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Analysis of Minerals of wild vegetable *Cassia obtusifolia* from Poladpur

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Abstract: *Cassia obtusifolia is predominant wild vegetable growing on wasteland. It is cheap vegetable abundant in minerals. Mineral contents of wild vegetables are higher than conventional vegetables. Results revealed that leaves of C. obtusifolia contain appreciable amount of Calcium, beside this it also contains significant amount of nitrogen, potassium and magnesium. These minerals play vital role in various biological processes. So, wild vegetable C. obtusifolia is beneficial in human health.*

Key Words: *Cassia, obtusifolia, minerals, wild vegetable.*

1. INTRODUCTION:

Wild vegetables are the plants that grow in natural conditions and are freely harvested as vegetables. *Cassia obtusifolia* is a wild vegetable, belongs to sub-family Caesalpinioideae of Family Leguminosae. Wild edible plants are cheaper food sources containing a number of nutrients, carbohydrates, minerals, vitamins, fats and crude proteins that form the basic source of diet and are the good source of energy (1, 2). Sometimes wild edible unconventional plants have more nutrients as compare to conventional vegetables (3). Several studies showed that, wild vegetables are best source of nutrients and minerals. Besides the nutrients and minerals wild plants also provide important health benefits with biological and pharmacological effects (4, 5–9). The present study explores the micro and macronutrient minerals status of *Cassia obtusifolia*.

2. MATERIALS:

The leaves of *Cassia obtusifolia* (*C. obtusifolia*) were collected from Poladpur. Leaves were washed first with tap water to remove dirt and then by distilled water. They were blotted dry with paper towel. The material was dried in shade and ground into fine powder. This powder kept in airtight container and used for further analysis.

3. METHOD:

Macronutrient like N, P, K, Ca, Mg and micronutrients like Na, Zn Cu, Fe, Mn, Co from the leaves of *C. obtusifolia* were estimated. 0.5 g dried plant material was acid digested following the standard method by Toth et al. (1948) (10). Material was acid digested using acid mixture (1:1) nitric acid (HNO_3) and perchloric acid (HClO4) mixture. The plant material and 20ml acid mixture was digested on hotplate until the solution became colourless and reduced to about 2-3 ml. After heating solution was allowed to cool. After cooling it was transferred quantitatively to 100 ml capacity volumetric flask, diluted to 100 ml with distilled water and kept overnight. Next day it was filtered through Whatman No. 44 filter paper. The filtrate was stored properly and used for analysis. Total nitrogen was determined using the Hawk et al., (1948) (11) micro-Kjeldahl method. Phosphorus was estimated from the same acid digest following the method described by Sekine *et al.* (1965) (12). 2 ml of acid digest was pipetted out in a test tube, to which 2 ml of 2 N HNO3 was added followed by 1 ml of Molybdate-Vanadate reagent (Reagent A: 1.25 g ammonium vanadate dissolved in 1 N HNO3 and volume was made to 500 ml with 1 N HNO3. Reagent B: 25 g ammonium molybdate dissolved in distilled water and volume was made to 500 ml. Then reagent A and B were mixed in equal volumes). The volume was made to 10 ml with distilled water. The ingredients were mixed well and allowed to react for 20 min. After 20 min yellow colour intensity was measured at 420 nm using a reaction mixture blank containing no phosphorus. The colour developed by standards of known concentration of Phosphorus in KH2PO4 solution (0.025 mg $P.ml^{-1}$) with Molybdate-Vanadate reagent was used for plotting the standard curve. With the help of standard curve, the concentration of phosphorus in the plant material was calculated. Sodium was estimated flame photometrically following the standard procedure on flame photometer (Model-Elico, ch-22A). For standardization,

various concentrations of sodium were prepared ranging from 10 to 80 ppm by diluting stock solution of NaCl (100 ppm). The remaining inorganic elements viz. calcium, potassium, magnesium, iron, manganese, zinc, copper and cobalt were estimated using Atomic Absorption Spectrophotometer (Perkin-Elmer, 3030 A).

4. RESULTs AND DISCUSSION:

Macronutrient and Micronutrient minerals in leaves of *Cassia obtusifolia* are shown in Table 1.

Nitrogen (N): The nitrogen is constituent of proteins. So, the nitrogen content in the plants is of great importance. The protein content can be calculated by multiplying a factor of 6.25 to the nitrogen content of plant. The higher nitrogen content in plants indicates presence of higher protein content. The presence of higher protein content in the plants increases their nutritional value. Total nitrogen content in *C. obtusifolia* found comparable to total nitrogen content of conventional vegetables spinach and Cauliflower and more than that of carrot, fresh beans, cabbage and cucumber (13). Total nitrogen content in *C. obtusifolia* indicates that it may act as a good source of protein. The values obtained for nitrogen content in *C. obtusifolia* was higher than the values reported for some other wild vegetables of Turkey such as *Beta corolliflora, Bellevalia forniculata, Caltha polypetala, Primula auriculata etc.* (14).

Phosphorus(P): Phosphorus is critical for numerous normal physiological functions of the body. It is required for growth, maintenance of bones, teeth and muscles, skeletal development, mineral metabolism, transfer of energy and nucleotide synthesis (15). Phosphorus is essential part of DNA materials hence very important for the human body and it also take part in energy distribution. Daily requirement of Phosphorus to human body is 700 mg (15). In leaves of *C. obtusifolia* phosphorus content is 160 mg/100g which is more than common vegetables. Higher phosphorus content reported in several wild edible plants of different areas across the world (14, 16,17). Mih et al. (2017) reported lower phosphorus content in wild edible plants (18).

Potassium (K): Potassium is a multi-functional mineral and has important role in regular contraction of the muscles, maintaining the electrical conductivity of the brain and normality of blood pressure in human body (19). Higher potassium intake lowers blood pressure which helps to protect from risk of stroke (20). The dietary reference intake (DRI) of potassium is 4,700 mg/day for adults (15). Leaves of *C. obtusifolia* Contains 1490mg/100g of potassium. *C. obtusifolia* can contribute 31.70 % of potassium to the DRI. *C. obtusifolia* has considerable amount of potassium. Tuncturk et al. (2015) reported highest potassium content in species of *Scorzonera* (16) and significantly higher amount of potassium also found in wild vegetables of Southern Angola (17). *Solanum nigrum*, *Phytolacca acinosa*, *Piper pedicellatum* and *Pouzolzia hirta* contain higher potassium than *C. obtusifolia* (21). While some wild vegetable from different regions reported lower potassium content (18, 22, 23).

Magnesium (Mg): Magnesium is involved in several biochemical reactions, energy metabolism, protein synthesis and other vital processes within the body. It is important for cardiac and nerve function (24). The DRI value of magnesium is 310– 420 mg/day for adults (15). The magnesium content in *C. obtusifolia* is 370mg/ 100g which can act as rich source. Mg content of *C. obtusifolia* in range of in *Scorzonera tomentosa* (3.17 g kg-1i. e. 317 mg/100mg) and lower than Scorzonera tomentosa (6.80 g/ kg i. e. 680mg/100g) as reported by Tuncturk et al. (2015) (16). *Amaranthus hybridus* and *Galinsoga parviflora* showed higher amount of Magnesium than that of *C. obtusifolia* (17). Wild vegetables from South Western Cameroon, North-Eastern Region in India various locations of Kolkata and Pakistan shown less magnesium content (18, 21, 22, 23, 25)

Calcium (Ca): Calcium is major constituent of bone, human blood and extracellular fluid. It plays very important role in the normal functioning of the cardiac muscles, blood coagulation, milk clotting and the regulation of cell permeability (26). The dietary reference intake (DRI) value of magnesium is 1000mg/day for adults (Otten et al. 2006). Calcium content in *C. obtusifolia* is 2550 mg/ 100g which is higher than those reported on some common vegetables (7–160 mg/100 g) (27, 28). Agbo (2004) reported significantly higher calcium content in leaves of *C. obtusifolia* from Nigeria (29). Seal et al. (2017) reported calcium content in *Solanum nigrum*, *Phytolacca acinosa*, *Piper pedicellatum* and *Pouzolzia hirta* found in the range of calcium content of *C. obtusifolia* (21). Tuncturk et al (2015) also reported amount of calcium in wild vegetables in the range of *C. obtusifolia* (16). Lower amount of calcium also reported from most of wild vegetables from Southern Angola, South Western Cameroon, Meghalaya and Kolkata in India (17, 18, 22, 23, 25).

Sodium (Na) Sodium is responsible for metabolite transportation. Sodium is essential in maintenance of osmotic pressure and water distribution in various body fluid compartments, maintenance of proper pH, regulation of the proper function of the heart and other muscles, involvement in oxidation - reduction reactions, and participation in catalysis as cofactors for enzymes (30). Sodium content in leaves of *C. obtusifolia* is 0.9 mg /100g. In various wild vegetables significant higher amount of sodium was reported. Tuncturk et al. (2015), Datta et al. (2019) Seal et al. (2020) reported highest sodium content in wild vegetables of Turkey in species of Scorzonera (16, 17, 22,23). Mih et al. (2017) found higher sodium content in *Amaranthus dubius*, *Gnetum africanum* and *Lomariopsis guineensis* while

lower in *Vernonia amygdalina* (18). In Wild vegetables of Arunachal Pradesh contain lower sodium content in leaves of *Solanum nigrum*, *Phytolacca acinosa*, *Piper pedicellatum* and *Pouzolzia hirta* than *C. obtusifolia* (21).

Zinc (Zn)- Zinc forms a structural component of many enzymes. It also plays an important role in nucleic acid synthesis, bone metabolism and cell division, sexual development and immune function (31). The DRI value of zinc is 11 mg for adult males and 8 mg for adult females (15). Zinc content in *C. obtusifolia* is 4.52mg /100g. Seal et al. (2017) reported highest Zinc content in *Solanum nigrum*, *Phytolacca acinosa*, *Piper pedicellatum* and *Pouzolzia hirta* than that of *C. obtusifolia* (21). Tuncturk et al. (2015) also found higher content of Zinc in *Scorzonera suberosa* (16). Wild edible plants of Southern Angola, South Western Cameroon, Pakistan and Meghalaya State in India showed lower content of Zinc (17,18,22, 25)

Copper (Cu) Copper is an important component of an enzyme that helps in collagen synthesis, iron mobilization, energy metabolism and haemoglobin formation preventing anaemia (32). In leaves of *C. obtusifolia* copper content is 1.26 mg/100g. Copper content of some cultivated vegetables ranged from 0.01 to 0.16 mg/100 g as reported by Holland et al. (1992) and Roe et al. (2013) (27, 28). Daily intake of copper for adults is 0.9 mg (15). This plant contains a sufficient amount of copper. 5 Tuncturk et al. (2015) reported higher copper content in three species of *Scorzonera* in Turkey (16). Seal et al. (2017) also found higher copper content in *Solanum nigrum*, *Phytolacca acinosa*, *Piper pedicellatum* and *Pouzolzia hirta* than that of *C. obtusifolia* (21). The amount of Copper in *C. obtusifolia* was found to be in greater amount than *Caralluma edulis*, wild vegetables of South Western Cameroon, Southern Angola and Kolkata in India. (17, 18, 23, 25).

Iron (Fe)- Iron is important in many bioreactions. It is essential component of catalase, protein and energy metabolism. It acts as a respiratory carrier of haem, oxidation–reduction reactions, and in the electron transport system (33). The DRI value of iron is 8 mg for adult males, 18 mg for adult females and 27 mg for pregnant women (15). Iron content in *C. obtusifolia* is 1.02mg /100g. Seal et al. (2017) reported higher iron content in *Solanum nigrum* and lower iron content in *Phytolacca acinosa*, *Piper pedicellatum* and *Pouzolzia hirta* than that of *C. obtusifolia* (21). Higher Iron content reported in wild vegetables of southern Angola, Turkey, Pakistan and also Meghalaya and Kolkata of India (16, 17, 22, 23, 25). Mih et al. (2017) reported lower amount of iron content in wild vegetables in South Western Cameroon (18).

Manganese (Mn)- Manganese is essential for the metabolism of carbohydrate, protein and fat. It also helps to increase production of steroid sexual hormones (34). It supports the immune system. It also works with vitamin K to support blood clotting, regulates the blood sugar level and helps control the effect of stress (26, 35). The DRI of manganese is 2.3 mg for adult males and 1.8 mg for adult females (15). In leaves *C. obtusifolia* 3.98 mg /100 g of manganese is observed. Tuncturk et al. (2015)- found higher Mn content in *Scorzonera cana* and *S. suberosa* than the *C. obtusifolia* (16). Seal et al. (2017) reported higher manganese content in *Solanum nigrum*, *Phytolacca acinosa*, *Piper pedicellatum* and *Pouzolzia hirta* than that of *C. obtusifolia* (16). Wild vegetables of Pakistan, South Western Cameroon and Meghalaya showed lower Manganese content (18, 22, 25).

Cobalt (Co) Cobalt is fundamental coenzyme of cell mitosis. It is also important component of vitamin B12. It is required for synthesis of amino acids and some proteins. Cobalt is essential for creating neurotransmitters. It is also required for the formation of erythrocytes in bone marrow and prevents anemia (36-39). *C. obtusifolia* contains 5.60 mg / 1000 g Cobalt. The Co content in vegetable sample was found within the allowable limit of 50 mg/kg suggested by FAO/WHO (40). Cobalt content in wild vegetables of north east India was similar to the range of cobalt content in *C. obtusifolia* (41). Tuncturk et al. (2015) and Mih et al. (2017) reported lower values of Cobalt in Turkey and South Western Cameroon respectively.

5. CONCLUSION:

RECOMMENDATIONS:

Table 1. Macronutrient (g 100g $^{-1}$ dry wt.) and Micronutrient (mg 1000g $^{-1}$ dry wt.) minerals in leaves of *Cassia obtusifolia*.

Macronutrients	N	P	K	Mg	Ca	
	4.39	0.16	1.49	0.37	2.55	
Micronutrients	Na	Zn	Cu	Fe	Mn	Co
	9.00	45.2	12.6	10.2	39.8	5.60

6. CONCLUSION:

Now a days consumption of wild vegetables is increasing in human diet. Various studies showed wild vegetables are rich in minerals. Minerals play important role in nutrition, various metabolic processes and help to fight against diseases. *Cassia obtusifolia* analysed to study the concentrations of different macro and micro mineral

nutrients. The results showed that *C. obtusifolia* contain significant amount of nitrogen, potassium, magnesium and calcium. The present study indicates that *C. obtusifolia* act as good source of mineral nutrients essential for the human nutrition and health.

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