SEED OF *AMARANTHUS CRUENTUS* AS BREAKFAST CEREAL AND SNACK PRODUCT

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Abstract:

This paper presents the possibility of extrusion, expanding and popping of Amaranthus cruentus seed. The seed and the snack products were analyzed for chemical composition, energy value and sensory evaluation. Results demonstrated that the Amaranth snack has high nutritive value. The sensory evaluation proved that these products have similar rank in comparison with other commercial snack products.

Keywords:

Amaranthus cruentus, snacks,chemical composition,energy value

INTRODUCTION

Amaranthus cruentus is one of 60 different species of the genus *Amaranthus*. This plant was a staple crop of the Aztecs and other pre-Columbian cultures (8). As it is not a true cereal, Amaranth grain has characteristics and properties similar to those of the cereal grains and is often called a pseudocereal.

Investigation with *Amaranthus* are a relatively modern endeavour and were undertaken in the 1970s in the United States of America (10). The importance of growing *Amaranthus* was overemphasized by the fact that it is a C_4 plant undergoing the Hatch-Slack CO_2 reduction (6).

Considering the biological as well as nutritional quality of *Amaranthus* seed it is of key importance to establish a gene bank in Serbia. Our study on the possibility of growing *Amarantus sp*. in a temperature continental climate under the precipitation regime of the Danube River basin has started in 1994 (3,2). Based on recent survey on the chemical content of the Indian Amaranthus in Yugoslavia it has been shown that it was a relatively high protein value in comparison to the average cereal protein values (9,3). Amaranth protein has been shown in numerous studies to be superior in quality to that of the cereals. It is high in the aminoacid lysine, which is caracteristically low in cereal proteins. Thus it is well suited for blending with cereals (5). High leavel of dry mater, protein, mineral content (calcium and iron) and fat gave importance to seed of *Amaranthus sp*. (1,3,9)

The *Amaranthus sp.* seed can be expanded and milled similar to corn. Extrudates have a pleasant specific taste and can be used as a separate snack, addition to müsli, cake decoration or as raw material for further processing (4).

It has long been known that Amaranth seeds expand or "pop" when heated. Popped Amaranth is used as an ingredient in snack, sometimes along with popped popcorn and in caramel corn or comparable sweet snacks (1,4,5).

The small size of the seeds and their oil content of aproximatly 8% allows exstrusion without grinding or adding additional water. By selecting the proper screw configuration along with a range of barrel temeratures and screw speeds, extruded products with varying degrees of expansion can be obtained (5).

MATERIAL AND METHODS

Seed of selected lines of *Amaranthus cruentus* No. A-17 used in investigation, were popped, expanded and extruded.

Popping of *A.cruentus* seed was on aluminium hot plate at 200 ^{0} C for 15-20 sec. *A.cruentus* seed was expanded using Expander LGUN with preasure of 11,5 A.

In this paper we also investigated pellets which were produced by exstrusion using "Brabender " 20 DN extruder with a range of barel temperature (100^0 C) and screw speeds of 150-200 o/min.

Proximate chemical analyses were determined according to the official regulations in force (7). Protein content (N x 5,8) was estimated by the Kjeldahl method. Carbohydrate content was estimated determing the total starch content according to Ewans and the reducing sugar content by Luff-Schoorl. Fat content was determined by Soxhlet extraction. Cellulose content was determined according to Wender. Moisture and ash content were determined by standard methods according to the official regulations.

RESULTS AND DISCUSSION

Chemical composition of *Amaranthus cruentus* seed and the snack products is presented in Table 1. The average protein content of *Amaranthus cruenus* seed was 17.6% (Table 1).The protein content of the snack products ranged fom 12.2% to 16.5%. The protein content of snack products are similar to the protein content of the raw seeds, except of the extruded pellets (Table 1).The protein content fall within ranges obtained by other authors.

The ash, fat and cellulose content of *Amaranthus cruentus* seed and snack products are higher than in cereals (Table 1).

The average ash, fat and cellulose content are 2.73%, 6.5% and 4.4% respectively (Table 1).

Data on energy and calorie distributions are reported in Table2. Energy values of *Amaranthus cruentus* seed and snack products are similar and range betweens 1665.9 kJ and 1705.9 kJ/100g dry basis (Table 2).

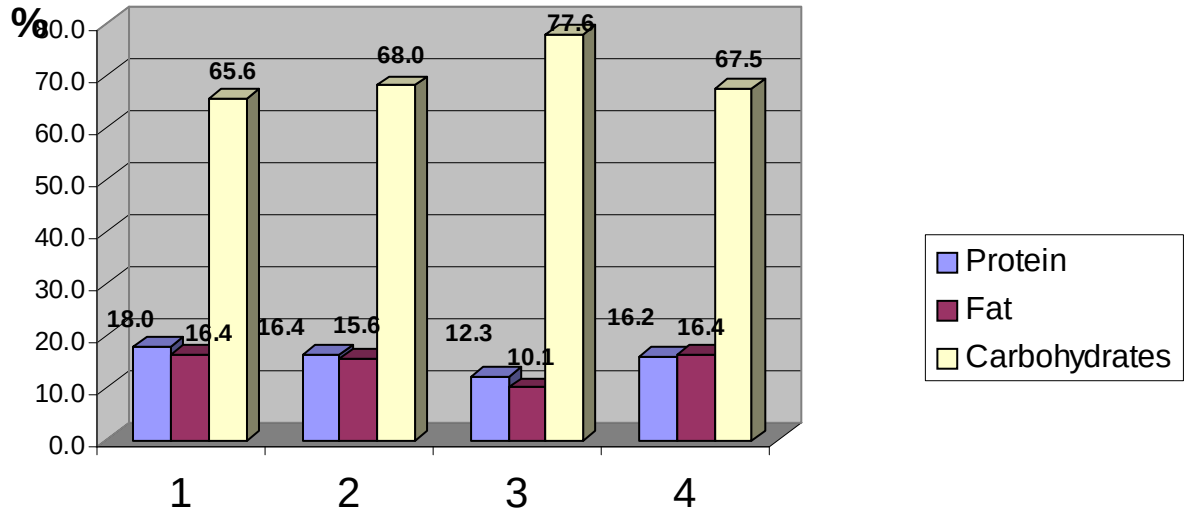
Table 1.- Composition of Amaranth seed and snack products

Amaranth seed, and snack products	Moisture (%)	Protein % d.m.	Ash %d.m.	Fat %d.m.	Cellul. %d.m.	Carbohydrates
seed of *A.cruentus* No. A.17	11.3	17.6	3.26	7.2	5.5	64.3
Expanded pellets 100% Amaranth seed	7.9	16.5	3.04	7.0	5.2	68.2
Extruded pellets 100% Amaranth seed	6.6	12.2	1.56	4.5	1.7	77.2
Popped *A.cruentus* seed	1.1	16.1	3.05	7.3	5.0	67.2
Average	6.7	15.6	2.73	6.5	4.4	69.2

Table 2.- Energy and caloric value of Amaranthus cruentus seed and the snack products

Energy value	seed of *A.cruentus* No. A.17	Expanded *A.cruentus* seed,	Extruded *A.cruentus* seed,	Popped *A.cruentus* seed,
kJ /100g.d.m.	1665,9	1705.9	1690.8	1693.5
kcal. /100g.d.m.	392.4	401.8	398.1	398.9

Energy distribution has shown that more than 65% energy is obtained from carbohydrates (Fig.1) The sensory evaluation proved that these products have similar rank in comparison with other commercial snack products (Table3).



1- Seed of *A.cruentus* No. A.17 2- Expanded *A.cruentus* seed
3- Extruded *A.cruentus* seed 4- Popped *A.cruentus* seed

Fig.1.-Energy distribution of Amaranthus cruentus seed and the snack *products*

Table 3.- Sensory evaluation of Amaranthus cruentus simple and there snack products

	seed of *A.cruentus* No. A.17	Expanded *A.cruentus* seed,	extruded *A.cruentus* seed,	Popped *A.cruentus* seed,
Taste	weak on Amaranth	neutral	similar to corn	specific crunchy
Aroma	weak on Amaranth	pleasant	pleasant	very pleasant

CONCLUSION

The snack products of *Amaranthus cruentus* seed have high nutritive value (high protein, fat, cellulose content). Sensory evaluation of *Amaranthus cruentus* seed and the snack products have neutral, specific taste and a pleasant aroma. *Amaranthus cruentus* seed and snacks blended with other raw materials and cereals are suitable for creating new formulations of snack food.

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