

The Influence of Organic and Conventional Food on Human Health

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Abstract

Organic food offers immense benefits to consumers as it contains a higher content of nutrients and antioxidants. The benefits of organic food over conventional products have been demonstrated by *in-vitro* experiments, whereby statistical analysis has shown that both types of food can have equivalent benefits. One of the important disadvantages of conventional food is that it contains heavy metals and also does not contribute toward prevention of cancer in consumers. It is not clear yet if consuming organic food combats obesity; we have attempted to gather some literature to clarify this aspect as well.

Keywords

Organic Food, Consumer Benefits, Cancer Prevention

1. Introduction

With increasing awareness in consumers about safe and healthy foods, the demand for organic foods is growing as well [1], which has led to an increase in sales of organic products in markets [2]. The major reason for the popularity of organic foods is the notion that they are the healthier alternative to regular foods [3] [4] [5] [6] [7]. As per common understanding, such food products have higher nutritional value and are free of pesticides and heavy metals [8] [9] [10]. In other cases, people may be interested in organic products because of the promise of environmental sustainability that organic agriculture offers [11] [12] [13]. In this review, we aim to explore the influence of organic foods on health by exploring the differences in nutrient content between organic and conventional foods. We address questions such as: Do organic food consumers enjoy a healthier life according to approved studies? Does consumption of organic foods contribute to reducing the risk of developing cancer?

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2. Nutritional Differences

A number of studies have reported a difference in the nutrient content of organic and conventional food stuffs. A richer nutrient content is generally present in organic food as compared to conventional food. For instance, in their natural states, the level of antioxidants is higher in organic beans than in conventionally grown beans [14]. This conclusion was made by a study that analyzed the differences in total phenolic content in eight types of beans that were cooked to varied extents and under different conditions; phenolic content was reduced in beans of all types after cooking. Similarly, tomato fruits grown in soil treated with organic matter showed higher phenolics and flavonoids than control plants grown in untreated soil. Furthermore, beta-carotene increased in soil that had been treated with chemical fertilizers as compared to untreated soil [15]. Research has also shown organic crops to have the highest concentration of vitamin C, iron, magnesium, and phosphorous. Treatment with organic fertilizers significantly decreases Cd, Pb, and As in tea leaves [16] [17] [18]. Conventional crops contain high levels of heavy metals, which pose a threat to people's lives. In an *in-vitro* study, the biochemical properties of organic foods revealed them to have higher activity of antioxidants and antimutagenic agents as compared to conventional foods [19].

The major nutritional differences are summarized in **Table 1** below [19].

3. Gap of Previous Studies and Research Significance

Despite the growing research interest in organic food and its health effects on the population, there is still a lack of studies that have applied reliable statistical tests to compare health effects of organic and conventional food in relation to the main criteria [20]. The significance of the present research refers to identifying the major long-term health effects, including the risks of serious diseases such as cancer in people consuming organic and conventional food respectively. On this basis, better-supported nutritional recommendations can be formulated.

Table 1. Nutritional differences between organic and conventional food.

Criterion	Organic Food	Conventional Food
Antioxidants' availability	High (20% - 40% more than conventional food)	Low
Phenolics and flavonoids concentration	High	Low
Beta-carotene levels	Low	High
Concentration of vitamin C, iron, magnesium, and phosphorous	High	Low
Level of heavy metals	Low	High

4. Organic Food and a Healthy Lifestyle

The risk of obesity is reported to decrease by 31% in individuals who consume organic foods as compared to in individuals, who consume conventional foods. A strong correlation was observed to exist between reduced risk of obesity and introduction of organic foods in diet [21]. Consumers of organic foods also exhibit higher levels of fitness [12] [20] [22] [23]. In addition to obesity, the levels of physical activity as well as the balance of carbohydrates, protein, vitamins, and minerals were also included in the parameters being evaluated [19].

5. Organic Food and Cancer

Increased consumption of organic foods has been associated with a decreased risk of developing non-Hodgkins lymphoma (NHL). Similarly, it has also been established that there is a reduced risk of breast cancer and soft tissue sarcoma in people with preferential consumption of organic food [24]. Preference for organic food and frequency of consumption was measured in terms of the individuals' eating organic food only sometimes, often, or never. Another study based on a large cohort of 68,946 participants observed that a higher organic food score (that reflected a higher frequency of organic food consumption) was associated with a decreased risk of developing NHL and postmenopausal breast cancer [25]. At the same time, no association was detected for other types of cancer [25].

6. Accessing Reliable Data on Organic and Conventional Food

The recent and reliable data on organic and nutritional food as well as their health effects can be accessed from corresponding peer-reviewed journal articles [19]. In addition, official websites and publications of government agencies and non-government organizations may provide the relevant statistics and explanations that may inform better-supported decisions to be made by a concrete individual.

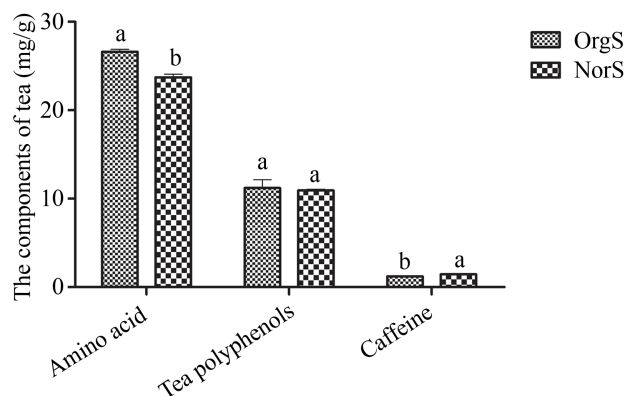


Figure 1. Amino acids, polyphenols, and caffeine contents of tea under treatment with organic (OrgS) or chemical (NorS) fertilizer. Columns with different letters indicate statistically significant difference (LSD test, $p < 0.05$) [18].

Table 2. Pearson's correlation coefficient for total polyphenol content and antioxidant capacity of organic and conventionally grown beans.

Pearson's correlation coefficient (<i>r</i>)	Parameter
0.840	DPPH radical scavenging activity
0.867	ABTS radical scavenging activity
0.774	FRAP activity

DPPH: 2,2-diphenyl-1-picrylhydrazyl, ABTS: 2,2'-Azino-bis(3-ethylbenzthiazoline-6-sulfonic acid); FRAP: Fluorescence recovery after photobleaching.

Table 3. Analysis of variance (ANOVA) of means square [MS (Pr > F)] for photochemical compounds [26].

Source	Total phenols	Total flavonoids	DPPH scavenging assay	FRAP assay	Cyanogenic glycoside
Fertilizer	259.23*	53.76**	502.98**	672.65**	0.022*
Variety	134.48*	5.44*	494.02**	0.37	0.002
F × V	56.91*	17.43**	45.34**	13.31*	0.001
CV (%)	2.91	2.70	3.68	3.00	9.02

**means significant at $p < 0.01$ and * means significant at $p < 0.05$.

7. Future Prospects

Currently, numerous statistical studies have compared phenolic and flavonoid compounds in organic and conventional crops, both of which are established to be highly correlated with antioxidant activity [27] [28]. **Table 2** and **Table 3**, as well as **Figure 1**, present a summary of phenolic content in conventional and organic crop production. It was reported by the authors of this information that the difference in phenolic content in organic and conventional crops was not statistically significant. However, when the same experiment was performed in laboratory settings, statistically significant differences were observed with organic crops having higher flavonoid content.

Given the varying results from research, it is not possible to conclude with confidence as to which organic foods contribute to reducing the risk of cancer. Regardless, the variability in results signifies its importance for health, and more clinical studies comparing organic and conventional foods will be immensely valuable to clarify this aspect. From our perspective, more studies will help elaborate the reasons working behind the lesser nutritional value of conventional products as compared to organic foods. A predominant idea in this regard is that the use of fertilizers may be the major cause for reduced nutritional benefits from conventional foods [19]; however, much research needs to be done to evaluate this hypothesis on both laboratory and field scales. Future research should consider the influence that the two different kinds of meals have on people with the same health conditions, sports practices, lifestyle, age, and gender. Such research would help solve the debate on whether consumers of organic foods are

truly making better and healthier food choices that reflect positively on individuals' health [29] [30] [31] [32].

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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