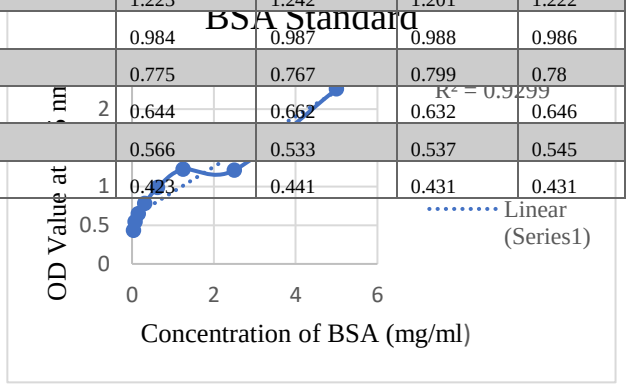

FIGURE 5. Protein Assay

TABLE 8. Total Protein content

Name of the sample	OD value at 595 nm	Total Protein content(mg/ml)	Mean value(mg/ml)
CB 10	1.787	3.63	3.54
	1.605	3.07	
	1.89	3.94	

5.3.3. LIPID

Sulfuric acid induces the reaction of lipids, producing carbonium ions that then engage with vanillin phosphate ester, resulting in a purple complex measured at 540 nm. The color intensity correlates with the total lipid concentration. The extract sample (CB-10) revealed a total lipid content of 0.85 mg/ml.

TABLE 9. OD and mean value of Lipid content

Cholesterol mg/ml	OD at 540 nm (triplicates)			Mean value
10	2.466	2.477	2.212	2.385
5	1.365	1.378	1.38	1.374
2.5	0.986	0.917	0.905	0.936

1.25	0.541	0.542	0.522	0.535
0.625	0.479	0.416	0.411	0.435
0.312	0.343	0.377	0.366	0.362
0.156	0.213	0.219	0.216	0.216
0.078	0.121	0.199	0.199	0.173

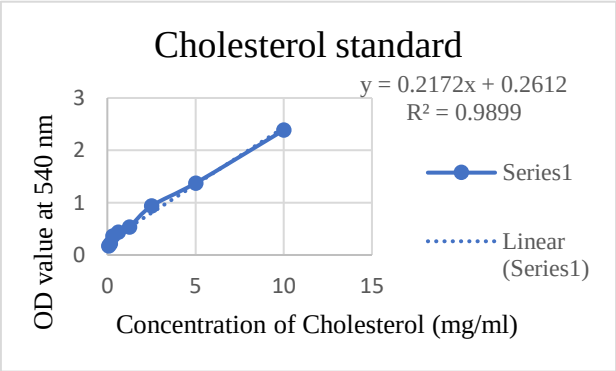

FIGURE 6. Lipid Assay

TABLE 10. Total Lipid content

Name of the sample	OD value at 540 nm	Total Lipid content(mg/ml)	Mean value(mg/ml)
CB 10	0.442	0.83	0.85
	0.446	0.85	
	0.452	0.87	

5.3.4. MOISTURE CONTENT

In CB-10 sample, the moisture content was assessed using Tandon's method with slight adjustments. A 1 g sample was placed in a sterilized beaker, sealed, and heated in a hot air oven at 500ºC for four hours. After cooling in a desiccator, the beaker was weighed, and the loss in weight indicated the moisture content. In this analysis, the total moisture content in the sample was determined to be 82%.

5.3.5. ASH CONTENT

Decomposition of organic matter from a test portion by incineration and weighing of the ash obtained. The percentage of the ash found to be **0.79 %**.

TABLE 11. Total Ash content

s.no	Name of the sample	Sample quantity (gm)	Total ash content
1	**CB-10**	**1**	**0.79**

6. CONCLUSION

This study highlights about the process of collected beans of *Cyamopsis tetragonoloba* were

successfully extracted using ethanol as a solvent by the Cold Maceration process. The obtained yield of the beans extract from *Cyamopsis tetragonoloba* by extraction was found to be 100 ml. Phytochemical analysis, Antioxidant activity, Antidiabetic activity, Sensory Analysis and Proximate analysis of Cluster bean extract of *Cyamopsis tetragonoloba* were analyzed by all the assay results reveal that beans of *Cyamopsis tetragonoloba* causes concentration-dependent effects. The IC50 value for antioxidant activity and anti-diabetic activity of ethanolic bean extracted from *Cyamopsis tetragonoloba* was found to be 415.986 µg/ml, 540.137µg/ml, and 389.354 µg/ml respectively. The Proximate analysis which includes Carbohydrate, Protein, Lipid, Moisture content and Ash was found to be 7.42 mg/ml, 3.54 mg/ml, 0.85 mg/ml, 82%, 0.79%. The current study's soup mix formulation demonstrated greater antidiabetic activity compared to findings reported in the existing literature.

Further studies can be carried out about Packaging material for instant cluster bean soup mix.

7. REFERANCE

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