

Nutrient content of vegetable amaranth (*Amaranthus cruentus L.*) at different harvesting stages

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Abstract

Data on the nutritional content of conventional vegetables can be reasonably associated with a specific stage of plant development, but information about the age of plant development to define harvest maturity for wild or indigenous leafy vegetables including amaranths is scanty. A field experiment was conducted in order to assess the P, K, Ca, Na, Cu and Zn content at different harvest stages of amaranth. Amaranths were harvested at 3, 4, 5, 6, 7 and 8 weeks after emergence (WAE). A significant difference ($P<0.05$) was observed in the time these different mineral nutrients reached highest levels. At 3 WAE Ca and Zn, at 4 WAE P, at 6 WAE K and at 7 WAE Na and Cu reached their highest levels. Protein level significantly decreased from 50.8 to 43.47% during the 8 weeks. Regardless of the differences in reaching their highest levels which stretched from 3 to 7 WAE, it was observed that when Ca and Zn reached their highest level at 3 WAE, other minerals despite being low in their concentration could still meet the Daily Required Allowance (DRA) for humans.

Key words: Amaranth, harvesting stage, foliar nutrients

Résumé

Les données sur le contenu nutritionnel des légumes conventionnels peuvent être raisonnablement associées à un stade déterminé du développement des plantes, mais l'information sur l'âge de développement de la plante pour définir la maturité de récolte pour les légumes à feuilles indigènes ou sauvages, y compris l'amarante, est maigre. Une expérience de terrain a été menée afin d'évaluer le contenu de P, K, Ca, Na, Cu et Zn à des stades différents de récolte de l'amarante. Les amarantes ont été récoltées à 3, 4, 5, 6, 7 et 8 semaines après émergence (WAE). Une différence significative ($P<0.05$) a été observée dans le temps, ces différents éléments minéraux ont atteint des niveaux plus élevés. À 3 semaines après émergence (WAE) le Ca et le Zn, à 4 semaines après émergence (WAE) le P, à 6 semaines après émergence (WAE) le K et à 7 semaines après émergence (WAE) le Na et le Cu ont atteint leurs plus hauts niveaux. La teneur en protéines a

diminué significativement de 50,8 à 43,47% pendant les 8 semaines. Indépendamment des différences à atteindre leurs plus hauts niveaux qui s'étendaient de 3 à 7 semaines après émergence (WAE), on a observé que lorsque le Ca et Zn ont atteint leur plus haut niveau à 3 semaines après émergence(WAE), d'autres minéraux tout en étant faible en leur concentration pourraient encore relever l'allocation quotidienne exigée (DRA) pour les humains.

Mots clés: Amarante, phase de récolte, nutriments foliaires

Background

Unlike conventional vegetables, there is no documented information about the age of plant development to define harvest maturity for wild or indigenous leafy vegetables including amaranths. Hence data on their nutritional value is likely to vary widely, due to influences of plant age and the environmental conditions during plant growth (Jansen *et al.*, 2004). The main objective of this study was to assess the foliar nutritional content of amaranth at the different harvesting stage.

Literature Summary

Indigenous vegetable have received significantly less research attention. Vegetable amaranth has been rated equal to or superior in taste to spinach and is considerably higher in calcium, iron, and phosphorous (Makus, 1990). The maturity stage of a conventional vegetable is universally defined, and a crop is normally harvested and consumed at a known stage of plant development, irrespective of environmental conditions for plant growth (Guarino, 1997).

Study Description

The research was carried out at the Africa University farm in the 2008-2009 farming seasons. The farm lies in Natural Farming Region II of Zimbabwe, at 18° 53.595 S and 32° 36.173 E, at an altitude of 1104 m above sea level. The mean annual rainfall is about 800-1000 mm. The soils are red sandy clay loam, Fersiallitic 5E soil under Zimbabwe soil classification system.

The experiment was laid out in Randomised Complete Block Design (RCBD) and was replicated three times. The treatments comprised six harvest stages at 3, 4, 5, 6, 7 and 8 weeks after emergence (WAE). At each harvest stage four different processing methods which include fresh harvested leaves used as control, dry leaves without any pre-treatment, blanched dry leaves and blanched frozen leaves were carried out.

Research Application

The highest amount of calcium ($2693.1\text{mg } 100\text{g}^{-1}$) was observed at 3WAE. At 7 WAE, amaranth had 73% and 88% more copper

than at 3 and 8 WAE, respectively. Potassium level was highest at 6 WAE ($29341\text{ mg }100\text{g}^{-1}$). The highest Na level was at 6 WAE ($16732\text{mg }100\text{g}^{-1}$). The highest P concentration of $160\text{ mg }100\text{g}^{-1}$ was reached at 4WAE.

Recommendation

Under the Africa University in Mutare (Zimbabwe) conditions, it has been observed that different minerals in amaranth reached their highest levels at different growth stages. If the amaranth is grown to meet the nutritional requirement for a particular mineral nutrient or protein, then it should be harvested at the stage when it reaches its highest level for that particular mineral nutrient or protein. On the other hand, if the grown amaranth is to meet the nutritional requirements for different minerals (P, K, Ca, Na, and Cu), the optimum time to harvest will be at 3 WAE.

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