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Ministry of planning
The central organization of
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Health benefit of organic food

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ABSTRACT

This study summarizes the existing evidence on the impact of organic food on human health and It compares organic vs. conventional food production with respect to parameters important to human health. Organic food consumption may reduce the risk of allergic disease and of overweight and obesity. In organic agriculture, the use of pesticides is restricted, while residues in conventional fruits and vegetables constitute the main source of human pesticide exposures, Positive effect on selected health problems probably results from a reduced amount of pesticide residues and an increased secondary plant metabolites intake which characterize organic food. Differences in the composition between organic and conventional crops are limited, such as a modestly higher content of phenolic compounds in organic fruit and vegetables, and likely also a lower content of cadmium in organic cereal crops. Organic dairy products, and perhaps also meats, have a higher content of omega-3 fatty acids compared to conventional products. However, these differences are likely of marginal nutritional significance. the greater concern is the prevalent use of antibiotics in conventional animal production as a key driver of antibiotic resistance in society; antibiotic use is less intensive in organic production. This study showed that there is a need for further, especially, large cohort studies concerning the effect of organic food consumption on specific diseases development.

INTRODUCTION

Organic food is produced from plant raw materials obtained without the use of artificial fertilizers and pesticides, and from animal raw materials in the production of which animals are bred without the use of antibiotics and live in conditions close to natural. Besides those, the applied raw materials for consumption and food production cannot come from genetically modified organisms and their processing excludes the use of radiation and most food additives (EC,2007). Organic food production is becoming more and more popular and is growing systematically at a rate of several percent per year (Kummeling, 2008). Still, it is a minority of food available on the market. A good example is the European Union in which organic farming area is 7.5% in a total utilized agricultural area (Eurostat,2020). Proponents of organic food are convinced that it is more beneficial to health and tastier. In recent years, several meta-analyses and cohort studies have been published that allow drawing more solemn conclusions about the impact of eating organic food on human health. The aim of the study was to review recent research related on this topic

Origin

The origin of green consumerism and organic foods goes back to the 1920s in Europe and was fueled by anti-industrialization sentiment (Tanneeru, 2006); however, it was not until the late 1960s and 1970s that the movement reached the United States (U.S.) due to some very public food scares in the food industry with regard to pesticides, after which the government banned the pesticide DDT. At the time, many counterculture and anti-Vietnam-War activists shifted their focus to the environment (Fromartz, 2006; Tanneeru, 2006). The succeeding wave of the organic movement started after the outbreak of Mad Cow disease -- bovine spongiform encephalopathy (BSE) -- at the beginning of the 21st century. The fear of genetically modified (GM) food also caused alarm, and public food safety concerns heightened (Wollen, 2003). European consumers became suspicious of the conventional agriculture industry and looked for alternative solutions. In the U.S., sales of organic food continued to grow as the rise of gourmet foods and celebrity chefs' introduction of organic ingredients to mainstream consumers further stimulated the organic market. Organic foods, perceived as healthier, more nutritious, and fresher compared to its conventional counterparts, ultimately grew from a cultural movement to a multibillion-dollar industry (Fromartz, 2006).

1- The composition of organic food

The composition of organic food which can be divided into :

1-1 The composition of organic food of plant origin

Nutritional composition of plant raw materials depends on growing conditions, a season of the year, application of fertilizers and plant protection products. Since plant materials produced in the organic system are obtained without the use of mineral fertilizers and pesticides, their composition has been compared many times to those obtained in the conventional system. The most commonly comparable ingredients are the following (Paweł G., (2020)).

A. Pesticides

Pesticide residues in food are regulated by the food quality protection act (FQPA), but the tolerance levels assigned for certain pesticides, though determined “allowable”, still pose potential health risks. The only way to avoid pesticide residues is to switch to organic foods. Some food tends to have lower pesticide residues either because fewer pesticides are used in their production or because they have thicker skins and, when peeled, contain smaller amounts of pesticides than more thin-skinned products. Children are particularly susceptible to the effects of pesticide exposure because they have developing organ systems that are more vulnerable and less able to detoxify toxic chemicals. Pesticide exposure also occurs through food, and switching to an organic diet is an important step in reducing this exposure. Research has shown that switching children to an organic diet drastically reduces their exposure to organophosphates, a class of pesticides that includes the common and toxic malathion and chlorpyrifos. Two studies

(2006 and 2003) compared the urine concentrations of organophosphorus pesticides and their metabolites in children eating conventional vs. organic diets. The results indicate that for certain types of pesticide, such as organophosphates, diet is the primary route of exposure and switching to an organic diet decreases exposure substantially. The most important organic food products to purchase for children are not only those that contain high residues in conventional form, but those that they consume in great quantity. For example, if children drink a lot of juice, purchasing organic juice is particularly important to reduce their pesticide exposure. While dietary contamination is a source for pesticide exposure and organic agriculture is critical to reducing this, it is paramount that we also consider all sources of pesticide exposure for children (Gopalakrishnan,2019).

B.Nitrates :

Nitrate are a natural component of plant material and their quantity depends on such factors as species, variety, part of the plant, fertilization, soil type and H, time of cultivation and harvest (Glibowski,2007). Many reviews showed that the content of nitrates in raw materials obtained organically is 15-50% lower, compared to conventional raw materials, although this difference is not always statistically significant (Brandt,2011).

A separate issue is the effect of consumed nitrates on human health and here this dependence is even more difficult, especially that usually the average diet of non-organic products does not exceed the harmful level of nitrate consumption (Findings and issues, 2018)

C. Content of toxic metals,

the cadmium content in organic cereals, vegetables and fruit was higher than in the conventional counterparts. On the other hand, lead level in most organic vegetables and fruits was lower in comparison with conventional products (Smith-Spangler, 2012) .

Different results were found that significantly higher heavy metal input to soil provided by addition the organic fertilizer significantly increased the content of Pb, Zn and Ni, simultaneously decreasing the content of Cd, Cr and Cu in semolina samples (Zaccone *et al.*2010).

D. secondary metabolites

Content of vitamin C in organic fruits and vegetables is in most cases higher than in the case of those obtained by the conventional method (Bobrowska-Korczak,2016) while the content of secondary metabolites such as carotenes that are not involved in defence against diseases and pests is no different (Brandt,2011) although there are some single studies where the content of carotenoids in organic samples was higher than in conventional counterparts (Gruszecka-Kosowska, 2017).

Another example of secondary metabolites is **phenolic compounds**. (Cebulak *et al.* ,2015) showed a 19% higher content of polyphenolic compounds in organic broccoli compared to those conventionally grown. The conventional pickled bell pepper fruits were richer in phenolic acids, while organic samples contained significantly more flavonoids and carotenoids. Such individual results are also confirmed by meta-analyses [Rauh , *et al.*,2011). Artificial nitrogen fertilizers used in conventional production increase the yield although they reduce the content of phenolic compounds in contrast to natural

fertilizers (with more difficult access to nitrogen), which affect a higher content of phenolic compounds, and thus greater resistance to pests and diseases, while giving a lower yield(Brandt, et al ,2011).

E. in addition to the above, some of mycotoxins was also subject to comparative analysis (the analysis showed significantly lower content of **patulin** and **5-HMF** in fruit and vegetable juices made from organic and conventional raw materials although in none of the samples the maximum permissible content has been exceeded (Polak-Śliwińska *et al.* 2012) . Analysis of **aflatoxin** and **ochratoxin A** in dried fruits also showed a lower probability of finding mycotoxins in organic than conventional products (Gajewska, 2019). Analysis of several studies concerning detecting **Escherichia coli** in organic and conventional fruits, vegetables and grains showed no significant difference (Rauh V., et al 2011).

An additional argument raised by enthusiasts of organic food is the difference in taste with a clear indication in favour of organic products, although other authors do not confirm this. One study showed no significant differences between the taste of traditionally and organically produced tomatoes, cucumbers, onions, lettuce and spinach (Zaccone, C.,2010).

1-2 The composition of organic food of animal origin

A . a meta-analysis concerning the nutritional quality of conventional and organic dairy products was shown that concentration of some pro-healthy ingredients like α -linolenic acid, total omega-3 fatty acid, cis-9,trans-11 conjugated linoleic acid, trans-11 vaccenic acid, eicosapentaenoic acid,

and docosapentaenoic acid and omega-3 to -6 ratio is significantly higher in organic products (Massey et al.2018). On the other hand, conventional products contained less fat, saturated and monounsaturated fatty acids. No significant differences were observed for the content of α -tocopherol and β -carotene., in contrast to Massey et al. other study showed that organic milk has significantly higher α -tocopherol concentrations.(Średnicka-Tober et al. 2016).

B. The a meta-analysis based on sixty seven studies, they showed that organic meat contains a slightly lower concentration of monounsaturated fatty acids and 23% higher polyunsaturated fatty acids (PUFA), especially, n-3 PUFA (47%) Średnicka-Tober et al. 2016).

C. Meta-analysis concerning contamination of organic and conventional animal origin products with bacterial pathogens showed insignificant differences in case of chicken, raw milk and eggs, however, in most analysed works risk for isolating antibiotic-resistant bacteria in organic products was lower than in nonorganic products (Rauh V, *et al* 2011)

Below Table 1 summarizes the compositional differences between organic and conventionally produced food

Table 1 the compositional differences between organic and conventionally produced food (Brantseater *et al* .2017)

Parameters	Food produce	Organic versus conventional
Vitamins: e.g., vitamin C, vitamin E, and carotenoids	Fruit, vegetables	Higher
Minerals: calcium, potassium, phosphorous, magnesium, iron	Fruit, vegetables, cereals	Higher
Nitrate	Fruit, vegetables, cereals	Lower
Antioxidant activity	Fruit, vegetables, cereals	Higher
Phenolic compounds (total)	Fruit, vegetables, cereals	Higher
Protein, amino acids, nitrogen	Fruit, vegetables, cereals	Lower
Beneficial fatty acids, i.e., eicosapentaenoic acid, docosapentaenoic acid, docosahexaenoic acid, α -linolenic acid, and conjugated linoleic acid	Milk , meat	Higher
Cadmium	Fruit, vegetables, cereals	Lower in cereal
pesticide residue	Fruit, vegetables, cereals	Lower risk for contamination
Fusarium toxins	Cereals	Similar or lower in organic

2-The effect of organic food consumption on human health

Although organic food has been known for a long time, research on the impact of its consumption on health for many years was not very spectacular. However it will be showed in this study number of health benefits as the following

2.1 organic dairy products

consumption of strictly organic dairy products (more than 90 % of organic products in a diet) was associated with a significantly lower risk of eczema in the analysed group (Kummeling et al. 2013) .

2.2 overweight and obesity

in a study on the risk of **overweight and obesity** was found that compared to non consumers of organic products, regular consumers of organic foods showed 42 and 36% lower probability of overweight in women and men, respectively, and in case of obesity, 48 and 62% lower probability in women and men, respectively. In the discussion of the results, authors indicate pesticide residues as factors responsible for an increased risk of having excessive weight (**Hallmann E., et al.2019**).

2.3 cancer

the relationship between the frequency of consumption of organic food and cancer incidence the studies showed that consumption of organic food was not associated with a reduction in the incidence of all cancer (radbury KE. Et al 2014).

2.4 pre-eclampsia

The study was carried out by (Tońska Eet al. 2017) who analysed the risk **of pre-eclampsia and organic** vegetable consumption. Women who often or mostly consumed organic vegetables had a 24% lower risk of pre-eclampsia than those who reported rare or lack of such consumption. As it was suppose that lower exposition on pesticide residues when organic vegetables are consumed can be the main factor affecting the obtained results.**The potential mechanism involved** in this phenomenon concerns **inflammation**. Since the low intake of pesticide residues and additionally, secondary metabolites present at a higher level in organic plants, with their positive influence on gut microbiota, decrease inflammation perhaps this decreases the risk of pre-eclampsia.

2.5 children health

Children born by mothers with a high level of organophosphate pesticide metabolites found in urine during pregnancy had an average deficit of 7.0 IQ points compared with those who were born by mothers with the lowest pesticide prenatal exposure. Fortunately, children's urinary pesticides metabolites concentrations were not associated with cognitive scores. Trying to understand the mechanisms involved in this phenomena authors indicate more vulnerable foetal nervous systems being under unique processes occurring during this stage of development (Polak-Śliwińska M., et al ,2013).

2.6 longer life

a woman who switched from conventional to organic products without changing the amount consumed per day she would **live 17 days longer**. The same calculation for a man gives 25 days' longer life.(Brandt K., et al .2011).

3. Environmental Advantages of Organic Food Production and regulation of organic food

3.1 Environmental Advantages of Organic Food Production

Organic food production eliminates soil and water contamination since organic production strictly avoids the use of all synthetic chemicals, it does not pose any risk of soil and underground water contamination like conventional farming which uses tons of artificial fertilizers and pesticides.

Organic food production helps preserve local wild life By avoiding toxic chemicals, using of mixed planting as a natural pest control measure, and maintaining field margins and hedges, organic farming provides a retreat to local wild life rather than taking it away its natural habitat like conventional agriculture.

Organic food production helps to conserve biodiversity. Avoidance of chemicals and use of alternative, all natural farming methods has been show to help conserve biodiversity as it encourages a natural balance within the ecosystem and helps prevent domination of particular species over the others.

Organic food production helps the fight against global warming. Most organically produced food is distributed locally, as a result, less energy is used for transportation which automatically reduces carbon dioxide emission which are believe to be the main cause of global warming.

Organic food production reduces erosion. Organic crop production methods do not foresee elimination of all v vegetation except for crops.

As a result, more soil is covered with vegetation preventing the wind to carry away the topmost fertile soil layers.

Despite the lack of scientific studies and existence of a few which even deny the environmental benefit of organic food production, there is no doubt about which food production method cause the greatest harm to the environment. The fact alone that organic farming methods strictly forbid the use of all synthetic chemicals is enough to reject allegation about organic food production not being any more environmentally friendly than the conventional farming practices. The effect of pesticides artificial fertilizers have been scientifically proven seriously damaging to both environment and human health. Pesticides do not only kills pests but beneficial mammals and birds. But their effect on the environment does not end here. Pesticides and fertilizers penetrate deep in to the soil reaching the underwater which is the main source of drinking water in many parts of the world including a large part of the UK.

3-2 Organic Food Regulations

Organic food production has been practiced for example in the United States since the late 1940s. From that time, the industry has grown from experimental garden plots to farms with surplus products to sell under a special organic label (USDA National Organic Program, 2007). Food manufacturers have developed organic processed products, and many retail marketing chains specialize in the sale of organic products. This growth has stimulated a need for verification that products were indeed produced according to certain standards. Thus, the organic certification process evolved. By the late 1980s, after an attempt to develop a consensus on production and certification standards, the organic industry petitioned

Congress to draft the Organic Foods Production Act (OFPA) defining organic (USDA National Organic Program, 2007). Before 2002, U.S. private organizations and state agencies set their own standards and had varying definitions of organic. Food labeled organic in California, for instance, may have had a different definition from what was labeled organic in Michigan, New York, or Texas. Other common food labels -- grass-fed, natural beef, free range, cage-free, and farm-fish -- are simply unregulated terms (Fernau, 2006). Natural beef can mean that cattle were raised without being fed antibiotics, hormones, or animal proteins (Fernau, 2006). Free range poultry or eggs mean that birds raised for meat, mainly chickens and turkeys, have an access to the outdoors (Fernau, 2006). The organic industry anticipated that uniformity in certification and labeling would create consumer confidence by clarifying whether a product is 100% organic or contains organic ingredients (Dryer, 2003). The USDA took more than 10 years and reviewed more than 315,000 comments from government officials, scientists, growers, and consumers to implement the new National Organic Program (NOP) and launched the NOP for agricultural products on October 21, 2002. Now, all foods that are sold, labeled, or represented as organic in the U.S., whether they are grown in the U.S. or imported from other countries, have to be produced and processed in accordance with USDA federal standards. Despite the organic seal, USDA makes no claims that organically produced food is safer or more nutritious than conventionally produced food. NOP rules are intended to help consumers know the exact organic contents of foods in the marketplace (USDA National Organic Program, 2007).

4- conclusions and recommendations

4.1 Conclusions

1. the organic food consumption may reduce the risk of allergic disease and of overweight and obesity, but residual confounding is likely, as consumers of organic food tend to have healthier lifestyles overall.
2. the growth and development is affected by the feed type when comparing identically composed feed from organic or conventional production.
3. the use of pesticides is restricted in organic agriculture, and residues in conventional fruits and vegetables constitute the main source of human exposures.
4. Epidemiological studies have reported adverse effects of certain pesticides on children's cognitive development at current levels of exposure.
5. The nutrient composition differs only minimally between organic and conventional crops, with modestly higher contents of phenolic compounds in organic fruit and vegetables.
6. There is likely also a lower cadmium content in organic cereal crops.
7. Organic dairy products, and perhaps also meats, have a higher content of omega-3 fatty acids compared to conventional products.
8. the prevalent use of antibiotics in conventional animal production as a key driver of antibiotic resistance in society; antibiotic use is less intensive in organic production.
9. Organic farming is better for the environment. Because the Organic farming practices reduce pollution conserve water, reduce soil erosion, increase soil fertility, and use less energy. Farming without pesticides is also better for nearby organisms and small animals as well as humans who live close to or work on farms.
10. Alzheimer's disease, type 2 diabetes, obesity, decreasing fertility. Many of these diseases have been linked to exposure to

endocrine disrupting compounds result from consumption non-organic food according to studies in animal and human .

4-2 Recommendations

1. There is a need for further studies concerning the effect of organic food consumption on specific diseases development.
2. Consumption of organic food instead of conventional food especially for pregnant and children because the main advantage of organic food production is the restricted use of synthetic pesticides.
3. Children do not generally respond well to dietary advice so increasing the omega-3 density of the diet by choosing organic food could be an important contribution to a healthy diet.
4. In spite of the organic food not recent product but it's necessary to get people attention about organic food.
5. Start to study issue the regulation or standard related to organic food .

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الخلاصة

تلخص هذه الدراسة الأدلة والوشرات على تأثير الأغذية العضوية على صحة الإنسان ومقارنة بين إنتاج الغذاء العضوي و إنتاج الغذاء التقليدي فيما يتعلق بالمعايير المهمة لصحة الإنسان. اذ يقلل استهلاك الأغذية العضوية من مخاطر الإصابة بأمراض الحساسية وزيادة الوزن والسمنة.

يتم تقييد استخدام مبيدات الآفات في الاغذية العضوية لكونها تشكل المصدر الرئيسي لتعرض الإنسان لمبيدات الآفات في الاغذية التقليدية نباتية المصدر، كما ويرجح من ان استهلاك الاغذية العضوية التأثير الإيجابي على بعض المشاكل الصحية نتيجة انخفاض كمية مبيدات الآفات وزيادة تناول النواتج النباتية الثانوية التي تميز الغذاء العضوي. مع ذلك وجد ان الاختلافات والفروقات في التركيب بين المحاصيل العضوية والتقليدية محدودة امثلة ذلك المحتوى الارتفاع البسيط في محتوى المركبات الفينولية في الفواكه والخضروات العضوية مقارنة بالفواكه والخضراوات التقليدية . ومن المحتمل أيضاً انخفاض نسبة الكاديوم في محاصيل الحبوب العضوية . اما منتجات الألبان واللحوم العضوية فقد تحتوي على نسبة أعلى من أحماض أوميغا ٣ الدهنية مقارنة بالمنتجات التقليدية الا أن الاختلافات ذات أهمية غذائية ضئيلة وغير محسوسة.

التحدي الأكبر في الاغذية حيوانية المصدر هو الاستخدام السائد للمضادات الحيوية في الإنتاج الحيواني التقليدي الذي يعد محرك رئيسي لمقاومة المضادات الحيوية في المجتمع في حين ان استخدام المضادات الحيوية اكثر تقييدا في الإنتاج العضوي . أظهرت هذه الدراسة أن هناك حاجة لمزيد من الدراسات على وجه الخصوص فيما يتعلق بتأثير استهلاك الغذاء العضوي على تطور أمراض معينة .