

## Mineral Elements of Seeds, Leaves and Kernel in *Sterculia guttata* (Kokrus)

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Seeds of *Sterculia guttata*, commonly called 'Kokrus' have sedative effect. Metal analysis of seeds, leaves and kernel showed presence of potassium, phosphorus, magnesium, copper, calcium, sodium, zinc, iron and aluminum. Seeds contain stimulating as well as sedative minerals. Seeds showed higher percentage of potassium, phosphorus, magnesium and copper than of other minerals. Copper plays an important role in the production of dopamine (DOPA) and thereby affects the central nervous system. So more consumption of these seeds may lead to sedation.

**Key Words:** *Sterculia guttata*, Magnesium, Copper, Potassium, Phosphorus.

### INTRODUCTION

Seeds of *Sterculia guttata*, commonly called 'Kokrus' are eaten raw or roasted by tribals mainly Katkaries in Maharashtra state, India<sup>1</sup>. *Sterculia guttata* Roxb. belong to Sterculiaceae family<sup>2</sup>. These trees are large, deciduous, generally found in Ajiwali, Dudhiware, Luglun, Kadav, Kambre, Khandala, Kandi Kusur, Shilimb, Tungi and Vanderkind<sup>2</sup>. Leaves of these trees are oval and oblong<sup>3</sup>. Flowers are yellowish purple with coil fowl smell. Seeds are oval in shape having a kernel<sup>3,4</sup>. One fruit contains 8 to 10 seeds. If the seeds are eaten more than a handful quantity at a time, the person feels lethargic. Therefore screening and metal analysis of seeds along with leaves and kernel has been carried out.

### EXPERIMENTAL

Authentication of *Sterculia guttata* Roxb. was done by comparing with herbarium specimens preserved in Botanical Survey of India, Pune (Maharashtra). Its Authentication No. is BSI/WC/Tech/2000/358.

Atomic absorption spectrophotometer used was of Chemito 201 Mech. Flame photometer used was of Chemito Mech. Ashes of seeds, leaves and kernel were prepared by taking 1.0 g of each sample and keeping it in muffle furnace at 550°C till constant weight was obtained. The major constituent of ash was determined qualitatively and quantitatively. For the detection of metals the ash was converted to chloride and it was tested for metals by applying standard procedures. Initially

the ash was dissolved in 10% HCl (5.0 mL) and evaporated to dryness on water bath. Again 10% HCl (5.0 mL) was added and evaporated to dryness. The material was filtered through Whatmann paper (No. 40). The residue was made chloride-free (tested with silver nitrate) by giving washings with hot water. The filtrate was diluted to 50 mL and used to estimate metal contents by using standard methods as illustrated in Table-1.

TABLE-1  
ASH FROM *STERCULIA GUTTATA*

| Particulars        | Method used     | Sample seed<br>(g) | Sample leaves<br>(g) | Sample kernel<br>(g) |
|--------------------|-----------------|--------------------|----------------------|----------------------|
| Acid soluble ash   | Standard method | 0.895              | 0.845                | 0.936                |
| Acid insoluble ash | Standard method | 0.055              | 0.075                | 0.032                |

## RESULTS AND DISCUSSION

Trace elements are called the 'Spark Plugs of Life' because they are required to activate hundreds of enzyme reactions within the body. Life is dependent upon the body's ability to maintain balance between the minerals<sup>5</sup>.

Metal analysis of acid-soluble ash of seeds shows that potassium, phosphorus, magnesium and copper are major constituents and calcium, zinc and iron are minor constituents. In leaves potassium, calcium, magnesium and phosphorus are major constituents in comparison to sodium, aluminum, iron, zinc and copper. In kernel potassium is extensively found to be high and other minerals are moderate in concentration.

Here main emphasis has been given to seeds as they are consumed by katkaries especially during the scarcity of food<sup>1</sup>. So the seeds are the only nutritional source. Seeds contain magnesium and copper, which are sedative minerals<sup>5</sup>.

Copper, either too much or too little, can affect the central nervous system. Copper is antagonistic to potassium and phosphorus. In presence of too much of potassium and phosphorus, absorption of copper decreases. Low level of copper results in decrease in synthesis of dopamine, which is a neurotransmitter. Copper is an important mineral in dopamine synthesis. Low level of dopamine results in decrease in activity of central nervous system; therefore function of brain is decreased, resulting in restlessness.

Copper is required for the normal myelination of nerves. Myelin is a fatty substance that acts as insulation around nerves. When this insulation is missing, material surrounding the nerves hardens or scleroses. Therefore abnormal neurological discharge results in spasticity, tremors and paralysis.

A deficiency of copper may cause hypertension, antibiotic sensitivity, hyperactivity, hyperglycemia, manic disorders, insomnia, allergies and osteoporosis<sup>5</sup>.

Magnesium is a key element in cellular metabolism. For higher metabolic rate, cells require high magnesium. In presence of higher percentage of potassium and phosphorus, absorption of magnesium increases. Because magnesium is a natural

sedative, it makes the person feel sleepy. Loss of magnesium leads to hyper-irritability. Adults may suffer muscle tremors, memory loss, inability to concentrate, apathy and depression.

Calcium plays a major role in CNS function. Calcium is seen as a major factor in neurotransmission and is required in the synaptic discharge of neurotransmitter. Increase in intracellular levels of calcium promotes fusion of synaptic vesicles within the axon membrane of the neuron, thereby assisting in neurotransmission with the CNS. Calcium is essential for nerve impulse conduction and activates some enzymes, which generate neurotransmitters. In seeds calcium percentage is very low (0.0094) (Table-2). So this is one more factor for sedation as nervous system is particularly sensitive to a low calcium level<sup>5</sup>

TABLE-2  
METAL CONTENTS OF *STERCULIA GUTTATA*

| Metals     | Method used                         | (%)      |          |         |
|------------|-------------------------------------|----------|----------|---------|
|            |                                     | Seed     | Leaves   | Kernel  |
| Potassium  | Flame Photometer                    | 0.8333   | 1.3695   | 2.5367  |
| Phosphorus | Spectrophotometer                   | 0.7722   | 0.2557   | 0.2178  |
| Magnesium  | Atomic absorption spectrophotometer | 0.2473   | 0.5729   | 0.2604  |
| Copper     | Atomic absorption spectrophotometer | 0.0227   | 0.00647  | 0.00196 |
| Calcium    | Atomic absorption spectrophotometer | 0.0094   | 1.0678   | 0.05828 |
| Zinc       | Atomic absorption spectrophotometer | 0.00789  | 0.01246  | 0.0028  |
| Iron       | Atomic absorption spectrophotometer | 0.00678  | 0.0698   | 0.01397 |
| Nickel     | Atomic absorption spectrophotometer | 0.000089 | 0.000267 | 0.00022 |
| Aluminium  | Atomic absorption spectrophotometer | Nil      | 0.0909   | 0.00406 |
| Sodium     | Flame photometer                    | —        | 0.1165   | 0.1529  |

Phosphorous is tied to calcium in bone structure and plays a significant role in CNS function. Many enzymes contain as a base phosphoproteins. Phospholipids are involved in nerve conduction. Phosphate is the primary ion in extra and intracellular fluid. It aids absorption of dietary constituents, helps to maintain the blood at a slightly alkaline level, regulates enzyme activity and is involved in the transmission of nerve impulses.

Potassium is found to be high in seeds, leaves and kernels among other metals. Potassium has many functions for protein synthesis, activation of many enzymes, stimulation of the movement of the intestinal tract, etc. Excess of potassium can produce neurological disturbances such as numbness of hand and feet<sup>5</sup>. Sudden death that can occur in fasting, anorexia nervosa or starvation is often a result of

heart failure caused by potassium deficiency. Potassium deficiency may cause symptoms of fatigue, weakness, mental depression, abnormal heartbeat and irregularities in the ECG, dry skin, glucose intolerance, low blood pressure, muscle cramps, etc.<sup>5</sup>

Zinc is extremely important for numerous body functions. In metal analysis of seeds, leaves and kernel, zinc is found to be very low. Zinc deficiencies are associated with mental impairments. Zinc deficiency may be associated with mental lethargy, emotional disorder and irritability<sup>5</sup>.

In seeds iron percentage is very low. Iron plays a significant role in oxygen transport in the body. Disturbances in mental functions can be caused by flaws in the metabolic pathways that require iron. This is because of too little oxygen reaching the brain. Other disturbances can be due to DNA abnormalities, since the synthesis of DNA requires iron. A deficiency of iron can impair neuronal development. Iron is also necessary for the activation of enzymes involved in brain neurotransmitters.

The percentage nutritional minerals like sodium, calcium, iron, zinc is very low in seeds. Magnesium and copper are moderately present, which leads to sedation. Thus seeds do not have much nutritional value. So, in scarcity, consumption of seeds leads to lethargic condition.

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### REFERENCES

1. D.E.P., 6, 363; *Fl. Br. Ind.*, 1, 355.
2. W.A. Talbot, *Forest Flower*, F.L.S., Vol. 1.
3. Odore Cooke, *Flowers of Presidency of Bombay*, C.I.E., Vol. 1.
4. CSIR, New Delhi, *The Wealth of India*, Vol. 1.
5. D. Watts. *Trace Elements and Other Essential Nutrients*, Clinical Application of Tissue Mineral Analysis, *Writer's B-L-O-C-K Edn.*, United States of America (1997).

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