

## Proximate and Amino Acid Composition of *Celosia argentea* Leaves

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**ABSTRACT:** The proximate, trace metals and amino acids composition of *Celosia argentea* were determined. The crude fat, fibre and protein contents were moderate with 1.10, 3.53 and 5.17% respectively while high in the ash content (22.43%). Results of the amino acid analysis revealed high contents of the essential amino acids with methionine as the limiting amino acid. Comparing its essential amino acids with the WHO recommended values, the vegetable is adequate in these acids.

**Keywords:** *Celosia argentea*, proximate, trace metals and amino acid composition

### INTRODUCTION

Vegetables are important foods and that their production, marketing and processing contribute to incomes (NSPRI, 1990). Population growth and urbanization are creating increased demand for food as concerns are rising about malnutrition in peri-urban areas (FAO, 1983). Vegetables are sources of vitamins, ascorbic acid, niacin, riboflavin and thiamine and minerals, calcium and iron, as well as supplementary protein and calories (FAO, 1988). Vegetables promote intake of essential nutrients from other foods by making them more palatable (Oke, 1980; Taylor, 1996).

*Celosia argentea* is an annual herbaceous vegetable of the family *Amaranthaceae*. In Nigeria, six species of the genus *Celosia* have been described (Hutchinson and Dalziel, 1954; Omueti, 1980; IITA, 1972; Grubben, 1976). In south-western Nigeria, it is known as *sokoyokoto* (Yoruba). The leaves and stems are cooked into soups, sauces or stew with other ingredients (Grubben and Denton, 2004) and may be consumed with maize, rice, yam and cassava (Tindall, 1983). In Kenya, the *Masai* use its liquid extract as a bodywash for convalescents (Burkill, 1995). In Ethiopia and Democratic Republic of Congo the seeds are used as medicine for the treatment of diarrhea, dysentery and muscle troubles (Budin et al., 1996; Chweya and Eyzaguirre, 1999). In India, the leaves mixed with honey are applied to inflated areas and the seeds are used for the treatment of diabetes *mellitus* (Tindall, 1983). In south-east Asia, the flowers are used as medicine for dysentery, haemoptysis and menstruation problems (Grubben and Denton,

2004). Three types of *Celosia argentea* are cultivated in Nigeria and Benin: green broad-leaved cultivars called *soko green* and the broad-leaved cultivars with anthocyanin pigmentation of the leaf blades and part of the stem called *soko pupa* and cultivars with deep green narrow leaves with a hard texture and early flowering (Brenan, 1981; Grubben and Denton, 2004). This work is aimed at determining the proximate, minerals and amino acids composition of *Celosia argentea*.

### MATERIALS AND METHODS

#### Collection and Preparation of Sample

Sample of *C. argentea* was randomly bought at Sabon Gari market, Kano-Nigeria during its harvesting period. The plant sample was authenticated at the International Institute of Tropical Agriculture (IITA) Kano, Nigeria. The leaves were cleaned and were allowed to dry at room temperature in the laboratory. The dry leaves, stems and shoots were crushed using pestle and mortar and were sieved through a 200 m sieve. The powdered sample was stored in airtight nylon bag.

#### Proximate Analysis

Percent moisture, crude fat and ash were determined using the methods of Association of Official Analytical Chemists (AOAC, 1975). The crude fibre was determined using fibretec 2021/2023 system (Foss Tecator, 2002). The dry and defatted sample (0.875g) was placed in a Kjeldahl digestion flask and was analyzed as described by AOAC, (1980).

Standard solutions using nitrates salts of the metals were prepared (AOAC, 2006). The digest were analyzed using flame photometer for K and Na, atomic absorption spectrophotometer (AAS) for other metals and UV-Visible spectrophotometer for P at 660nm wavelength (Donald and Clyde, 1979). The metal concentration in the sample was read out from standard curve by extrapolation.

The defatted sample (0.292g) was hydrolysed in 6N HCl at 105 C for 22 hours in nitrogen flush. The hydrolysate was further analyzed for amino acids using the sequential multi-sample amino acid analyzer as described by Spackman et al (1958). The chromatogram of the sample was compared using norleucine as standard.

**RESULTS AND DISCUSSION**

The proximate composition of *Celosia argentea* is as shown in Table 1. The mineral and trace element composition is as shown in Table 2. The amino acid profile of the leaf and its chemical score relative to henø egg are shown in Table 3. Its essential amino acids compared with FAO reference are shown in Table 4 The moisture content of the dried sample is 8.84±0.07% and is within the acceptable range for good keeping (Harvey, 1995). The fat content is 1.10±0.01%. This value is within the range reported in literature for leafy vegetables (Sheela et al., 2004). The crude protein is 5.17±0.17% whilst its crude fibre is 3.53±0.42%. The ash content of 22.43±0.02% indicates its high inorganic components (Pearson, 1981).

*C. argentea* showed high concentrations of calcium, phosphorus, potassium, sodium, magnesium, iron, zinc and copper while the concentrations of chromium, manganese, nickel and lead are in trace. The low concentrations of lead and other heavy metals make it suitable for consumption.

Quantitative chromatographic analysis of the *Celosia argentea* hydrolysates revealed 17 amino acids (Table 3). The hydrolysates are rich in glutamic, aspartic, leucine, lysine, arginine, phenylalanine and glycine. It is adequate in valine, tyrosine, isoleucine and serine while low in cystine and methionine. Comparing its chemical score relative to henø egg (Table 3) revealed higher percent in cystine, aspartic and glycine. It is adequate in glutamic, histidine, lysine, arginine, leucine, tyrosine, phenylalanine, proline and threonine. However, it is low in methionine. Comparing its hydrolysate with the FAO reference for essential amino acids *Celosia* appeared superior in leucine, lysine, arginine, phenylalanine and threonine while adequate in valine, histidine and isoleucine but low in methionine.

**Table 1:** Proximate Composition of *C. argentea*

Parameter	Composition (%)
Moisture content	8.84±0.07
Crude Fat	1.10±0.01
Crude protein	5.17±0.06
Crude fibre	3.53±0.42
Ash	22.43±0.02
Nitrogen Free Extract	58.93±0.05

**Table 2:** Mineral Composition of *C. argentea*

Element	Composition (mg/100g)
Calcium	178.08±0.50
Chromium	1.98±0.01
Copper	3.75±0.30
Iron	15.25±0.23
Lead	0.83±0.01
Magnesium	39.64±0.08
Manganese	1.73±0.04
Nickel	1.03±0.04
Phosphorus	38.01±0.42
Potassium	62.34±0.38
Sodium	35.25±0.30
Zinc	7.25±0.25

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**Table 3:** Amino Acid Composition of *Celosia argentea* (g/16gN) and its Chemical Score Relative to Hen's Egg

Amino Acid	Composition	*Hen's Egg	Chemical Score (%)
Alanine	2.35±0.13	5.87	40.03
Arginine	4.91±0.67	7.06	69.55
Aspartic acid	7.97±0.04	5.80	137.41
Cystine	1.10±0.14	0.64	171.88
Glutamic acid	10.66±0.42	13.14	81.13
Glycine	4.01±0.07	3.36	119.35
Histidine	2.14±0.30	2.96	72.30
Isoleucine	2.99±0.11	7.32	40.85
Leucine	6.51±0.30	9.58	67.95
Lysine	5.09±0.33	7.26	70.11
Methionine	1.08±0.25	3.52	30.68
Phenylalanine	4.32±0.50	6.58	65.65
Proline	2.61±0.50	4.43	58.92
Serine	2.90±0.14	7.45	38.93
Threonine	3.33±0.81	5.49	60.66
Tyrosine	3.34±0.11	4.96	67.34
Valine	4.32±0.50	8.04	49.13

\*Source: Eka (1987)

**Table 4:** Essential Amino Acid in *C. argentea* Compared with FAO Reference (g/16gN)].

Essential Amino Acid	*FAO Reference	<i>C. argentea</i>
Arginine	2.00	4.91
Histidine	2.40	2.14
Isoleucine	4.20	2.99
Leucine	4.80	6.51
Lysine	4.20	5.09
Methionine	2.20	1.08
Phenylalanine	2.80	4.32
Threonine	2.80	3.33
Valine	4.20	3.95

\*Source: Betschart et al (1975)

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