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Research Article

Effect on Nutritional Composition of Organically and Inorganically Cultivated Garlic

Preeti Bajpai* and Darshan Punia

Department of Foods and Nutrition

***Corresponding author:** Preeti Bajpai, Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar

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Abstract

Organic agriculture is a unique production management system which promotes and enhances agro ecosystem health, including biodiversity, biological cycles and soil biological activity [1]. Conventional agriculture is characterized by using a great amount of chemical fertilizers, synthetic pesticides, and growth regulators etc., resulting in heavy reliance on non-renewable resources. The present investigation was carried out with the objectives to study the nutrient composition of garlic grown under organic and inorganic conditions. Samples of organically and inorganically grown garlic were procured from the university farm. Proximate Nutrients composition and mineral composition of garlic grown organically and inorganically was studied. The results of the present study revealed that inorganically grown garlic had significantly higher moisture and crude protein per cent as compared to organically grown garlic. Significant difference was observed in crude fibre content of the organically grown and inorganically grown garlic. Garlic grown organically had significantly higher ash content as compared to their inorganically grown and conventionally grown counterparts. Calcium, phosphorus, iron, zinc, and manganese content of organically grown garlic were significantly higher as compared to inorganically grown garlic.

Keywords: Garlic; Nutritional evaluation; Organic; Inorganic; Conventional

Introduction

Organic agriculture is a unique production management system which promotes and enhances agro ecosystem health, including biodiversity, biological cycles and soil biological activity [1]. Organic agriculture system is based on principle intended to guarantee the production of nutritious food with minimal environmental impact [2]. Organic system consistently differs from conventional system primarily in the prohibition of manufactured soluble fertilizers and pesticides. The extent to which these inputs are replaced by alternative management practices for inputs such as green manure crops, compost, fertilizers or integrated pest management varies between commodities, location and individual farmers [3]. Conventional agriculture is characterized by using a great amount of chemical fertilizers, synthetic pesticides, and growth regulators etc., resulting in heavy reliance on non-renewable resources, reduced biodiversity, polluted water resources, chemical residues in food, soil degradation and health risks to farm workers handling pesticides all of which bring into question the sustainability of the conventional farming system [4,5].

Public interest is increasingly focusing on the problem of the quality of foods because of people's growing awareness of health and the environment. The global consumer is increasingly becoming health cautious with diet being the most important aspect in health control agenda. Pesticides are widely used throughout the world in agriculture to protect crops, but they pose significant health problems besides commonly contaminating soil, air and water. The high-risk groups exposed to pesticides include the production workers, formulators, sprayers, mixers, loaders and agricultural farm workers. Organic food products with high nutritive value and without chemicals (with potential carcinogenic and mutagenic properties) are being increasingly preferred over conventional agro products, which are cultivated using insecticides, pesticides and chemical fertilizers. The vegetable crops have been well advocated in solving the problem of food security in India.

They are rich source of minerals, vitamins, fibre and contain a fair amount of protein as well as carbohydrates. Garlic and its supplements have long been consumed in many cultures as

a natural remedy against a range of human illnesses, including various bacterial, viral and fungal infections, hypolipidemic, antiplatelet, antitumoral, regulating blood pressure, lowering blood sugar and cholesterol levels and providing pro circulatory effects. It is fascinating to observe how ancient cultures came to the same conclusion about garlic's action and efficacy as confirmed from results of modern science. Analysis of data showed in numerous studies confirm that many people believe that organic foods are healthier and safer than inorganically produced foods and are produced in a more environmentally compatible manner [1,6].

Although the interest in the organically grown foods has been on increase, there have not been substantial studies to substantiate convincingly that organically grown foods are nutritionally superior to their inorganically grown counterparts. Organic Farming can contribute to meaningful socio-economic and ecologically sustainable development, especially in poorer countries [7]. Owing to the nutritional importance of vegetables in our diet and increasing concern toward health and organic farming of people's it becomes important to evaluate the nutrient composition of vegetables grown under organic and inorganic conditions. The present investigation tried to determine the nutrient composition of garlics grown under organic and inorganic conditions.

Materials and Methods

Procurement of Vegetables

The samples of the garlic grown under organic and inorganic conditions were procured from Vegetables Farm, Chaudhry Charan Singh Haryana Agricultural University, Hisar. Samples of garlic were also procured from the local market for comparative study.

Nutrient Composition

Sample Preparation: After cleaning garlic cloves dried in hot air oven at 60 ± 5 °C. After drying, dried powder garlic were grounds in an electric grinder to a fine powder. The powder kept in an air tight container at room temperature for further analysis except for moisture in which fresh samples of garlic was used.

Proximate Nutrients: Moisture (in fresh sample), crude protein, crude fibre, and total ash were estimated by employing standard method of analysis [8].

Minerals: Total minerals including Ca, P, Fe, Zn, Mn and Cu were analysed by using Atomic Absorption Spectrophotometer [9].

Data Analysis

Standard method of statistics i.e. analysis of variance was used for analyzing the data obtained.

Result and discussion

Proximate Composition of Vegetables

The data presented in Table 1 showed that moisture content of organically grown and conventionally grown was almost similar but inorganically grown garlic contained significantly higher moisture content (62.89 %) as compared to organically (62.04%) and conventionally grown (62.01%) garlic. These variations in the moisture content of vegetables might be because plant grown in inorganically managed soil grows very fast and in this period of rapid growth, there is more water uptake and less nutrient uptake from the soil [10]. But in contrast, plants grown organically managed soil take time to grow and have more time to absorb nutrients from soil and thus have less water in their cell matrix.

Table 1: Proximate and Mineral composition of Garlics grown under organic and inorganic conditions.

Vegetables	Conditions			CD (P≤0.05)
	Organic	Inorganic	Conventional	
Moisture (%)	62.04 ± 0.012	62.89 ± 0.369	62.01 ± 0.019	0.82
Protein*	6.33 ± 0.002	6.78 ± 0.219	6.85 ± 0.073	0.46
Crude Fiber*	1.82 ± 0.03	1.80 ± 0.01	1.80 ± 0.02	NS
Ash*	4.26 ± 0.01	3.82 ± 0.08	3.96 ± 0.02	0.17
Calcium*	53.83 ± 1.69	47.18 ± 0.91	50.00 ± 1.00	4.33
Phosphorus*	344 ± 1.52	323.83 ± 0.88	320.83 ± 0.67	3.77
Iron*	3.82 ± 0.01	2.35 ± 0.01	2.48 ± 0.02	0.06
Manganese*	1.88 ± 0.014	1.79 ± 0.008	1.86 ± 0.013	0.04
Zinc*	2.07 ± 0.030	1.61 ± 0.028	2.06 ± 0.017	0.08
Copper*	0.97 ± 0.012	0.68 ± 0.006	0.72 ± 0.008	0.03

*(% dry weight basis)

It has been observed that both conventionally grown and inorganically grown garlic had significantly higher protein content (6.85 and 6.78 %) respectively as compared to organically grown garlic (6.33 %). The lower crude protein content in the organically grown vegetables might be attributed to the non-availability of adequate nitrogen content throughout the crop growth period, as there is slow release of nitrogen from organic manures [11]. The crude fibre content of garlic grown organically, inorganically and conventionally was observed almost similar. However, ash content of organically grown garlic was observed significantly higher (4.26 %) as compared to inorganically grown (3.82 %) and conventionally grown garlic counterparts (3.96 %). This might be attributed to higher dry matter content of the organically grown vegetables.

Mineral Composition of Vegetables:

The data on mineral composition elucidated in Table depicted that garlic grown under organic conditions had significantly higher amount of calcium (53.83 mg/100 g) as compared to those were grown under inorganic conditions (47.18 mg/100 g); however, calcium content of conventionally grown garlic (50.00 mg /100 g) non significantly differed from organically and inorganically grown counterparts. Organically grown garlic had significantly higher amount of phosphorus and iron (344 and 3.82 mg/100 g) respectively as compared to inorganically grown as well as conventionally grown garlic (323.83 and 320.83; 2.35 and 2.48 mg/100 g) respectively. Non-significant differences were observed between conventionally grown and inorganically grown garlic for their phosphorus and iron content. The increase in phosphorus content of organically grown vegetables may be attributed to increased availability of soil phosphorus due to the solubilizing effect of organic acids, which are produced from decomposing organic manures.

Further, the organic manures also reduce the fixation of phosphorus and increase the available phosphorus concentration in soil for absorption resulting in increased content of phosphorus in vegetables [11]. Variation in iron content of organically and inorganically grown vegetables might be attributed to the fact that inorganically managed soils contain adequate amount of iron but in an unavailable form. The presence of abundant microorganisms in organically managed soil stimulates substances such as citrate and lactate to combine with the soil iron and make them more available to plant roots [12]. The comparison between mean values of zinc content of garlic revealed that organically grown and conventionally grown garlic had significantly higher (2.07 and 2.06mg/100g) zinc content as compared to inorganically grown garlic (1.61mg/100g); whereas a non-significant difference was observed between organically grown and conventionally grown garlic.

Copper content of organically grown garlic (0.97 mg/100g) was significantly higher as compared to their inorganically grown (0.68mg/100g) and conventionally grown (0.72mg / 100g) respectively. Copper and zinc are common constituents of animal feed supplements and a possible explanation for the higher concentrations of Cu and Zn in the organic samples is that the application of manures, more typical of organic cultivation, may act as an additional source of Cu and Zn to the soil and the plants [13,14]. Garlic grown under organic conditions had significantly higher manganese content (1.88mg/100g) as compared to those were grown under inorganic conditions (1.79 mg/100g). However, manganese content of organically grown and conventionally grown garlic (1.86mg/100g) was observed almost similar.

Conclusion

We can conclude that organically grown garlic may have more nutritional benefits than inorganically grown counterparts and consumption of these vegetables can be beneficial for our health though more research is needed on this part. People should be encouraged to consume organically grown vegetables as they have better nutrient profile and consumer acceptability.

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