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Analysis of Organic Food: Evaluating Nutritional Value and Impact on Human Health

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Abstract: ***This investigation will mostly focus on the organic farming practices and product quality. Although organic agriculture has become more well-known in recent years, there is still much to learn about this method of producing food, including how it may affect the wellness of consumers and other environmental factors. Human health is the most important factor to consider when it comes to eating. The environment is exposed to a multitude of pesticides, and heavy metals from industrial waste and these pollutants contaminate irrigated water, endangering human health. A lower Body Mass Index (BMI) and obesity, changes in blood nutritional composition, and a lower risk of preeclampsia associated with pregnancy and maternal obesity have all been associated with increased consumption of organic foods. In this way, research assessing organic food products assessed the critical domain of nutritional quality. The key objective of the present research was to evaluate the nutritional content of fruits, vegetables, and other commonly grown organic food in India.***

Keywords: Health, Nutritional Value, Organic Food and Quality Etc.

1. INTRODUCTION

The two basic components of human capital are health and education. Health has an impact on labour output, and access to food determines life quality. Nowadays, the use of pesticides and fertilizers in conventional farming has a negative impact on people's health. In India, organic farming is widespread. India's modern agriculture is barely 60 years old, but the green revolution, which was brought about in 1966 as a result of significant American arm-twisting, is

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barely 40 years old. On the other hand, farming has been in India for almost 4,000 years. Anybody attempting to write about the history of organic farming will need to make references to India. The farmers are referred to as "farmers of forty centuries," and their livelihood comes from organic farming (http://navdanya.org/site/campaigns/2-uncategorised/441-organic-farming-In-India). In the 1960s, India initiated the 'Green Revolution'. With the introduction of fertilizers and pesticides, the amount of food that could be produced on each acre of land increased dramatically throughout this time (worldofchemicals.com).

Growing interest in organic farming methods as a substitute for traditional plant foods has been observed over the last few decades. Foods grown organically are now among the greatest choices for growers and customers alike. By the end of the 20th century, organic foods became more and more popular as consumer awareness and preference grew, because they are not used during growth, organic foods are known to have fewer agrochemicals. Because organic agriculture is a less expensive technique of cultivation, conventional farming is more commonplace globally than organic cultivation. (Annapurna. A et al, 2003). The concept of "organic farming" refers to a method of agricultural production that substitutes natural processes and inputs for synthetic chemicals, fertilizers, and pesticides. Producing wholesome, high-quality food while advancing social responsibility, environmental care, and sustainability is the aim of organic farming. In India, there are 6,50,000 organic farmers and around 5.2 million hectares of unfertilized soil, per a report. In terms of the sheer number of producers, India is one of the world's largest producers of organic food. Organic farming and food production have advanced because of the desires of Indian consumers and policymakers for high-quality food production that promotes the welfare of animals, the environment, and the development of rural areas. The organic movement has been pushing for a more equitable, ecologically responsible, and health-conscious food and farming system by 2030. According to this vision, 50% of India's agricultural land will be managed using the organic values of justice, fairness, environment, and care. However, there is still a substantial disparity between the supply and demand of organic food, despite the industry's extraordinary expansion (Mona Elena Popa et al., 2019). One might think that organic food would be healthier because they appear to include more of certain vitamins and minerals, phytonutrients that are linked to health, and less pesticide residue. Therefore, the present study focusing on assesses the organic products and their nutritional value and quality of food.

2. RELATED WORKS

A comprehensive literature evaluation is an essential component of every research project. Assessing earlier research in the relevant topic of study is a researcher's most significant responsibility. It aids in both defining the boundaries of the field and preventing inadvertent copying of previously completed work.

Adom et. al. (2003) stated that by consumption of whole grain there may be reduction in the risk of life style disorders like cardiovascular diseases, cancer and chronic diseases. The specific phytochemicals found in grains have such beneficial health effects as found from vegetables and fruits. A study was conducted with the objectives to develop profiles of phytochemicals and to

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determine total antioxidant activity among 11 varieties and experimental lines of wheat. Large genotypic variations in carotenoid concentration could lead to new breeding opportunities for more nutritious wheat types.

Around the world, there has been a rise in the use of organic food, as reported by Gyorene (2006). The aim of review was to find the nutritional value both positive and negative of crops grown conventionally and organically, as determined by current global comparative studies. Additionally, research was done on the connections between conventional and organic food production methods, the nutritional content of food items, and the consumption of conventional and organic diets, all of which have a significant impact on human health. Compared to conventional crops, organic crops have a higher dry matter content and much higher concentrations of certain antioxidants (such as vitamin C, flavonoids, and polyphenols), as well as minerals. Furthermore, compared to conventional crops, organic crops have reduced levels of pesticide residues, nitrate, and some heavy metal pollution. The nutritional makeup of crops was correlated with the various techniques used in these two plant production systems for fertilisation and plant protection. As a result, it was shown that compared to conventional food items, organically produced plant-derived food products have a better nutritional value, including antioxidants.

Hoogenboom (2008) analysed organically grown products to evaluate the presence of antibiotic resistance, microorganisms and contaminants in comparison to conventionally grown products. Organically and conventionally grown wheat during dry and wet season was compared but no differences could be observed for the toxins produced by *Fusarium* (zearalenone and deoxynivalenol). In the head of lettuce, which were grown organically, lower level of nitrate was observed compared to conventionally grown lettuce.

Crinnion (2010) stated that the perception among consumers that organic food is healthier—having more nutritional value and fewer harmful chemicals—fuels the multibillion dollar organic food industry. Due to variations in the ground cover and maturity of the organic farming operation, studies on the nutrient content of organic foods yield varying results. Additionally, the amount of nutrients fluctuates from year to year and among farmers. Reviews of numerous research, however, revealed that compared to nonorganic versions of the identical foods, organic variations do offer noticeably higher quantities of vitamin C, iron, magnesium, and phosphorus. These nutrients are higher in them, but the levels of nitrates and pesticide residues are notably lower. Moreover, organic foods often include higher concentrations of several significant antioxidant phytochemicals (anthocyanins, flavonoids, and carotenoids), with the exception of wheat, oats, and wine. In vivo studies of antioxidant activity in humans have not shown any additional benefit, despite the fact that in vitro studies of organic fruits and vegetables consistently show that organic foods have greater antioxidant activity, are more potent suppressors of the mutagenic action of toxic compounds, and inhibit the proliferation of certain cancer cell lines. When it comes to allergic dermatitis, there are undeniable health benefits to eating organic dairy products.

Benbrook *et. al.*, (2014) evaluated the nutritional content variations between 236 matched pairs of conventional and organic food samples. Vitamin C, beta-carotene, vitamin E, potassium,

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phosphorus, nitrates, total proteins, total phenolics, total antioxidant capacity, and the polyphenols quercetin and kaempferol were among the nutrients taken into consideration. In accordance to this review, organic produce has an 80% higher total antioxidant capacity than produce cultivated conventionally. It also has higher levels of total phenolics, vitamin E, vitamin C, and quercetin. The three main components of conventional fertilizers—potassium, phosphorus, and total protein—were found in higher concentrations in conventional products.
A study on growing of cereal crops in three regions in republic of Macedonia: stip-ovce pole veles and Negotino. In the 2013 three types of farming methods were applied viz: organic, conventional and in-conversion production for collection of wheat, barley and oat samples investigated by **Menkoveska *et. al.* (2014).** The proximate composition of the study showed that moisture content 12.08 per cent was found highest in conventional farming followed by 11.38 per cent in conversion and least 9.90 per cent were observed in organic farming.
The agricultural sector of organic food production is expanding rapidly, having grown by almost 250 percent in the last ten years. Organic farming relies solely on natural fertilisers and biological pest control methods, without the use of synthetic fertilisers or pesticides. The latest large-scale meta-analysis indicates that compared to conventional food, organic food has far lower levels of pollutants and higher quantities of antioxidants. According to preliminary research, people who consume organic food assess their health state more accurately than those who consume conventional food reported by **Rembialkowska *et. al.* (2016)**.

3. MATERIALS AND METHODOLOGY

Research is a methodical and sophisticated way of thinking that uses specialized equipment, techniques, and methods to solve problems more thoroughly than would be feasible with standard tools. It begins with an issue, gathers information or facts, critically evaluates them, and renders a decision based on the available evidence. Comparative studies between organic and conventionally produced food products were used to evaluate the nutrition, health hazards, and benefits of eating organic food. Discovering the solution to the issue by using a scientific method is the aim of any research project. Finding out if organically grown food differs from conventionally grown food is the goal of the current study, "A comparative study on consumer perception, sensory attributes, nutrients, and pesticide residue level among organic foods and conventional foods". Several research activities have been performed in order towards achieving the study's objectives, which include the following:

- To assess the nutritional value of conventional and organic foods in India
- To investigate non-nutritive bioactive substances found in both types of food
- To evaluate the amount of pesticide residue in conventional and organic foods.

Several studies that look into whether the nutritional worth of food grown conventionally and organically differs have been published. The kinds of studies and the designs of those studies differ greatly. But most use one of the following four fundamental methods:

1. The chemical evaluation of conventional and organic foods that are bought from stores

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2. How various fertiliser treatments affect crops' nutritional value
3. A comparison of conventional and organic food produced on farms with conventional and organic management
4. The impact of conventional and organic feed and foods on the health of humans and animals, with a focus on reproductive health.

Because the study designs differ among the four methodologies, it is quite challenging to compare the results. Furthermore, it is difficult to draw firm conclusions on the differences in nutritional value between conventional and organic farming methods due to the lack of data from research analyzing foods acquired from retailers and focusing on the effects of fertilizer type. Nonetheless, it is not unexpected that this strategy is frequently used, as studies on fertilizer treatments are less expensive and simpler to do than comparative studies involving entire farms. Although these studies add to our basic understanding of the impacts of fertilizers, they are unable to definitively address the question of how diverse farming practices affect the nutritional value of crops. Since the influence of entire production systems (which are documented) on nutritional content are essentially being analyzed, a potentially more meaningful examination of any variations in nutritional value would come from comparing food produced from conventional and organic farms. Studies on the health of humans and animals as well as data on the content of food may finally provide the most definitive answer. Naturally, these kinds of investigations are the most costly and challenging to carry out. Data on food composition by themselves do not provide much insight into the possible digestion and metabolism of foods in the body. According to some researchers, buying the food directly from the retailers is the greatest approach to assess the nutrients that customers are actually consuming. However, this method does not allow for any control over variables like freshness, cultivar, maturity at harvest, or growing circumstances; hence, these variables may potentially mask any apparent variations in nutritional value. The research utilizes secondary data were used in the study. Conceptual modeling and an assessment of the literature represent the study's main research methodologies. The primary source of secondary data collection was, The Agricultural and Processed Food Products Export Development Authority (APEDA), Socio-Economic Survey 2022–2023, The data was gathered from a variety of online sources, research papers, reports, ResearchGate and Google Scholar searches etc,.

4. RESULTS AND DISCUSSIONS

4.1 Organic Food Products and Human Health

Additionally, compared to their conventionally farmed counterparts, organic foods typically include higher levels of important elements like antioxidants. When someone consumes solely organic foods, their symptoms of sensitivities to chemicals, foods, or preservatives may lessen or go away. (M. Elayaraja et al, 2020). Since organic food is not grown using chemical fertilisers, it is free of these harmful chemical residues and poses no health risks to humans. Natural fertilisers such as manure work perfectly and organic farmers are happy to use this safer but more odorous

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kind of fertilizer. (https://www.maple3.ca/post/9-amazing-benefits-of-organic-food). The multibillion-dollar organic food market is driven by consumers' conviction that organic food is healthier (has greater nutritious value and fewer hazardous chemicals). Studies on the nutritious content of organic foods produce inconsistent results because of differences in the ground cover and maturity of the organic farming operation. Furthermore, the amount of nutrients varies across farms and from year to year.

Reviews of numerous types of research studies, however, show that organic foods do provide significantly larger amounts of vitamin C, iron, magnesium, and phosphorus when compared to non-organic versions of the same foods pesticide residues are notably lower. These metabolites protect plants from harm and might potentially help shield people from illness. However, there is significant fluctuation in the amount of nutrients in food depending on soil-related, meteorological, and geographic factors as well as when the produce is harvested and stored. It is challenging to generalize about the nutritional value of organic vegetables because of these considerations **(Irene Mathieu et al., 2021)**. Furthermore, with the exception of wheat, oats, and wine, organic foods frequently have higher amounts of numerous important antioxidant phytochemicals (carotenoids, flavonoids, and anthocyanins). While in vitro studies of organic fruits and vegetables consistently demonstrate that organic foods have greater antioxidant activity, are more potent suppressors of the mutagenic action of toxic compounds, and inhibit the proliferation of certain cancer cell lines, in vivo studies of antioxidant activity in humans have not demonstrated any additional benefit. Eating organic dairy products has proven health benefits when it comes to allergic dermatitis **(Crinnion WJ,2010)**.

4.2 Nutritional Quality and Health Benefits

Individual's quality of diet has a direct impact on their health. There are various reasons why the organic process is better than the standard method, as stated by **Smith-Spangler et al. (2012)**. According to **Reeve et al. (2016)**, the foods that were organic had a higher nutritional density. Polyphenols are secondary metabolites that are primarily produced by a number of plant metabolic pathways, including the pentose pathway, phosphate pathway, phenyl propanoid pathway, and shikimic acid pathway. All of these pathways are essential for the physiological and anatomical components of the human diet to enhance their antioxidant properties. When comparing organic farming to conventional farming, a study on food items showed lower levels of pesticides and nitrates as well as higher nutritional value as indicated by the levels of polyphenols (Flavanol), vitamin C, vital amino acids, and sugars **(Matt et al., 2011)**. **Rembiałkowska (2016)** observed that there was a 20% increase in phenolic component concentration in organic products as compared to conventional products. **Faller et al (2009)** also found that fruits and vegetables cultivated organically had greater polyphenol contents. Moreover, a number of antibacterial, antioxidant, immune-modulating, analgesic, anti-inflammatory, cardioprotective, and vasodilatory qualities have been discovered in vegetables cultivated organically **(Talhaoui et al., 2015)**. Furthermore, other investigations have found that because organic food is healthier, uses less pesticide, and is less likely to harbour disease-causing microbes, it is preferable to conventional food. When apples, tomatoes, eggplants, cauliflowers,

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carrots, and cereals from organic and conventional farming were compared, it was found that the organic food sources had higher levels of nutrients such vitamin C, carotene, amino acids, and polyphenols **(see table-4.2.1)**.

One of the main tenets of the organic farming method is that health in plants and animals is not just about the absence of disease, but rather a condition of vitality and health that makes the organism more resilient to outside stresses in its natural habitat. This refers to a plant's innate ability to reproduce and withstand disease and pests. The UN is responsible for international dietary guidelines that are set by the FAO and the WHO. They are designed to be food-based and customized for particular nations or areas conducted an analysis of several national dietary standards and found that there are many different perspectives on what makes a healthy diet.

Table- 4.2.1 Comparison of organic and conventional farming in terms of nutritional quality

Vegetables & Cereals	Chemical Constituent	Analysis
Cauliflower	Lipo soluble antioxidant	Organic cauliflower contained more antioxidants as compared to conventional
Zucchini	Potassium	Potassium was found to be more in organic zucchini as compared to conventional.
Apple	Phenolic components	Higher amount of polyphenols was detected in organic apple
Eggplants	Phenolic compound	In the millionaire cultivar organic content was found more
Carrots	Cartenoids	B – carotene was found to be in higher amounts in organic farming
Cereals	Proteins and essential amino acids	Organic grain was found to be more nutritious as compared to conventional.
Tomatoes	Phenolic content, Vitamin-C, Carotenoid	No difference was found in cartenoid but phenol & vitamin was found to be in higher amount in organic as compared to conventional one.

Source: Madhu Rani et al., 2023

A summary report by **Reganold et al (2016)** reviewed evidence for organic food being more nutritious. Organic foods were mentioned in German, Dutch, and British standards, but only in the context of promoting sustainable habitats, not because organic food has any intrinsic health benefits does not harm the environment **(Fischer C.G et al 2016)**.

- ❖ Promotes and sustains rural communities
- ❖ Is nutritious and healthful to consume
- ❖ Honors farm animals
- ❖ Provides farmers an equitable compensation
- ❖ Has no additional toxins

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- Is raised in the neighborhood
- Does not negatively impact farm workers' health

4.3 Nutritional Aspects of Organic Food Products

Since conventional fertilisers are not permitted in the development of organic crops, organic farming typically relies on natural fertilisers (such as green and animal dung). As a result, compared to conventional farming, organic farming uses less total plant nutrients, particularly nitrogen (see Fig. 1). As a result, there are less nutrients available overall for plant growth; yet, organic crops have somewhat higher nutritional value than conventional crops. Pesticides have been connected to juvenile malignancies as well as neurologic, neurobehavioral, and endocrine consequences, even though no researches have shown a causal relationship between dietary pesticide exposure and harmful health effects. A youngster who transitioned from a conventional diet to an organic diet showed a significant decrease in the excretion of metabolites of popular organophosphorus pesticides (malathion and chlorpyrifos) in their urine, according to a study that followed a longitudinal cohort of toddlers. It is also a constant finding of systematic reviews and monitoring program reports that organic foods have lower detectable pesticide residue than conventional foods. Children seem to be more vulnerable to these effects because of their longer life expectancy, which allows related diseases more time to develop, lower levels of detoxifying enzymes such paraoxanase-1, and higher exposure per kilogramme of weight **(Irene Mathieu et al., 2021)**.

On the other hand, information about toxicity, exposure, and long-term health impacts is not always consistent. Based on laboratory examination, the Environmental Working Group has compiled a list of produce that is most likely to have numerous chemical residues. Consumers who wish to reduce risk but are unable to purchase entirely organic food may find this useful. In regards to animal products, it is well known that organic milk has less iodine than regular milk but more omega-3 and omega-6 fatty acids. There aren't any significant nutritional differences between non-organic and organic meat products; nevertheless, because conventional animal husbandry uses more antibiotics than organic, microorganisms in conventional meat may be more antibiotic-resistant than those in organic meat. Therefore, eating conventional meat may aid in the spread of bacteria resistant to antibiotics, while there isn't much evidence to support a clear causal relationship. Furthermore, there is a widely held theory that the use of estrogenic in traditional meat may raise hormone levels in consumers, resulting in an earlier onset of puberty and an increased risk of breast cancer. However, given the low levels of sex hormones present in animal products, there aren't any research that support these theories as of yet. A small number of studies have shown correlations between the consumption of organic foods and favourable health outcomes in children, including a lower incidence of atopy, eczema, and hypospadias in boys.

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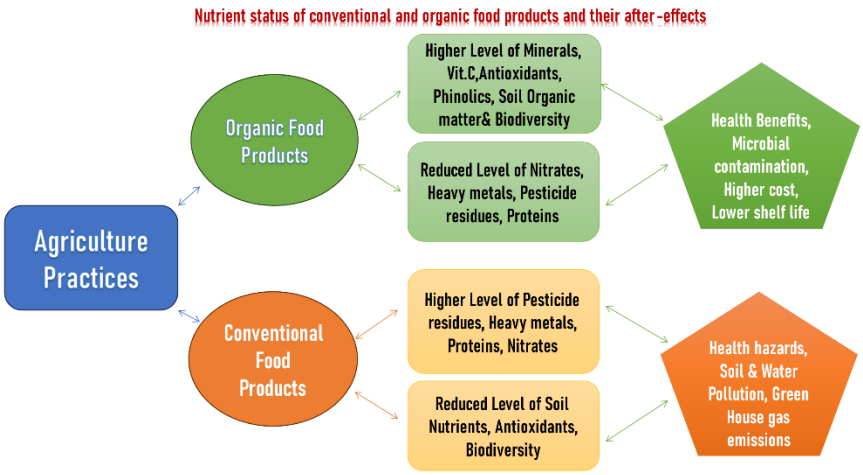

Fig-4.3.1: Nutrient status of conventional and organic food products and their after-effects.

4.4 Organic Foods and Healthy Futures

There are two strategies to think about what the future holds for organic food. First, a comparison between conventional and organic foods needs to be understood empirically. Second, In addition to improving knowledge of the ecology of organic foods, the evidence base will help with consumer choices and decision-making around these products. We understand that in order to inform public health policies and initiatives, both must go hand in hand. It would be beneficial to apply Eco-health perspectives, such as those used globally by the United Nations, that emphasize the cyclical, bidirectional relationship between diet, food systems, environment, and health outcomes. These perspectives show that small-scale agriculture with fewer industrial inputs can be more adaptable, sustainable, and health-promoting **(Preety Gadhoke et al, 2019).**

5. CONCLUSIONS

Organic foods have an approximate nutritional advantage and are linked to decreased levels of pesticide exposure; however, it is unclear if these findings have any practical implications. Eventually, the cost of organic items is typically significantly more than that of conventional products, which poses a challenge for most families. Instead of focusing just on organic goods, families should make it a priority to provide their kids lots of fresh food. Paediatricians should explain the finer points of food labelling to families who choose to buy organic items. Higher calibre research is required to fully comprehend the differences between organic and nonorganic food consumption in terms of health and environmental impacts.

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