

## Integral Chemical Analysis of the Amaranth (*Amaranthus greggii* S. Wats)

Silvia H. Pattacini, Gladis E. Scoles and Guillermo F. Covas

Chair of Organic Chemistry, Chemistry Department, College of Exact and Natural Science, National University of La Pampa. Santa Rosa, La Pampa, Argentina

E-mail: spattacini@exactas.unlpam.edu.ar

---

**Abstract:** The objective of this work was to obtain information on *Amaranthus greggii* S. Wats., related to its nutritional value, its agricultural application as leaf vegetable and for animal consumption. The following variables were analyzed: dampness, ashes, protein, mineral, ethereal extract (fat), brute fiber, oxalic acid, nitrates and carbohydrates.

---

### Introduction

One of the species of the genus *Amaranthus* whose study is of a high interest due to its economical and nutritional value, has been identified botanically as *Amaranthus greggii* S. Wats. The excellent qualities of some annual amaranth as vegetables, owing to their nutritional value and pleasant taste, have also been determined (Castañeda *et al.*, 1987).

### Experimental Area

The green material of amaranth was dried in a stove with air forced to 60° C until stable, and was then ground and dehydrated. Different types of chemical assays were carried out: dampness, ashes by calcination in muffle at 550° C (Pearson, 1976), proteins by the Kjeldahl method (N x 6,25) (Skoog, West and Holler, 1995); Ca and Mg by complexmetric (Hamerly *et al.*, 1984), P and Fe by colorimetry (Jackson, 1964), ethereal extract (extraction by Soxhlet), gross fiber and oxalate following (AOAC 1984), nitrate by colorimetry (Cataldo *et al.*, 1975) and carbohydrates (according to difference).

### Results and Discussion

The chemical composition determined on dried basis of leaves of *A. greggii*, is detailed on Table 1; the data were compared with the data obtained by Cattaneo *et al.* (1994) and Arellano *et al.* (1992) for *A. mantegazzianus* and spinach.

It was observed that *A. greggii* leaves have a protein content similar to spinach and *A. mantegazzianus* has values which surpass other types of amaranth (Rawate, 1983).

The relatively high value of ashes denotes important contents of minerals, having an outstanding content of calcium and magnesium in *A. greggii*, which surpasses spinach and *A. mantegazzianus*, although inferior to the ones found by Rawate. Comparing the value of the content of iron with other amaranths, it was observed that its content is high, the values were similar to *A. mantegazzianus* and superior to spinach (Castañeda *et al.*, 1987). The percentages of phosphorus found in the foliage during the analysis were near the ones mentioned by Troiani *et al.* (1992).

The results obtained for nitrate and oxalate in *A. greggii* compared with the results obtained by Gomez *et al.* (1986) and Arellano *et al.* (1992) for *A. mantegazzianus* and spinach are shown in Table 2; the values are below the ones considered as toxic (Avila *et al.*, 1987).

The analysis performed on *Amaranthus greggii* show similar values to the blanks which allows us to infer that this species is another alternative to the human diet.

**Table 1.** Proximal Chemical Composition of the tested *A. greggii*, confronted with *A. mantegazzianus* and spinach.

	<i>A. greggii</i>	<i>A. mantegazzianus</i>	Spinach
Dampness % b.s.	8.83 +-0.056	10.13	7.81
Ashes % b.s.	26.80 +-0.370	25.14	28.18
Gross Protein % b.s.	28.28 +-0.349	28.44	28.60
Gross Fiber % b.s.	13.25 +-0.343	12.14	7.75
Ethereal extract % b.s.	2.18 +-0.361	3.59	4.79
Calcium % b.s.	1.28 +-0.219	2.27	1.03
Magnesium % b.s.	0.62 +-0.190	0.67	1.10
Phosphorus % b.s.	0.62 +- 0.153	0.69	0.89
Iron mg % b.s.	45.15 +- 0.204	45.2	41
Carbohydrates <sup>1</sup> % b.s.	20.66 +-0.730	20.56	22.87

<sup>1</sup>They were determined by difference.

**Table 2.** Antinutrients of the tested *A. greggii*, confronted with *A. Mantegazzianus* and spinach.

Antinutrients	<i>A. greggii</i>	<i>A. mantegazzianus</i>	Spinach
Oxalate % b.s.	3.15 +-o.331	4.92	9.3
Nitrate % b.s.	0.18 +- 0.062	0.63	1.22

## References and Notes

1. Association of Official Analytical Chemmists. *Official Methods of Analysis of the AOAC*; The As-

- sociation: Washington, D.C., 1984.
2. Castañeda, C.L.; Suárez, R.G.; Valdez, L.A. *Evaluation of Amaranth as vegetable in comparison with spinach. Col. Nac. of Amaranth.*; Mexico, 1987; pp150-158.
  3. Hamerly, J; Marracini, J. and Piagentini, R. *Course on Analytical Chemistry*; El Ateneo: Bs. As, 1984; p 1006.
  4. Rawate, Prabhu D. *Amaranth (Pigweed): a Crop to Help Solve the World Protein Shortage. Environmentally Sound Agriculture*; 1983; pp 287-298.