



**NUTRITIVE VALUE OF RHIZOME OF THE *CANNA INDICA* LINN.
AND CHARACTERISTICS OF VARIOUS EXTRACTED
MATERIALS FROM THE RHIZOME**

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ABSTRACT

Rhizomes of *Canna indica* Linn. has its own great important medicinal value, so thenutritive value of the rhizome is determined. Rhizome of *Canna indica* is found rich in carbohydrate and have enough crude fiber (67.99 and 12.50% respectively) ; nutritive value being 319.15 Cal /100 g. Rhizome is rich in Potassium (24405 ppm) and sufficient in sodium, calcium and magnesium (7500, 1345 and 1610 ppm respectively). Other biologically important metals Cu, Ni , Mn, Fe, and Zn are also in suitable amounts. The useful materials from the rhizomes of *Canna indica* were extracted by using solvents of decreasing polarities, viz. Water, Ethanol, Diethyl ether and Petroleum ether. The water extract has maximum yield. All of the solvent extracted materials are dextrorotatory.

KEY WORDS : *Canna indica* Linn, *Canna orientalis*, Cannaceae, Nutritive value, Ash analysis



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INTRODUCTION

The plant *Canna indica* Linn. (Syn. *Canna orientalis* Roscoe) is a well known plant of Cannaceae family. In Hindi it is known as *Sabbajayain*, and Devakuli sankrit¹. It is also known as Indian shot or Canna lily. The stem of *Canna indica* is high (0.9-1.2m), leaves are, oval or almost orbicular,, lanceolate to ovate, caudate acuminate, veins arching, sheath open above (15-45 cm by 10-20 cm). Its flower rather distant (5-6.5 cm long) bracts (1.3-2.5 cm), oblong membranous.²Dried leaves and stem of the plant is used as anti diabetic in the north India³. Essential oil from the rhizomes of *Canna indica* also shows inhibitory activity against some tested bacteria⁴. The antimicrobial properties of various extracts obtained from the rhizomes of *Canna indica* is also reported by Abhishek et. al⁵. Every part of *Canna* has beneficial properties that can serve humanity so the whole plant can be extensively studied for further research aspects⁶.

MATERIALS AND METHODS

Authenticated rhizomes of *Canna indica* were procured from North India and authenticity verified from F.R.I. Dehradun. Specimens have been deposited in the herbarium of Plant Medicine Section of the Botany Division of University. The procured rhizomes were washed with luke warm water and dried in shade.

EXTRACTION OF MATERIAL IN SOLVENT OF DIFFERENT POLARITY

Dried rhizomes (about 100 gm) were crushed and kept in sufficient quantity of Solvent (Petroleum ether, Diethyl Ether, Ethanol and Water) in a Soxhlet extractor for 72 hours. A decoction was collected and fresh quantity of solvent was added again and kept again for 72 hours. The process was continued till the extract become colourless. All the extracted solutions were mixed and extracted material was separated under reduced pressure. A Yellowish brown viscous oily material was obtained in the case of Petroleum ether and Diethyl ether, and dark solid material was obtained in case of ethanol and water.

ANALYSIS OF MATERIAL FOR MINERAL AND TRACE ELEMENT

A silica crucible was heated to about 600°C and cooled to get the constant weight. About 5 gm of dried material was placed in crucible and it was heated first over a low flame till all the mineral was completely charred followed by heating in a muffle furnace for about 3-5 hours at 600°C. Now cooled in a desiccator and weighed. To ensure the completion of ashing, the crucible was again heated in a muffle furnace for 30 min. Cooled and weighed. This procedure was repeated till two consecutive weights were the same and the ash was almost white or grayish white⁷. 1 gm of the ash obtained from the above mentioned method was dissolved in 100 mL of 5% hydrochloric acid. Obtained solution is ready for the mineral analysis using ICP-MS (PerkinElmer SCIEX ELAN DRCE).

NUTRITIVE VALUE ANALYSIS OF THE MATERIAL (RHIZOMES)

For the determination of moisture content about 2 gm or material (rhizomes) was over night in a flat bottom disk in an air oven at 100-110°C and weighed. The loss on drying the moisture content^{8,9}. The crude proteins were determined using micro Kjeldahl method¹⁰. The estimation of crud fibre is based on treating the moisture and fat free material with 1.25% dilute acid, then with 1.25% alkali, thus imitating the gastric and intestinal action in the process of digestion. The material left undissolved is considered as crude fibre¹¹. The fat or oil is extracted from the moisture free material with ether or petrol of boiling point below 60°C. Other substances, e.g., waxes, resins, organic acids, colouring matter etc. are also extracted with fat¹².The percentage of carbohydrate is determined by difference Carbohydrate % = 100 – (Ash% + Moisture% + Fat% + Protein %) Nutritive value of plants can be calculated by using the following formula
 Nutritive value = {4 × Protein (%)} + {9 × Fat (%)} + {4 × Carbohydrate (%)}

RESULTS AND DISCUSSION

Physical state and yield of the various extracted material is compiled in Table-1. Material has the highest yield in water

extract. Elemental analysis of the ash analysis is compiled in Table-2. It is clear from the table that the amount of potassium is maximum (24405 ppm) indicates a high usefulness of the rhizome. Potassium (K) is of importance as diuretic. Sodium is also in good amount (7500 ppm). Sodium and Potassium take part in ionic balance of the human body and maintain tissue excitability. Because of the solubility of salt, Na plays an important role in the transport of metabolites. Both are in suitable amounts in the studied. Calcium is also in very good amount (1345). Calcium constitutes a large proportion of the bone, human blood and extracellular fluid; it is necessary for the normal functioning of cardiac muscles, blood coagulation and milk clotting, and the regulation of cell permeability. It also plays an important part in nerve-impulse transmission and in the mechanism of neuromuscular system. Amount of Magnesium is also remarkable (1610 ppm). Mg has electrochemical and enzyme activating functions¹³. Mg is required in the plasma and extracellular fluid, where it helps maintain osmotic equilibrium. It is required in many enzyme-catalysed reactions, especially those in which nucleotides participate where the relative species is the magnesium salt, e.g., MgATP²⁻. Lack of Mg is associated with abnormal irritability of muscle and convulsions and excess Mg is associated with depression of the central nervous system. Copper is present in sufficient amount (102 ppm). Importance of Copper is well known. It is a

component of many enzyme systems such as cytochrome oxidase, lysyl oxidase and ceruloplasmin, an iron oxidizing enzyme in blood¹⁴. The observation of anaemia in Cu deficiency may probably be related to its role in facilitating iron absorption and in the incorporation of iron into haemoglobin¹⁵. Nickel is lowest (<1 ppm). It is a little bit lower than required for good nutrition. Nickel is an active metal in several hydrogenases and plant ureases. Chicks and rats raised on deficient nickel diet show impaired liver function and morphology¹³. Chromium is <1 ppm. It is again a suitable quantity. Honey contains 0.29 ppm of Cr. Chromium plays a vital role in metabolism of carbohydrates and its deficiency leads to diabetes¹⁶. Deficiency of chromium may also result in hyperglycaemia, growth failure, neuropathy, cataract and atherosclerosis¹⁷. Manganese is also <1 ppm. Mn is essential for haemoglobin formation¹⁸, but excess is harmful. Quantity of Zn is not very high and only just the sufficient. Zn is a component of many metalloenzymes, including some enzymes which play central role in nucleic acid metabolism¹⁹. In addition, Zn is a membrane stabilizer and a stimulator of the immune response. Its deficiency leads to impaired growth and malnutrition²⁰. A salient feature of the present study is that the nutritive value of the rhizomes is very good (319.15 Cal per 100g). Results are compiled in table-3. The rhizome of *Canna indica* seems to be good in amounts of fiber (12.50%) and carbohydrate (67.99%).

Table-1
Physical state of various Extract from Rhizomes

S. No.	Solvent	Physical state	Yield	Colour of decoction	Colour of isolated material	Odour
1.	Petroleum Ether	Semisolid	0.40%	Light Brown	Dark brown	Mild Spicy
2.	Diethyl Ether	Semisolid	0.65%	Dark yellow	Red brown	Sharp Spicy
3.	Ethanol	Semisolid	1.85%	Reddish Brown	Brown	Pleasant spicy
4.	Water	Semisolid	9.15%	Reddish Black	Black	Mild Spicy

Table-2
Concentration of various elements (ppm)

S. No	Elements	Concentration (ppm)
1	Na	7500
2	K	24405
3	Ca	1345
4	Mg	1610
5	Cu	102
6	Ni	Less than 1 ppm
7	Mn	Less than 1 ppm
8	Fe	1.9
9	Zn, Pb, and Cr	Less than 1 ppm

Table-3
Nutritive value of studied rhizome

S.No.	Parameter	Result
1	Moisture Content	15.20%
2	Crude protein	0.85%
3	Crude fiber	12.50%
4	Crude fat	0.710%
5	Carbohydrate	67.99%
6	Nutritive value	319.15 Cal/100 g

CONCLUSION

As the global scenario is changing to use nontoxic plants to use as a medicine. *Canna indica* Linn. is a perfect example to fit in this scenario. Various extracts and essential oils obtained from the plant have good antimicrobial activity against certain

pathogens^{4,5}. The results of the determination of moisture content, crude proteins, crude fibre, crude fat and carbohydrate indicate that the rhizomes of *Canna indica* offer a balanced nutrition as they have all essential elements in good amount.

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