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# Phytochemical Investigation of Plant Seeds of Chhattisgarh: Amino Acid Composition of Seeds of *Butea monosperma* and *Ocimum gratissium*

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**ABSTRACT**

Seeds of *Butea monosperma* (Palash) and *Ocimum gratissium* (Bantulsi) were analyzed for their fixed oil, moisture ash, total organic matter, carbon, hydrogen, nitrogen, sulphur, Protiens and Calorie contents. High values of total organic matter in these seeds indicated the high nutritional quality of these seeds. Proteins were found to be 24.25% and 20.03% in the seeds of *B. monospermaa* and *O. gratissium* respectively. The seeds under investigation were found to be rich in essential amino acids. All essential amino acids, Leucin (15.9g / 100g protein and 8.2g / 100g protein), Phenylalanine (9.4g / 100g protein and 4.6g / 100g protein), Lysine (3.7g / 100g protein and 1.6g / 100g protein), Iso leusine (7.5g / 100g protein and 3.4g / 100g protein), Threonine (5.8g / 100g protein and 3.3g / 100g protein), Methionine (3.3g / 100g protein and 1.5g / 100g protein), Valine (9.4g / 100g protein and 4.2g / 100g protein), Histidine (11.3g / 100g protein and 6.6g / 100g protein) were found to be present in the seeds of *B. monospermaa* and *O. gratissium* respectively. Non essential amino acids viz. Asprtic Acid, Serine, Glutamic Acid, Glycine, Arginine, Alanine, Proline and Tyrosine were also present in the two seeds in varying amounts.

**Key words:** Phyto Chemistry, Plant Seeds, Amino Acid Profile.

## INTRODUCTION

The significance of wild plants in the nutrition of human population and animals is increasing for several reasons, particularly in developing countries. One of the reasons is that these regions continue to be visited by drought and other weather related calamities, which in turn reduce the yields of traditional grain staples. Increasing population of these areas has also put enormous stress on the nutritional scenario of these areas. Poor economic growth and the degradation of the rural environment are threatening to increase malnutrition in the decades ahead. The result is that, the population in these areas will be compelled to turn with increasing urgency to indigenous and wild plants as staples. Many reports have appeared in the literature on the nutritional aspects of wild plants and their various parts[1-4]. In the present paper we are reporting the amino acid composition of the seeds of two wild plants of Chhattisgarh state viz. Palash (*Butea monosperma* of Papilionaceae family) and Bantulsi (*Ocimum gratissimum* of Lamiaceae family).

## EXPERIMENTAL

The seeds of the two plants under investigation were collected from the villages around Bilaspur in the state of Chhattisgarh. The collected seeds were dried in shade. Hard shells of the seeds were removed and the seeds were

crushed. These crushed seed meals were used to determine their proximate composition using standard methods [4]. Calorie contents of the seeds were determined using Julius-Peter's Bomb Calorimeter. Moisture and ash in the seeds were determined using methods reported in the literature[5]. The total organic matter in the seeds were calculated by subtracting the ash percentage of the seeds from 100 [6]. Crushed seeds were extracted in a soxhlet extractor with petroleum ether (60°–80°C) to remove the oil from the seeds. Nitrogen and protein contents in the seeds were determined by using Kjeldahl's method.

Proteins from the defatted seeds were extracted by the method reported by Joshi and Nigam [7]. The proteins thus isolated were converted to their respective hydrolysates by the methods of Shrivastava *et al*[8]. Protein hydrolysates thus obtained were subjected to their analysis by HPLC to ascertain their amino acid profile of these seeds with AccQ-Fluor kit (Water Corporation, USA). The digested samples were derivatised with 6-aminoquinolyl-N-hydroxysuccinimidyl carbamate (AQC) following manufacture's instructions. Five pico moles of the samples were loaded on to ACCQ–tag column and eluted with acetonitrile gradient (5 - 100%). These elutes were monitored with fluorescent detector. The amino acid peaks were compared with standard run under identical conditions.

## RESULTS AND DISCUSSION

The results of proximate and other analyses are reported in the table 1 and the results of HPCL of seed protein hydrolysates of *B. monospermaa* and *O. gratissium* are recorded in table 2. A perusal of table 1 showed that the moisture content in the seeds of *B. monospermaa* was 13.6% and that in the seeds of *O. gratissium* was 11.8%. As the moisture contents in these seeds were found to be below 15%, hence these seeds seem to be capable of being stored for longer durations[9].

Ash Contents in these seeds were found to be 6.2% (*B. monosperma*) and 4.1(*O. gratissium*)

Ash content is a measure of total mineral matter in the sample. Total organic matter in the seeds, which was calculated by difference of the ash contents from 100, was around 95% for both the seeds. Therefore, these seeds may be considered to be highly nutritious [9].

Protein contents in these seeds were recorded to be 24.25% (*B. monospermaa*) and 20.03% (*O. gratissium*). This indicates that these

**Table 1: Percentage Composition of Seeds**

| S. No | Percentage Estimation | *Butea monosperma* | *Ocimum gratissium* |
|---|---|---|---|
| 1 | Oil | 10.98 | 5.4853 |
| 2 | Calorific value | 4515.17 | 4305 |
| 3 | Nitrogen | 3.881 | 3.206 |
| 4 | Carbon | 22.25 | 64.98 |
| 5 | Hydrogen | 4.964 | 5.950 |
| 6 | Sulphur | 5.379 | 0.712 |
| 7 | Protein | 24.25 | 20.03 |
| 8 | Moisture | 13.6 | 11.8 |
| 9 | Ash | 6.2 | 4.1 |
| 10 | Organic Matter | 93.8 | 95.9 |

**Table 2: Amino Acid Profile (Quantity in gm/100gm)**

| S. No | Percentage Estimation | *Butea monosperma* | *Ocimum gratissium* |
|---|---|---|---|
| 1 | Leucine | 15.9 | 8.2 |
| 2 | Phenylalanine | 9.4 | 4.6 |
| 3 | Lysine | 3.7 | 1.6 |
| 4 | Isoleucine | 7.5 | 3.4 |
| 5 | Methionine | 3.3 | 1.5 |
| 6 | Valine | 9.4 | 4.2 |
| 7 | Histindine | 11.3 | 6.6 |
| 8 | Theronine | 5.8 | 3.3 |
| 9 | Aspartic Acid | 4.3 | 2.0 |
| 10 | Arginine | 2.8 | 7.6 |
| 11 | Serine | 2.8 | 1.4 |
| 12 | Glutamic Acid | 9.4 | 15.2 |
| 13 | Glycine | 3.2 | 1.3 |
| 14 | Alanine | 6.6 | 4.0 |
| 15 | Proline | 3.9 | 12.1 |
| 16 | Tyrosine | 2.2 | 2.1 |

seeds had fairly good amounts of proteins in them. A perusal of table–2 reveals the presence of 16 major amino acids in both seeds. Out of those 16, eight are essential amino acids and remaining eight are non-essential amino acids.

Leucine, which is an essential amino acid was found to be 15.9 gm / 100 gm protein (*B. monosperma*) and 8.2gm / 100gm protein (*O. gratissium*). Leucine is the amino acid which is responsible for regulating the blood sugar levels, growth and repairs of muscles and tissues[10].

Phenylalanine, another essential amino acid responsible for the production of norepinepherine in the brain and helps in improving memory, was recorded to be 9.4gm / 100gm protein (*B. monosperma*) and 4.6g / 100gm protein (*O. gratissium*). Phenylalanine also keeps body alert, reduces hunger pain and acts as antidepressant[11].

Iso Leucine was found to be 7.5gm / 100gm protein (*B. monosperma*) and 3.4gm / 100gm protein (*O. gratissium* ). This essential amino acid provides ingredients for manufacture of other essential biochemical components in the body, some of which are used for energy production, brain simulation and keeping human being alert [11].

Another important essential amino acid is Lysine, which ensures the adequate adsorption of calcium; helps to form collagen which is a component of bone cartilage and connective tissues; aids in the production of antibodies, hormones and enzymes. This was present in these seeds to the extent of 3.7gm / 100gm protein (*B. monosperma*) and 1.6gm / 100gm protein (*O. gratissium*). A lysine deficiency may result in fatigue, inability to concentrate, irritability, bloodshot eyes, retarded growth, hair loss, anemia and reproductive problems [12].

Threonine was recorded to be 5.8gm / 100gm protein (*B. monosperma*) and 3.3gm / 100gm protein (*O. gratissium*). This essential amino acid is an important constituent of collagen, elastin and enamel protein; helps to prevent fat build up in the liver; helps the digestive system and intestinal tract to function more smoothly; assists with metabolism [13].

The seed proteins under investigation were found to contain 9.4gm / 100gm protein (B. monosperm) and 4.2gm / 100gm protein (*O. gratissium*) valine. Valine is an essential amino acid which promotes mental vigor, calm emotions and muscle coordination [14].

Methionine contents in these seeds were recorded to be 3.3gm / 100gm protein (*B. monosperma*) and 1.5gm / 100gm protein (*O. gratissium*). Methionine is a principal supplier of sulphur which prevents disorders of the hair, skin and nails; helps lower cholesterol levels by increasing the liver's production of lecithin; reduces liver fat and protects the kidneys. It is a natural chelating agent of heavy metals; regulates the formation of ammonia and creates ammonia-free urine which reduces bladder irritation; influences hair follicles and promotes hair growth [11].

Histidine is an essential amino acid, particularly for children, as child's body can't synthesize this amino acid. 11.3gm / 100gm protein (*B. monosperma*) and 6.6gm / 100gm protein (*O. gratissium*) of histidine was found to be present in these seeds. Histidine is found abundantly in hemoglobin; has been used in the treatment of rheumatoid arthritis, allergic diseases, ulcers and anemia. A Histidine deficiency can cause poor hearing [13].

Along with Essential amino acids, different non-essential amino acids were also found to be present in both these seeds.

Alanine was found to be 6.6gm / 100gm protein (*B. monosperma*) and 4.0gm / 100 gm protein (*O. gratissium*). Alanine is an important source of energy for muscle tissue, brain and the central nervous system; strengthens the immune system by producing antibodies; helps in the metabolism of sugars and organic acids [13].

Table 2 shows that glycine concentrations in these seeds were 3.2gm / 100 gm protein (*B. monosperma*) and 1.3gm / 100gm protein (*O. gratissium*). Glycine facilitates the release of oxygen to cell for production of energy. It aid in the manufacture of hormones responsible for a strong immune system [12].

Another non-essential amino acid Arginine, which improves immune responses to bacteria, viruses and cancer cells, promotes wound healing and regeneration of the liver; causes the release of growth hormones and is crucial for optimal muscle growth and tissue repair[10]; necessary for production of the amino acid Ornithine[14]; was found to be present in both these seeds. Its concentration was recorded to be 2.8gm / 100gm protein (*B. monosperma*) and 7.6gm / 100gm protein (*O. gratissium*). Level of arginine was particularly high in seeds of *O. gratissium*.

Glutamic acid is one of the non-essential amino acid which was present in both these seeds in fairly large amounts. The amounts of this were found to be 9.4gm / 100gm protein (*B. monosperma*) and 15.2gm / 100gm protein (*O. gratissium*). This amino acid helps in improving mental capacities. It also speeds the healing of ulcer and reduces fatigue. It is also important in helping control schizophrenia and cravings for the both alcohol and sugar [13].

Proline concentrations was pretty high particularly in the seeds of *O. gratissium* . 3.9 gm / 100gm protein (*B. monosperma*) and 12.1gm / 100gm protein (*O. gratissium*) were recorded in the two seeds. Proline is important for the proper functioning of joints and tendons. This helps to maintain and strengthen heart muscles [11].

Aspartic acid is important to human being as it aids in the expulsion of harmful ammonia from the body; may increase resistance to fatigue and increase physical endurance [15]. 4.3 gm / 100gm protein (*B. monosperma*) and 2.0gm / 100 gm protein (*O. gratissium*) of this amino acid was found to be present in these seeds.

Serinie was present in the two seeds with concentration 2.8gm / 100gm protein (*B. monosperma*) and 1.4 gm / 100 gm protein (*O. gratissium*). This amino acid is needed for the proper metabolism of fats and fatty acids, the growth of muscle and the maintenance of healthy immune system. This is a component of the protective myelin sheaths that cover nerve fibers and is important in RNA and DNA function and cell formation. It also aids in the production of immunoglobulin and antibodies[12].

Table–2 also shows that 2.2gm / 100gm protein (*B. monosperma*) and 2.1gm / 100gm protein (*O. gratissium*) of tyrosine was present in these seeds. Tyrosine is important to overall metabolism. It is a precursor of adrenaline, nor-epinephrine, and dopamine, which regulates mood and stimulates metabolism and the nervous system. It also acts as a mood elevator, suppresses the appetite and helps to reduce body fat; aids in the production of melanin (the pigment responsible for hair and skin color) and in the functions of the adrenal, thyroid and pituitary glands. Tyrosine has been used to help chronic fatigue, narcolepsy, anxiety, depression, low sex drive, allergies and headaches [14].

## CONCLUSION

The present study clearly indicates that the seeds of *B. monospermaa* and *O. gratissium* posses fairly good amount of proteins in them and their amino acid composition suggests that these seeds can serve as a rich source to meet out the amino acid requirements of human as well as animal stocks as all the major essential amino acids were found to be present in both the seeds.

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