

SHORT COMMUNICATION

PROXIMATE COMPOSITION, MINERAL CONTENT AND ANTINUTRITIONAL FACTORS OF SOME CAPSICUM (*Capsicum annum*) VARIETIES GROWN IN ETHIOPIA

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ABSTRACT. This study was conducted to generate baseline information on the nutritional composition, mineral content and antinutritional factors of three capsicum varieties (Marako fana, Bako local and Oda haro) grown in Ethiopia. In relation to proximate composition, Marako fana, Bako local and Oda haro contained 9.2, 9.0 and 8.8% moisture; 11.9, 8.8 and 9.2% crude protein; 27.3, 26.0 and 28.6% crude fiber and 11.2, 9.5 and 9.2% fat (oleoresin) on wet weight basis. They also contained 1.7, 1.6 and 1.8 mg/100 g potassium; 27.2, 38.2 and 54.6 mg/100 g calcium and 7.2, 6.9 and 9.6 mg/100 g iron on wet weight basis. Tannin was found to be 0.142, 0.164 and 0.148 mg/100 g, respectively, while phytate was not detected in any of the samples. Analysis of variance and LSD (least significant difference) test revealed that protein and oleoresin of Marako fana were significantly higher ($p < 0.05$) than Bako local and Oda haro. Potassium, calcium and iron contents of Oda haro were significantly higher ($p < 0.05$). Based on these results Marako fana is preferable for large scale production of oleoresin, while Oda haro is nutritionally preferable because it contains high amounts of potassium, calcium and iron.

KEY WORDS: Capsicum, Ethiopia, Composition, Mineral, Antinutrients

INTRODUCTION

Capsicum (pepper) is an autogamous plant, native to tropical America, which belongs to the family of solanaceae [1]. Capsicums or red peppers are the berries of capsicum plant and they form an indispensable ingredient of the culinary throughout the world [2]. The fresh green and dried whole fruits or their powder with varying degrees of pungency, aroma and flavor are used in different cuisines. Besides being an important food crop, red pepper is also used in pharmaceutical industries [2], cosmetics and for ornamental in gardens [3]. Capsicums are important food additives in many parts of the world, valued for their sensory attributes of color, pungency and aroma [4]. Pepper used as food colorant has traditionally been in the form of ground powder, although today oleoresins are widely used [5].

Pepper is the world second important vegetable ranking after tomatoes and it is the most produced type of spice used for flavoring and coloring food while providing vitamins and minerals [6]. Nowadays, it is almost impossible to imagine the dishes of Asia and Pacific region without chili peppers, while the traditional African sorghum or maize porridge would be tasteless without them [3].

Production of pepper is well known in Ethiopia [7]. The history of pepper in Ethiopia is perhaps the most ancient than the history of any other vegetable product [6]. Ethiopians have

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strong attachment to dark red pepper, which has high value principally for its high pungency. The fine powdered pungent product is an indispensable flavoring and coloring ingredient in the common traditional sauce “wot” whereas, the green pod is consumed as a vegetable with other food items. There is a general belief among Ethiopians that a person who frequently consumes hot pepper has resistance to various diseases. The average daily consumption of hot pepper by Ethiopian adult is estimated to be 15 g, which is higher than tomatoes and most other vegetables [6]. In addition to having major role in Ethiopians daily dish, it also plays an important role in the national economy as on average 79% of pepper production is for market and generates employment to urban and rural workers [6]. Oleoresin paprika and capsicum are extracted from red pepper (capsicum) for export purposes. The deep red colored and large podded cultivars (sweet/hot) have a very high processing demand in the country. The main processed product, oleoresin, is exported to different countries and the spiced ground is supplied to local market [8].

Ethiopia is the land of diverse climate and soil type that grow several indigenous and exogenous spices, herbs, medicinal plants and other essential oil bearing plants. Despite the availability of the diverse agro ecologies of the country to produce this wide variety of plant species and as they were playing a significant role on the national economy, through generating considerable export earnings or import substitution, the research conducted on their proximate composition, mineral content and antinutritional factors is limited. This study therefore, was undertaken to generate baseline information on the nutritional composition of the three capsicum varieties, namely, Marako fana, Bako local and Oda haro which are grown in Ethiopia.

EXPERIMENTAL

Sample collection and preparation. Three capsicum varieties, Marako fana, Bako local and Oda haro were collected from Bako Agricultural Research Center, Ethiopia. For each variety there were thirty sacks and samples were collected from each sack using random sampling technique, mixed together and packed by polyethylene packaging material. The samples for each variety were mixed and packed separately. The packed samples were transported to the Ethiopian Health and Nutrition Research Institute laboratory, where all the analysis was conducted. Samples were then ground by using Iika-weke grinding mill of model M2059 (IKA-Werke GmbH & Co., Staufen, Germany), sieved through 1 mm sieve and packed in dry polyethylene bags.

Proximate composition. Moisture, total, crude fat (oleoresin), crude fiber and total ash were determined according to AOAC [9] using the official methods 925.05, 979.09, 4.5.01, 920.169 and 941.12, respectively. Carbohydrate was calculated by difference with the exclusion of crude fiber.

Mineral analysis. Mineral content of raw capsicum flour was determined according to Osborne and Voogt [10]. The Fe, Zn, Mg, Na, Cu, Mn and Ca contents were determined using Buck Scientific Atomic Absorption Spectrophotometer (AAS, Buck scientific, East Norwalk, USA), model 201 VGP at 248.3, 213.9, 285.2, 589.0, 324.7, 279.6 and 422.7 nm, respectively. Potassium (K) was determined using Atomic Emission Spectrophotometer (AES, Buck scientific, East Norwalk, USA) at 766.5 nm, using air acetylene flame.

Antinutritional factors. Tannin content of the raw capsicum flour samples was determined according to Maxson and Rooney [11]. Phytate content was determined according to Latta and Eskin [12].

Data analysis. Analysis of variance (ANOVA) was employed using SPSS software of version 15.0. All the analysis was carried out in triplicates and results were expressed as mean±standard deviation. LSD test was used to separate means and the significance was accepted at $p \leq 0.05$.

RESULTS AND DISCUSSION

Proximate composition. As is presented in Table 1 there is no significant difference between the three varieties in their moisture, crude fiber, total ash and carbohydrate ($p > 0.05$). Marako fana, Bako local and Oda haro contained 9.2, 9.0 and 8.8% moisture; 27.3, 26.0 and 28.6% crude fiber; 5.3, 7.3, 7.3% ash and 35.3, 39.5 and 37.1% carbohydrate, respectively. On the other hand, crude protein and fat contents of Marako fana were higher, and found to be significantly different ($p < 0.05$) when compared to Oda haro and Bako local. Marako fana, Bako local and Oda haro contained 11.9, 8.8 and 9.2 % crude protein and 11.2, 9.5 and 9.2% fat (oleoresin).

Table 1. Proximate composition of three capsicum varieties (Marako fana, Bako local and Oda haro, grown in Ethiopia) on wet weight basis (g/100 g).

Parameters	Marako fana	Bako local	Oda haro
Moisture (%)	9.2 ± 0.1 ^a	9.0 ± 0.2 ^a	8.8 ± 0.1 ^a
Crude protein	11.8 ± 0.1 ^a	8.7 ± 0.4 ^b	9.2 ± 0.2 ^b
Crude fiber	27.3 ± 0.2 ^a	26.0 ± 1.3 ^a	28.6 ± 0.8 ^a
Crude fat (Oleoresin)	11.2 ± 0.2 ^a	9.5 ± 0.1 ^b	9.2 ± 0.4 ^b
Total ash	5.3 ± 0.6 ^a	7.3 ± 0.1 ^a	7.3 ± 2.2 ^a
Carbohydrate	35.3 ± 0.6 ^a	39.5 ± 0.9 ^a	37.1 ± 2.1

Results are presented as mean ± standard deviation; values with different letters across the row are significantly different at 95% confidence level.

As is reported in FAO [13] dried peppers (*Capsicum annum*) contain 13.4% moisture, 12.8% protein, 11.9% fat, 56.2% carbohydrate, 22.5% fiber, and 5.7% ash. The Ethiopian varieties exhibited lower values in moisture, protein, fat, and carbohydrate. However, they have higher values of ash and crude fiber. This suggests that the products can be good sources of crude fiber and total ash. Crude protein is a measure of dietary protein that is based on the assumption that the average amino acid in a protein contains 16 percent nitrogen. Thus, total chemically determined nitrogen $\times 6.25$ ($100 \div 16$) = crude protein.

Mineral composition. Table 2 shows the mineral composition of the three capsicum varieties. There is no significant difference ($p > 0.05$) between the three varieties as far as magnesium, sodium, zinc, copper and manganese contents were concerned. On the other hand, significant difference was observed in the contents of potassium, calcium and iron. Oda haro was found to have higher contents of potassium, calcium and iron. These would make Oda haro to be nutritionally preferable compared to Marako fana and Bako local. Sodium, potassium, calcium, magnesium, iron, zinc, copper and manganese content range for capsicums grown in Tenerife Island (the largest of Spain's seven Canary Islands) were reported to be between 0.5-5.00, 177-260, 9-12, 10-14, 0.4-0.75, 0.12-0.26, 0.0065-0.104 and 0.10-0.125 mg/100 g, respectively [14]. While comparing to these results sodium, calcium, iron, zinc, copper and manganese contents of Ethiopian capsicum varieties were found to be within the range of the results reported for capsicum grown in Tenerife Island. Potassium and magnesium on the other hand, were found to be low.

Antinutritional factors. Tannin content of Marako fana, Bako local and Oda haro were found to be 0.142, 0.164 and 0.148 mg/100g sample, respectively. Phytate was not detected in all the

three varieties. There was a significant difference between the three varieties in tannin content at 95% confidence level, in which Bako local was found to have the highest value, while Marako fana exhibited the lowest. Since there is no phytate, the possibility of finding the mineral in available form is high for all the three varieties.

Table 2. Mineral composition of three capsicum varieties on wet weight basis (mg/100 g).

Mineral type	Marako fana	Bako local	Oda haro
Potassium	1.7 ± 0.1 ^a	1.7 ± 0.1 ^a	1.8 ± 0.1 ^b
Magnesium	8.7 ± 0.2 ^a	8.5 ± 0.1 ^a	8.8 ± 0.3 ^a
Sodium	13.8 ± 0.9 ^a	14.0 ± 0.3 ^a	14.4 ± 0.1 ^a
Calcium	27.2 ± 0.2 ^a	38.2 ± 0.5 ^a	54.6 ± 0.1 ^b
Iron	7.2 ± 0.4 ^a	6.9 ± 0.3 ^a	9.6 ± 0.7 ^b
Zinc	3.9 ± 0.8 ^a	4.0 ± 0.3 ^a	2.8 ± 1.3 ^a
Copper	0.3 ± 0.2 ^a	0.3 ± 0.1 ^a	0.4 ± 0.1 ^a
Manganese	0.8 ± 0.2 ^a	0.7 ± 0.1 ^a	0.8 ± 0.4 ^a

Results are presented as Mean ± standard deviation; values with different letters across the row are significantly different at 95% confidence level.

CONCLUSIONS

Marako fana is preferable for large scale production of oleoresin. It has low tannin and hence chance of getting protein in available form is high. Oda haro on the other hand is nutritionally preferable because it contains high amounts of potassium, calcium and iron.

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