



**MICRONUTRIENTS AND VITAMIN ANALYSIS OF  
*BRYONOPSIS LACINIOSA* FRUIT**

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**ABSTRACT**

The study was planned to analyse the vitamins and minerals present in *Bryonopsis laciniosa* fruit. Study revealed that the fruit contains Vitamins like C, D and E. Iron was found to be very much abundant and Calcium, Magnesium, Potassium, Chloride are in high amount. Sulphate and sodium are in a moderate level. Carbon, phosphorous, sodium, sulphur, zinc and manganese are substantially present while copper, Boron, selenium and molybdenum are present in trace amounts. These substances may be responsible for the health related properties which are based on their antioxidant, anticancer, antipyretic, antiaphoretic, antidiabetic, anti-inflammation, antiheamatisum, antimicrobial and antiviral activity.

**KEY WORDS:** *Bryonia laciniosa*, Vitamins, minerals, essential nutrients



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## INTRODUCTION

Plants have great importance because of their nutritive value. Throughout the human history they are the major sources of medicines<sup>1</sup>. In the traditional system the contribution of herbal medicine for curing various diseases has been documented<sup>2</sup>. Use of herbal medicine has been gradually increased in recent years because they are regarded as potentially safe. More than 70% of world population depends on herbal medicine for health care<sup>3</sup>. Vegetables, pulses and cereals are the major part in the Indian food system. They can provide rich nutrition and health because almost all vitamins and minerals are present in it<sup>4</sup>. Our body requires vitamins and minerals to lead a healthy life. They involve in various biochemical processes<sup>5</sup>. Minerals are the substances that cannot be synthesized by living organisms and must be obtained from diet. Our human body requires essential minerals to maintain good health. The presence of trace elements indicates the medicinal value of the plant. Minerals influence the normal growth, development and biochemical functions combating a variety of diseases and ailments. *Bryonopsis laciniosa* Linn is a shrub widely found in India, Philippines and some part of Africa. It belongs to Cucurbitaceae family called as Shivlingi in India and commonly known as lollipop climber. Stem is slender, grooved, much branched, globous. Tendrils are slender, scabrous above, smooth, margin denticulate undulate or subcrenulate. Flowers monoecious, often male and female clustered together. Fruits berries, spherical. Subsessile, globose, smooth, bluish green, streaked with broad vertical lines. Seeds ovoid with thickened, corrugated, margins. Plant flowers and fruits during the period of August to December<sup>6</sup>. *Bryonopsis laciniosa* is one of the most versatile plants having wide spectrum of biological activity. Leaves and fruits are cooked as vegetables so they are edible in nature<sup>7</sup>. It is a potent adjunct in treatment of inflammation, fever. Seeds are antibacterial, antifungal, and it is used as a tonic in homeopathy and ayurvedha. Tincture made from roots are used in inflammation of uterus, vaginal disorders and

urinary problem<sup>8</sup>. Leaf juice can be applied for pains. Fruits are used as tonic. Seeds enhance the spermatogenesis and increase the sperm count. Whole plant is used to treat asthma, cough and bronchitis. The aim of this study is to determine the vitamins and minerals in *Bryonopsis laciniosa* fruit, which may provide an insight into its use in traditional medicine.

## MATERIALS AND METHODS

### **Collection of *Bryonopsis laciniosa* fruit**

*Bryonopsis laciniosa* (Linn) is an annual scandent herb and is widely spread in India. This plant fruit was collected from Ramanathapuram District. (Identification: These samples were authenticated by Dr. V. Ramachandran, Associate professor, Department of Botany, Bharathiyar University, Coimbatore.) Each specimen was washed under running tap water, labeled, weighed and annotated with the date of collection. Each specimen dried at 37°C for 15 days, powdered and stored in an air-tight container.

### **Preparation of Fruit extract**

2 gm of dried finely powdered plant material was taken in a beaker. 30 ml of distilled water and 70 ml of methanol was added. The mixture was shaken by continuous stirring at room temperature for 30 minutes and kept for 2 days. Then the solvent was allowed to evaporate and the extract was used for the phytochemical analysis.

### **Qualitative analysis of Vitamins**

Vitamins are analyzed by the standard method<sup>9,10</sup>

### **Qualitative analysis of inorganic elements**

Fruits (0.5 gram) of *Bryonopsis laciniosa* were treated with 10 ml of mixture of concentrated HNO<sub>3</sub> and HCl (3:1 v/v) and kept in boiling water bath for 1 hour. After the filtration, the filtrate was used to perform the inorganic elements followed by the method of<sup>11</sup>.

### **Quantitative analysis of Elementals**

Sample was prepared according to standard method followed. Ash and total Sulphur was

estimated using Gravimetric method by Golterman<sup>12</sup> Organic Carbon was estimated by the method of Walkey and Black<sup>13</sup>. Total Nitrogen was determined by the method of Micro Kjeldhal<sup>14</sup> and Total Phosphorous by Pemberton method<sup>15</sup>. Total Potassium, Total Sodium, Total Calcium, Total Magnesium were

analysed by Flame Photometry by the method of Stanford and English method<sup>16</sup>. Total Zinc, Total Copper, Total Iron, Total Manganese, Total Boron, Total Selenium, Total Molybdenum were analysed by using Atomic Absorption Spectroscopy (Solar-AAS2-UK made).

**Table 1**  
**Qualitative analysis of Vitamins in Bryonopsis laciniosa fruit extract**

S.No	Name of the Vitamin	Observation
1	Vitamin – A	---
2	Vitamin - C	+ + +
3	Vitamin - D	+ + +
4	Vitamin - E	+ + +

(+) Presence; (-) Absence +++ = High concentrations

**Table 2**  
**Qualitative analysis of Inorganic elements in Bryonopsis laciniosa fruit extract**

S.No	Name of the Compound	Observation
1	Calcium	+ + +
2	Magnesium	++ +
3	Sodium	++
4	Potassium	+ + +
5	Iron	+ + +
6	Sulphate	+
7	Phosphate	--
8	Chloride	+ + +
9	Carbonate	---
10	Nitrate	+ + +

(+) Presence; (-) Absence ++ = Medium, +++ = High concentrations

**Table 3**  
**Quantitative analysis of Minerals in Bryonopsis laciniosa fruit extract**

Sl.No	Name of the parameter	Quantity
1.	Ash (%)	0.32
2.	Total Iron (ppm)	84.23
3.	Total Calcium (%)	2.62
4.	Total Potassium (%)	2.36
5.	Total Magnesium (%)	1.26
6.	Total Nitrogen (%)	1.05
7.	Total Sulphur (%)	0.69
8.	Total Manganese (ppm)	0.56
9.	Total Sodium (%)	0.54
10.	Organic Carbon (%)	0.52
11.	Total Zinc (ppm)	0.42
12.	Total Phosphorus (%)	0.15
13.	Total Copper (ppm)	0.11
14.	Total Boron (ppm)	0.02
15.	Total Selenium (ppm)	0.01
16.	Total Molybdenum (ppm)	0.01

## RESULTS AND DISCUSSION

The present investigation focused on the analysis of vitamins and minerals in *Bryopnosis laciniosa* fruit and represented. Vitamins C, D and E are present in rich amount and is given in table 1. Vitamin C possesses antioxidant protection and enhances the immune cell activity, particularly T-cell activation and phagocytosis<sup>17,18</sup>. It supports the synthesis and function of neurotransmitters, collagen and carnitine<sup>19</sup> and it maintains its concentration in higher level in brain<sup>20</sup>. Vitamin C is very essential for conversion of dopamine to nor epinephrine and enhances the interneuronal communication<sup>21</sup>. Collagen is a basic component of bones, joints, gums, ligaments, blood vessels, tendons vertebral discs, teeth and skin. It protects the mucous membrane of the mouth and gastro intestinal tract from hemorrhage and helps in wound healing<sup>22</sup>. It facilitates in the transformation of Cholesterol into bile acids in liver and required for proline hydroxylation<sup>23</sup>. For several metabolic enzymes it acts as cofactor<sup>24</sup>. It also acts as a powerful antioxidant and express its role in the prevention of asthma, heart diseases, cataract and cancer<sup>25</sup>. Vitamin C participates in the breakdown of histamine which is the component for many allergic reactions and helps to absorb the Iron. It protects the DNA from the cell damage and lymphocytes from mutation<sup>26</sup>. It also helps in the production of thyroid hormones. Supplementation of vitamin C (1000mg/day) decrease the risk of developing pressure in surgical patients<sup>27</sup>. This Vitamin supports the sperm from oxidative damage<sup>28</sup> and mainly improves the quality of the sperm in smokers. Blood pressure and Cholesterol levels are maintained by vitamin C<sup>29</sup>. Release of uric acid along the urine is enhanced by Vit.C<sup>30</sup>. Sufficient amount of Vitamin C give relief from back pain and pain from inflammated discs<sup>31</sup>. It prevents the body from bacterial and viral infections. Vitamin D maintains the level of calcium and phosphorus<sup>32,33</sup>. Therefore it has great effort in formation and maintenance of strong bones. It prevents pellagra, diabetes and tuberculosis. Vitamin D prohibit the muscle

weakness and fracture<sup>34,35</sup>. It Influences the systemic blood pressure<sup>36,37</sup>. Breast feeding mothers those having sufficient levels of Vitamin D possess the prevention from rickets in children. One of the most potent hormone Vitamin D enhances the normal cell growth and inhibits the proliferation, invasiveness angiogenesis and metastatic potential in various cancers.<sup>38, 39,40</sup> It act as powerful immunosuppressant and plays important role in brain development. Vitamin E is a powerful antioxidant that helps to reduce the atherosclerosis. Vitamin possesses the strong anticancer activity by increasing apoptosis<sup>41</sup>. Minerals in the fruit were analyzed and shown in the table. 2. Minerals are called a "spark plugs of life" because they are required to activate hundred of enzymes reactions within the body. Life is dependent upon the body's ability to maintain balance between minerals. In this calcium, magnesium, potassium, iron, chloride, nitrate are present in high amount and sulphate and Sodium in secondary level. Quantitative estimation of minerals were carried out and the results are represented in table 3. The fruit was found to be very rich in iron when compared to other elements. Calcium, Potassium, Nitrogen and Magnesium were high when compared to the carbon. phosphorous, sodium, sulphur, zinc, and Manganese were found in moderate level and copper, boron, selenium and molybdenum were in trace amount. Ash exhibits the inorganic part of plant<sup>42</sup>. Iron is well known component essential for oxygen transport and cellular respiration<sup>43</sup>. Integral part of cytochrome, haemoglobin, myoglobin, metallo flavoproteins and enzymes like catalase, peroxidase are mainly composed by Iron. It facilitates the oxidation of carbohydrates, proteins and fat to control body weight and prevents anemia<sup>2</sup>. Iron is highly required for DNA synthesis and involves in the activation of neurotransmitter enzymes. Calcium involves in functioning the central nervous system, conduction of nerve impulses and activates neurotransmitters enzymes. Main action of calcium is bone and teeth formation. It promotes normal action of cardiac muscle, blood coagulation, cell permeability, and sufficient level of calcium

prevents rickets, osteoporosis, indigestion, back pain, irritation, cramping of uterus, tetany Calcium activates the enzymes like adenykinase, ATPase, arginine kinase, phospholipase and involves in erythropoiesis<sup>44</sup>. Potassium is concerned with activation of enzymes, peristaltic movement in gastro intestinal tract, synthesis of proteins, maintenance of ionic balance, tissue excitability, muscle contraction, transmission of nerve impulse, regulation of the heart rhythms, gastric juice formation in stomach and red blood cell formation. In intra and extra cellular fluid this mineral is very important and it is traditionally used for Jaundice<sup>45</sup>. Magnesium is an important trace element associate with phosphate and calcium and play a role in formation of muscles and bones, RBC and prevents the blood pressure, heart diseases and depression Mainly magnesium activates the carbohydrate metabolizing enzymes which particularly involves in Krebs and glycolysis and nucleic acid synthesizing enzymes. During protein synthesis it acts as binding agent of ribosomes. It also participate in muscle regulation, membrane stabilization, nerve co ordination, ion transport and amino acid activation. Adequate amount prevents from peripheral vasodilation, cardiac diseases, depressed skeletal muscle contraction, leukemia and cancer<sup>46</sup>. Magnesium plays role in release of Insulin. Nitrogen involves in food digestion and growth Sulphur is used as an ointment for various dermatological diseases, antidote for exposure of radioactive material. Sulphur is a potent wound healing agent particularly external wounds. Sulphur containing soaps and perfumes prevents infections, rheumatic pain and psoriasis. It is also used to promote the immune system in HIV +ve patients. It act against depression, arthritis, intestinal cystitis, congenitive heart failure, diabetes, cancer AIDS, auto immune diseases, allergy, pain, athletic injuries. Chondroitin sulphate promotes the water retention, elasticity in cartilage and inhibit the enzyme that breakdown the cartilage<sup>47</sup>. Manganese is essential for Hemoglobin formation. Sodium plays a vital role in many physiological process. Sodium is required in

large amount by animals for regeneration of nervous impulses, regulation of fluid balance, blood volume, blood pressure, osmotic equilibrium, pH, body fluids, heart activity<sup>[48]</sup>. The major source of sodium is sodium chloride in diet and also used as preservatives. when sodium ion come across the nerve cell membrane in central nervous system, the amount of signal transduction is indirectly regulated by renin-angiotensin system and the atrial natriuretic peptide. Thus sodium is very much important in osmoregulation between cells and extracellular fluid and functioning of neurons. All living organisms contain carbon, which forms the basis for all of the organic molecules in the body. Carbon is the second most abundant element in the human body, accounting for 18% of body weight. Zinc is one of the essential trace element posses normal growth, cell division, brain development, wound healing, behavioural response, reproduction, optimizing the immune system and bone formation. It cooperates in the formation and regulation of DNA throughout the life. It supports normal growth and development. It plays role in management of diabetes and also in Ca and Mg utilization and posses antioxidant and anti microbial activity. Particularly in children it prevents the lack of immunity, growth retardation, poor appetite, diarrhea, pneumonia, mental lethargy, skin lesions and male hypogonadism<sup>2,49</sup>. It is present in alcohol dehydrogenase, alkaline phosphatase, carbonic anhydrase and procarboxy peptidase. Zinc indicates the sense of taste and smell. Zinc is used as signal messenger in cells of immune system, intestine, prostate and salivary glands<sup>50</sup>. Zinc exhibit antiproliferative effect and inhibits the development of cancer. It also prevents Chromosome and DNA damage. Phosphorous helps in formation of bones and teeth. Generally nerve conductary enzymes are phosphoproteins and phospholipids. Phosphate ion is the primary ion in both intra and extra cellular fluid<sup>51</sup>. Coenzymes and high-energy compounds contains phosphates. Normal cell growth, kidney function, maintenance of pH, Blood sugar level and normal heart rate depends on the level of phosphorous<sup>52</sup>. Copper

is an enzymatic mineral important for growth, embryonic development, mitochondrial respiration, regulation of hemoglobin levels, iron metabolism, biosynthesis of neurotransmitter, free radical detoxification and it cooperates with iron and prevents anemia and neutropenia. It also prevents hypertension, hyperglycemia, allergy, osteoporosis and Wilson's disease[2]. Copper increases the antioxidant response and scavenges the free radicals. The essential component in ceruloplasmin, iron oxidizing enzyme, lysyl oxidase and cytochrome oxidase is copper. Copper strengthens the skin, blood vessels, epithelial cells and connective tissue. It plays a vital role in haemopoiesis, production of melanin and myelin. Normal function of thyroid gland is due to copper. Metallo enzymes contains copper which it act as an electron donor or acceptor. Boron is a trace mineral involves in the stabilization of intra and extra cellular skeleton, bone development, mineralization of Ca, P and Mg. It is a co factor in enzymes and cell signaling molecules. It can reduce the triglycerides and cholesterol and prevents the type II diabetes and alcohol induced fatty liver, hypocalcemia and hypomagnesemia<sup>53</sup>. Selenium is a potent anticancer agent. It decrease the rate of tumor growth and increases the apoptosis. It prevents cell death and promotes cell cycle progression. It prevents various cancer particularly colon, prostate and lung cancer. Selenium is present in active site of many enzymes and it is component of glutathione peroxidase. It posses anti infective property by improving the immune

system. Selenium enhances the T-lymphocyte immune response. Selenium causes the formation of natural killer cells. It involves in detoxification process by inducing P450 enzymes in liver. It prevents inflammation, liver necrosis, cardiac diseases, asthma, viral infections, neurological disorders and enhances male fertility by increasing sperm motility<sup>54</sup>. Molybdenum is important component in enzymes involved in oxidation reduction reactions<sup>55</sup>.

## CONCLUSION

The fruit contains Vitamins and minerals which supports the normal physiological and metabolic process showing the high nutritive value. Good concentration of these vitamins and minerals makes the plant therapeutically important. Fruit can also be used in the various ailments.

## CONFLICTS OF INTEREST

No Conflict of Interest

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