

Role of genus *Cassia* in combating malnutrition in *Sahariya* dominated Sheopur kalan region of Madhya Pradesh

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Abstract: The devastating condition of malnutrition prevails in Madhya Pradesh. Wild edible plants on their nutritional grounds can serve as novel potential source of food to the tribals suffering from malnutrition. Four species of *Cassia* were evaluated for their nutritional status and compared to the RDA value for further recommendation as food source. The comparison of various nutritional parameters of four species of *Cassia* genus was done to establish their potential to fight against conditions like malnutrition. Different parts of four different species of genus *Cassia* were selected for investigation on account of their edibility. The study reveals that, the flowers of *C. fistula* contain 88.64 % of moisture and 23.75% of total lipids. The leaves of *C. tora* contain 20.25% of total proteins, 2.7% of calcium and 3.24% of nitrogen. Seeds of *C. occidentalis* possess 6.4% of potassium while the seeds of *C. hirsuta* possess 65.45% of total carbohydrates and 1.75% of sodium.

Keywords: *Cassia*, *Sahariya* tribe, Sheopur kalan region, Malnutrition, Nutritional value.

1. Introduction

Madhya Pradesh is a rich depository of biodiversity. It has got 1,35,464 sq.mts. of forest area. Food yielding, medicinal, aromatic and herbal plants are the important products obtained from the forest area of the state. There are 46 recognized schedule tribes in Madhya Pradesh. The *Sahariya* is one of the primitive tribe of India dwells in forest. The history of *Sahariya* tribe goes back to many centuries and they still persist with their old traditions. Despite of number of natural calamities this tribe has managed its survival on account of their traditional knowledge and selection of food during the period of natural calamities [1], [2]. But in the present scenario as the tribe traditionally dependent on the forest for their livelihood and food, the *Sahariyas* have become encroachers on their own land as a result of the policy of "eminent domain" under which governments since the British raj has taken over forests [3]. Incidences of deaths caused by malnourishment are increasing at an alarming rate in the study area. This is evident by the reports related to the deaths caused by malnutrition. The *Sahariyas* are a designated as particularly vulnerable tribal community, which comprises nearly 4% of the tribal population of Madhya Pradesh as per 2011 census of India. It is one of the Primitive Tribe Groups (PTGs) in India, faces extreme poverty and serious child malnutrition [4].

On account of poor educational status, hygiene and inadequate supply of food the tribe is facing several serious health problems. Several reports of Government and non government agencies are there to explain the devastating condition of the tribe. Chronic energy deficiency and anemia was observed in *sahariya* women nearly 42.4% and 90.1% respectively. Under weight and stunting among under five children was reported 59.1% and 57.3% respectively. Low food security was found in *sahariya* inhabitant villages the odds of children were being found underweight and stunted. Calorie, fat, vitamin A, riboflavin, vitamin C and folic acid intake among women was lower than recommended dietary

allowance. A high prevalence of under nutrition and dietary deficiency exists among *Sahariyas* [5].

Districts like Sheopur- home to *Sahariya* tribal community tell the true picture of hunger and malnutrition in the state. According to the data provided by the Regional Medical Research Institute of Tribals in Jabalpur, 93 percent of *Sahariya* children are victims of severe malnourishment and 15 percent of them are almost on the verge of death due to malnourishment [6]. Malnourished children lead to the high mortality risks and survivors as vulnerable individuals with impaired immune system, prone for many infections. It is important to discuss that according to the World Health Organization's World Food Programmers, one of the most detrimental effects of malnutrition is the inability to resist disease. Besides Primary malnourishment there is one more physiological condition referred as Secondary malnourishment. This refers to instances when the body cannot properly process minerals and nutrients of food due to health conditions such as diarrhea. This is a serious issue in developing nations where a lack of clean water and poor sanitation are common. On account of poor educational and hygienic conditions tribe is dealing with many infectious diseases like diarrhea, fever, mouth ulcers [4] and pulmonary tuberculosis [7].

According to the report from Govt. of India, food deficiency usually prevails in under developed tribal areas. Still such tribal groups sustain successfully under adverse conditions as they stick on the alternative source of food, in the absence of wheat and rice and other kinds of conventional staple food plants. A large number of plant species as supplementary food, used by tribes of India. Broad nutrient categories include carbohydrates, fats, proteins, vitamins and minerals such as sodium, calcium, potassium etc. which are required in comparatively larger amount by the body and therefore called as macro-elements, whereas elements required in smaller amount are called trace or minor elements e.g. iron, zinc and copper etc. [8].

According to the reports published in national daily, The Hindu dated 28th Nov. 2009,[9] which emphasizes the fact that malnutrition has reached epidemic proportions in most parts of Madhya Pradesh. Children were said to be the most vulnerable group as 14 deaths were reported in this region due to severe malnutrition. Such reports drew our attention to this grave problem and an attempt was made to find out a long lasting solution to this problem. The methodology followed in the present study was by organizing field trips and ethanobotanical surveys in various regions of Sheopur kalan, to record different plant species of alternative food sources used by the aforesaid tribe in previous times

Large number of wild edible plants previously consumed by this tribe during scarcity of food are been enlisted, which were left in the course of modernization viz. *Amaranthus viridis* L., *Asparagus racemosus* Wt., *Bauhinia variegata* L., *Bauhinia purpurea* Wt. & Arn., *Sonchus aspera* L., *Butea monosperma* Kt. *Cassia tora* L., *Cassia obtusifolia* L., *Cassia occidentalis* L., *Cassia hirsuta* L. *Cassia fistula* L., *Dioscorea bulbifera* L., *Emblica officinalis* Gearth., *Jasminum auriculatum* L., *Moringa oleifera* Lam., *Oxalis corniculata* L., *Achyranthes aspera* L., *Tridax* sp., *Mangifera indica* L., *Zizyphus* sp. L., *Prosopis spicijera* Roxb., *Amaranthus spinosa* L., *Boerhavia diffusa* L., *Ficus glomerata* L., *Cassia floribanda* L. and *Nymphaea sentilla* L. [10]-[13].

The leaves of *Oxalis corniculata* exhibit rich in mineral contents like Sodium ($1.12 \pm 0.02\%$), Potassium ($2.17 \pm 0.31\%$), Calcium ($2.5 \pm 0.08\%$), Nitrogen ($3.56 \pm 0.70\%$) and Magnesium ($0.25 \pm 0.03\%$), these mineral components are vital in regulating various metabolic pathways in human body. Thus observations indicate that consuming *oxalis corniculata* during scarcity of food proves to be nutritious. The species grow in wild can be collected easily and tribals also store its dried parts so that it can be consumed at any time. Mineral composition of leaves also indicates that all required mineral found as per the RDA requirement [14].

Further to discover new sources of food we explored the knowledge of primitive people and came across the fact that there are immense sources of food which are being used by various tribes during scarcity of food and which helped in their existence till date. Genus *Cassia* came forth as one of the potential source of alternative food source. The present paper deals with the evaluation of four species of Genus *Cassia*. The various species of Genus *Cassia* were predominantly found to grow in this region. They are the rich source of nutrients and have great potential to fight against the severe problem of malnutrition [16], [17]. Hence, different edible parts of four species of the genus *Cassia* were selected for the purpose of the present study viz. leaves of *Cassia tora* L, seeds of *Cassia occidentalis* L., seeds of *Cassia hirsuta* L. and flowers of *Cassia fistula* L., on account of their edibility and were analyzed biochemically to establish their nutritional status.

2. Materials and Methods

The edible parts of selected plant species employed for biochemical analysis were collected from the waste land

near by the residential areas of sahariya tribe during a particular season say, the leaves of *C. tora* were collected in rainy season, flowers of *C. fistula* were collected in the month of Sept. and Oct. during its blooming period, the seeds of *C. occidentalis* and *C. hirsuta* were collected in the month of Aug. to Sept. and Nov. to Jan. respectively.

The nutritional values of the selected plant parts were studied by using various standard protocols. Estimation of moisture content was done by the method of Rajaram and Janardhanan [17]. For further biochemical estimations, the dried samples were powdered and sieved through the fine sieve, were used for analysing the nutritional status of the selected plant species. Estimation of total carbohydrates was done by anthrones method which was formulated by Jain and Guruprasad [18]. Ethanolic extracts were prepared and centrifuged, supernatant was collected and used for estimation of total carbohydrates in all the four samples. Total proteins were estimated by the method of Lowry *et al.* [19]. Protein extract was purified by precipitation in cold with 20% TCA and centrifuged. The pellets were dissolved separately in 0.25N NaOH and protein content was quantified spectrophotometrically. Total lipids were determined by Bligh and Dyer's method [20]. Minerals like sodium, potassium and calcium were estimated by quantifying the acid digested mixture of samples by digital flame photometer. Nitrogen content was estimated by microkjeldhal's method modified by Iswaran and Marwaha [21].

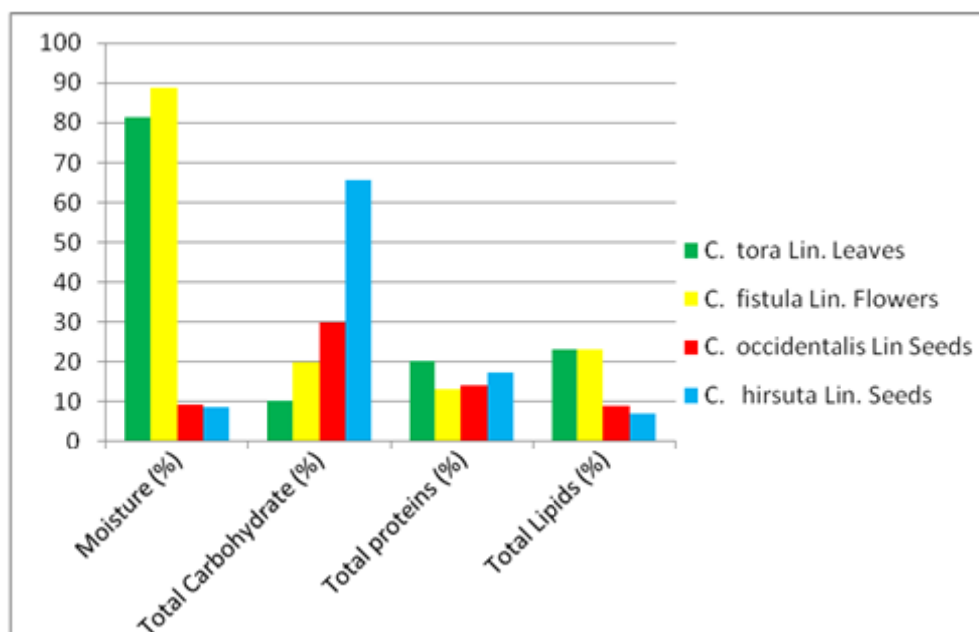
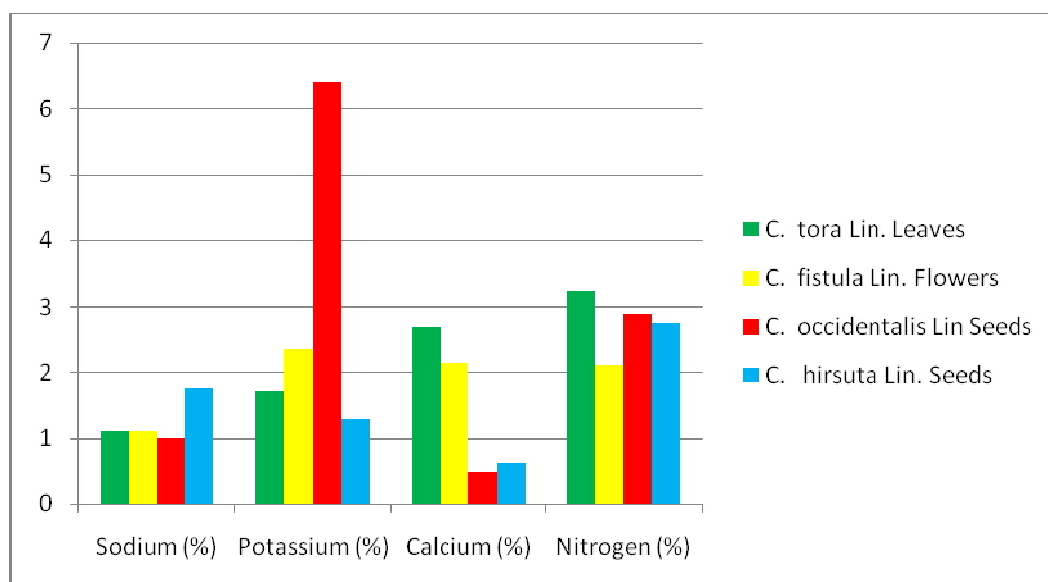
3. Results and Discussion

On evaluating the various nutritional parameters of four different species of genus *Cassia*, the following data was obtained. The moisture content of the flowers of *C. fistula* was recorded to be 88.64 % which was the highest among the four studied species. This was followed by the leaves of *C. tora* and seeds of *C. occidentalis* and *C. hirsuta* (Table 1; Fig. 1). The highest percent of total carbohydrates was recorded in the seeds of *C. hirsuta* which was 65.45 %. It was followed by the seeds of *C. occidentalis*, leaves of *C. tora* and flowers of *C. fistula*. The highest total proteins were found in the leaves of *C. tora* which was found to be 20.25 % followed by the seeds of *C. hirsuta*, *C. occidentalis* and flowers of *C. fistula* (Table 1; Fig. 1). Total lipid percent of the flowers of *C. fistula* was found to be 23.75 % which was recorded to be the highest followed by the leaves of *C. tora*, seeds of *C. occidentalis* and *C. hirsuta* (Table 1; Fig. 1).

The mineral profile of different edible parts taken for the study is shown in Table 1; Fig. 2. Of all the macrominerals, potassium was abundant in the seeds of *C. occidentalis* having 6.4 % followed by the flowers of *C. fistula*, leaves of *C. tora* and seeds of *C. hirsuta*. Highest percentage of sodium was recorded in the seeds of *C. hirsuta* which was 1.75% followed by the leaves of *C. tora* and the flowers of *C. fistula*. Lowest sodium percent was reported in the seeds of *C. occidentalis*. Leaves of *C. tora* showed highest percentage of calcium and nitrogen which was recorded to be 2.7 % and 3.24 % respectively.

Table 1: Comparison between various nutritional parameters of four selected species of genus *Cassia*

S. No.	Name of the species	Part used	Moisture (%)	Total Carbohydrates (%)	Total proteins (%)	Total Lipids (%)	Sodium (%)	Potassium (%)	Calcium (%)	Nitrogen (%)
1	<i>C. tora</i> Lin.	Leaves	81.43	10.35	20.25	23.25	1.102	1.72	2.7	3.24
2	<i>C. fistula</i> Lin.	Flowers	88.64	20	13.13	23.75	1.102	2.36	2.15	2.1
3	<i>C. occidentalis</i> Lin	Seeds	9.47	30	14.04	8.95	0.99	6.4	0.48	2.88
4	<i>C. hirsuta</i> Lin.	Seeds	8.58	65.45	17.24	7.04	1.75	1.29	0.62	2.75


Figure 1: Various nutritional parameters of four selected species of genus *Cassia*.

Figure 2: Mineral composition of four selected species of genus *Cassia*

Species of genus *Cassia* were found to grow wild in the region. All the four species taken into account for nutritional analysis were found to be sufficient enough to meet the daily requirement of nutrition [22]-[25]. All of them emerged as a good source total proteins, total carbohydrates and total

lipids by showing high percentage of all the three nutritionally important components and provide suitably enough minerals such as potassium, which was found to be 6% in the seeds of *C. occidentalis*. Nearly 3 % of calcium and. 3.3 % of nitrogen was found in the leaves of *C. tora*.

This is in concurrence with the recommended daily allowance [22].

Study reveals that all the four species can serve as the new and novel potential source of nutrition and can help in facing the problem of malnutrition caused by acute shortage of food in the third world countries like India. They can also help in the sustenance of traditional tribes like *Sahariya* or combating the prevalent condition of malnutrition in Sheopur Kalan. Not only Sheopur Kalan but the wild species which can be used as an alternative source of food to combat against malnutrition in their respective native areas. [26], [27]

4. Further scope of study

Wild edible plants from the local areas can further be investigated and can be used as low cost food substitute of conventional food plants, which would release the pressure from the existing food chain and add new substitutes to the list of edible plants. Addition in the list of food plant will help in making pace with increase in population and food resources especially in third world countries like India. Such edible plants can further investigated for their antimicrobial and antioxidant properties and can be used to strengthen the immune system and would serve as two way approach to fight against malnutrition and would improve the health status of the tribal population and people of third world country.

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Authors Profile



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