



**PROXIMATE COMPOSITION AND FUNCTIONAL PROPERTIES OF CARPET WEED -
CORBICHONIA DECUMBENS (FORSSK.) EXELL**

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ABSTRACT

Plant biodiversity contribute significantly to human health, nourishing and alleviating the acute and chronic diseases. Plants not only served as curing agents since long but also provide basic nutrients like carbohydrate, protein, fat to humans and animals. The present study explores the nutritional properties of the entire plant *Corbichonia decumbens*. The proximate composition such as ash content, moisture content, crude lipid, chlorophyll, carotenoids, starch, carbohydrate, free amino acid, proline were evaluated. In addition to this various physiochemical properties such as swelling capacity, water retention capacity and oil holding capacity were also analyzed. The present data may provide a guideline for the use of the entire plant of *C. decumbens* is food and medicine formulation.

KEYWORDS: Carpet weed, proximate, *Corbichonia*, water retention, protein.

INTRODUCTION

Plants have always been a source of inspiration and way of livelihood to human kind since time immemorial. Plant-derived and other natural product provided many novel bioactive molecules that are available in market today as medicines or food. The wild edible plants growing in their natural conditions have been a source of food to the rural people inhabiting to the remote areas of the world including India. With the explosion of human population, rapid urbanization as well as climatic changes, the agricultural lands are decreasing rapidly leading to the decrease of major crop productivity affecting our daily lives which ultimately may cause nutritional deficiency disorders and diseases (Odhav *et al.*, 2007). The botanicals and nutritional content of a plant depends on the season, geography and climatic conditions of the habitats. Fresh, nutritious and healthy foods are the sole source of energy for proper growth and maintenance of physiological homeostasis in the body. It also acts as a defense system to many diseases by boosting the immune system of our body. Like other plants, wild edible plants also act as a vital component of human food that is consumed throughout the year. These plants not only serve as an alternative to staple food during periods of food deficit but also act as a valuable supplement for balanced diet and provide source of income generation to the poor families (Narzary *et al.*, 2013). *C. decumbens* belongs to the family Lophiocarpaceae is a prostrate glabrous, succulent and annual weed found almost throughout India. This plant is commonly distributed Africa, W. Asia, India and W.

Pakistan. It is found in rocky or sandy places, in dry hot areas up to 1000m altitude. This plant is used in kidney stone problems and also used in gonorrhoea. The present study was aimed to evaluate the nutritional composition, physical, chemical and functional properties of *C. decumbens*.

MATERIALS AND METHODS

COLLECTION OF PLANT MATERIAL

The whole plant of *C. decumbens* were collected in around Kallipalayam, Annur taluk, Coimbatore District, Tamil Nadu. The plant was identified and authenticated at the herbarium of Botanical Survey of India (BSI), Coimbatore, Tamil Nadu.

PROXIMATE ANALYSIS

The collected plant materials were washed with tap water to remove soil, dust particle, etc. Then the whole plant was shade dried for some day and grinded well as fine powder and stored in room temperature. The proximate nutrient compositions like Ash, Moisture, Crude lipid, Total protein, Total carbohydrates, Starch, Total free amino acids, Chlorophyll, Carotenoids, Proline were determined by various methods by following standard procedures.

RESULTS

PROXIMATE COMPOSITION

The moisture contents were found to be 54.2±0.05% g/100g dry weight. The ash contents were found to be 13.3±0.1% g/100g dry weight. The crude lipids were

found as $6.5 \pm 0.001\%$ g/100g dry weight. Pigments like chlorophylls and carotenoids were investigated only in leaves as $2.803 \pm 0.01\%$ and $2.083 \pm 0.02\%$ $\mu\text{g/g}$ fresh weight respectively. The protein content was found to be $18 \pm 0.002\%$ dry weight and it was the highest concentrated property than other properties in the plant. The total carbohydrates were found to be $6 \pm 0.001\%$ mg/g dry weight and starch content in the plant was found to be $16.2 \pm 0.001\%$ dry weight. This is the second high concentrated property in this plant than other proximal properties. The free amino acids were found to be $10.2 \pm 0.01\%$ mg/g dry flour and the proline content was analyzed as $9.8 \pm 0.001\%$ mg/g dry weight (Table No.1).

FUNCTIONAL PROPERTIES

The solubility(S) of the entire plant flour was observed as $28.1 \pm 0.15\%$. The swelling capacity (SC) of the plant was found to be $429.2 \pm 0.55\%$ high than other functional properties. The water absorption capacity (WAC) was found to be $267.8 \pm 0.15\%$ and oil absorption capacity (OAC) was analyzed as $347.9 \pm 0.11\%$. The foaming volume increase (FC) was observed as 169.5 ± 0.50 and the foaming stability (FS) was found to be $26.3 \pm 0.20\%$. The emulsifying activity (EA) and emulsifying stability (ES) was observed as 185.6 ± 0.11 and $79.9 \pm 0.14\%$ respectively. The bulk density was analyzed as loose and packed bulk density. The values were found to be $34.8 \pm 0.1\%$ in loose bulk density (LBD) and $29.5 \pm 0.15\%$ in packed bulk density (PBD).

Table 1: Proximate composition analysis of the entire plant *C. decumbens*.

S. No.	Parameters	Concentration
1	Moisture content (g/100g FW)	54.2
2	Ash content (g/100g DW)	13.3
3	Crude lipid (g/100g DW)	6.5
4	Total chlorophyll ($\mu\text{g/g}$ FW)	2.803
5	Carotenoids ($\mu\text{g/g}$ FW)	2.083
6	Total proteins (mg/g DW)	18
7	Total carbohydrates (mg/g DW)	6
8	Starch (mg/g DW)	16.2
9	Free amino acids (mg/g DW)	10.2
10	Proline (mg/g DW)	9.8

Table 2: Functional properties of the entire plant *C. decumbens*.

S. No.	Properties	Concentration
1	Solubility (%)	28.1
2	Swelling capacity (%)	492.2
3	Water absorption capacity (%)	267.8
4	Oil holding capacity (%)	347.9
5	Foaming volume increase (%)	169.5
6	Foaming stability (%)	26.3
7	Emulsifying capacity (%)	185.6
8	Emulsifying stability (%)	79.9
9	Loose bulk density (g/ml)	34.8
10	Packed bulk density (g/ml)	29.5

DISCUSSION

Plant metabolites exists in diverse numbers and contribute to the physiological dynamics of growth and development in plants (Wang *et al.*, 2019), invariably making them useful, natural and nutritional sources. In this present study different proximate compositions and functional properties of the entire plant were analyzed with using standard procedures given by various authors. The stability and shelf life of any food component is determined by its moisture content (Uyoh *et al.*, 2013). The moisture content of any food is an index of its water activity and it is used as a measure of stability and the susceptibility to microbial contamination. The moisture content found in this study was $54.2 \pm 0.05\%$ compared with the works of Jailani *et al.*, 2019. Ash content was $13.3 \pm 0.1\%$. Ash content is generally taken to be a measure of the mineral content of the original food

(Zubaida *et al.*, 2007). The crude lipid content obtained from the plant was $6.5 \pm 0.001\%$. Fat provides very good source of energy and aids in transport of fat soluble vitamins, insulates and protects internal tissues and contributes to important cell processes (Okak *et al.*, 2001). Nutritionally, relatively high dietary fiber evaluated in the sample is beneficial because it provides the buck necessary for proper peristaltic action and aids the absorption of trace elements in the gut and reduces cholesterol absorption (Dhingra *et al.*, 2012; Adebowale *et al.*, 2013).

Total pigment molecules present in the leaf are chlorophylls and carotenoids which are essential for photosynthesis. Chlorophyll content of leaf tissue is a good index of photosynthetic activity (Chowdhury and Kohri, 2003). Carotenoids provide bright coloration,

serve as antioxidants, and can be a source for vitamin A activity (Britton *et al.*, 1995). The present studied plant having convincible amount of chlorophyll and carotenoids which are need to do good photosynthetic activity. Bannari *et al.*, 2007 stated that Chlorophyll content is an indicator for crop growth and development, therefore accurately determining and assessing of chlorophyll concentration is essential. Dietary proteins are key elements in body building processes and tissue repair. They have been reports of emerging evidence of the functional role of dietary proteins in reducing type II diabetes and glucoregulatory mechanism (Comeford and Pasin, 2016). Dietary proteins are pivotal in the manufacturing and safe guarding of certain organic materials necessary for the smooth functioning of the human body (Hayat *et al.*, 2014). This plant is a moderate source of protein ranges to $18 \pm 0.002\%$. According to Alloway (1990), proteins from plant sources have lower quality but their combination with many other sources of protein such as animal protein may result in adequate nutritional value. This plant having comparatively high protein values than the plants reported by Robert *et al.*, 2016.

Carbohydrates, fats and proteins are the key nutrients of life. High carbohydrate content indicates high energy content in food. The main function of carbohydrate in the body is to supply energy and it is responsible for doing activities in our daily life (Yisa *et al.*, 2010). In the present study, the carbohydrate concentration is $6 \pm 0.001\%$. Starch is the common carbohydrate in the human diet and is contained in many staple foods. The major sources of starch intake worldwide are the cereals (Rice, Wheat and Maize) and the root vegetables Potato and Cassava) (Charlotte Eliasson, 2004). Before the advent of processed foods, people consumed large amounts of uncooked and unprocessed starch-containing plants, which contained high amounts of resistant starch. Microbes within the large intestine fermented the starch, produced short-chain fatty acids, which are used as energy, and support the maintenance and growth of the microbes. More highly processed foods are more easily digested and release more glucose in the small intestine less starch reaches the large intestine and more energy is absorbed by the body. It is thought that this shift in energy delivery (as a result of eating more processed foods) may be one of the contributing factors to the development of metabolic disorders of modern life, including obesity and diabetes (Walter and Jens; Ley and Ruth, 2011). The present studied plant having the high amount of starch $16.2 \pm 0.001\%$. Plants synthesize Amino Acids from the Primary elements, the Carbon and Oxygen obtained from air, Hydrogen from water in the soil, forming Carbon Hydrate by means of photosynthesis and combining it with the Nitrogen which the plants obtain from the soil, leading to synthesis of amino acids, by collateral metabolic pathways. The present plant contains high amount of free amino acids ranges $10.2 \pm 0.01\%$. Proline is an amino acid it was found to be high in the present studied plant $9.8 \pm$

0.001% . Proline aids the body in breaking down proteins for use in healthy cells. In conjunction with lysine, another amino acid, proline is a precursor for hydroxyproline and hydroxylysine. The body uses hydroxyproline to make collagen, tendons, ligaments and heart muscle.

In this research, different functional properties of the entire plant ground sample were analyzed using standard procedures. The degree of solubility may depend on the type and species of starch and proteins present in the flour. The milling process causes the breakdown of starch granules which further leads to an improvement in the solubility index. An increase in temperature facilitates the hydrolysis of starch leading to an improved solubility (Hoover & Maunul, 1996). The solubility range of the plant is $28.1 \pm 0.1\%$. The increase in the SC may be attributed to the fact that the outer membranes of the starch granules present in the flour are ruptured during the milling process and swell up in the form of a gel by absorbing water at low temperature i.e. $40-50^{\circ}\text{C}$. A remarkable increase in swelling power may be observed between $60-90^{\circ}\text{C}$ (Hoover & Sosulki, 1996). The swelling capacity of the plant is 492.2 ± 0.1 . This amount of SC is higher than the values of wheat flour and composite flour were reported by Suresh Chandra *et al.*, 2014. The water and oil holding capacities are essential functional properties of protein which may be defined as the amount of water or oil retained by a known weight of flour under specific conditions. The water holding capacity depends on capillary, pore size and the charges on the protein molecules. This is due to strong correlation of extent of protein hydration with polar constituents along with the hydrophilic interaction through hydrogen bonding. The higher protein content in the flour might be responsible for high hydrogen bonding and high electrostatic repulsion (Altschul, & Wilcke, 1985). The oil holding capacity is also due to enhanced hydrophobic character of proteins in the flours. Water and oil holding capacities of the *C. decumbens* were found to be 267.8 ± 0.15 and 347.9 ± 0.11 respectively (Table No: 2). Foaming properties are much important in the maintenance of the texture and structure of different food products (ice creams and bakery products) during and after processing. The foam ability of the flour depends on the presence of the flexible protein molecules which may decrease the surface tension of water (Sathe *et al.*, 1982). The results revealed that foaming volume increase and foaming stability of lotus rhizomes were found to be 169.5 ± 0.50 and $26.3 \pm 0.20\%$ respectively. The emulsifying capacity and stability is higher than the lotus flour reported by Muhamad Aslam Shad *et al.*, 2011. The emulsifying capacity and stability were found to be 185.6 ± 0.11 and 79.9 ± 0.14 respectively. The loose bulk density and packed bulk density of flour were found to be 34.8 ± 0.1 and $29.5 \pm 0.15\text{g/mL}$ respectively.

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