

Nutritional Value
of Organic Food:
What do we know?

Ellen Desjardins MHSc, RD

“Growing Up Organic” Conference
February 17, 2007 - Toronto

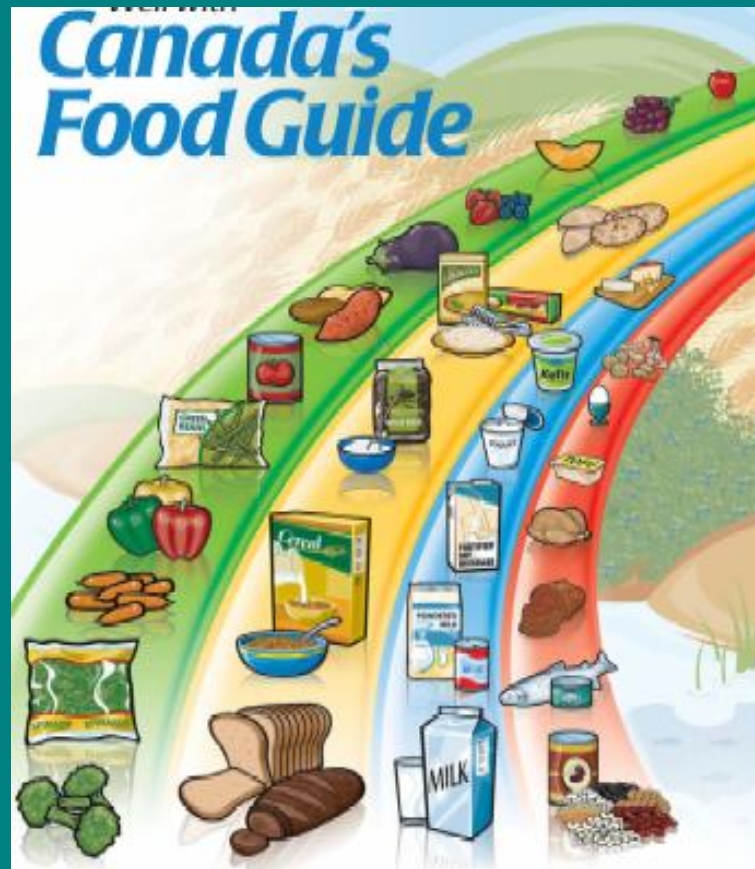
Overview

Q1. Does organic production enhance essential nutrient content of fruit and vegetables?

Q2. Does organic production enhance phyto-chemical content of fruit and vegetables?

Q3. How do we use this information to benefit our health?

Following the food guide ensures you get
“essential nutrients” in the right amounts
(protein, carbohydrates, fat, vitamins and minerals)



Recent studies that compare levels of **essential nutrients** in organic and conventional foods

<p>Bourn, D and Prescott, J 2002</p> <p>review of 34 studies</p>	<p>“With the possible exception of nitrate content, there is no strong evidence that organic and conventional foods differ in concentrations of various essential nutrients.”</p>
<p>Worthington V. 2001</p> <p>review of 41 studies</p>	<p>Vitamin C – higher in organic Mg, Fe, P – sometimes higher in organic Nitrates – lower in organic Other nutrients – No significant difference</p>

The new guide also emphasizes plant foods,
and foods with minimal processing. Why?



Whole plant foods contain beneficial phyto-chemicals

- Plant-based foods contain complex mixtures of “phyto-chemicals” : bio-active compounds produced by plants.
- Diets rich in fruits, vegetables, legumes, whole grains and nuts are associated with a lower risk of chronic diseases because of these phyto-chemicals.



Whole plant foods contain beneficial phyto-chemicals

- Phyto-chemicals are not “essential nutrients”, but foods that contain them have health-promoting properties.
- These health effects may be due to combinations of nutrients and/or phyto-chemicals acting together.

Some types of phyto-chemicals

...and their connection
to health
(and to organic foods)

Phenols

- Phenolic compounds are the largest group of phyto-chemicals (several 100 types in edible plants)
- Phenols protect plants from oxidative damage, and also act as **anti-oxidant** protectors in humans
- **Flavonoids** are a subclass of phenols, associated with reduced risk of heart disease (*by preventing platelet aggregation*) and with estrogen-related cancers

Flavonoids: examples

Anthocyanidins	Cyanidin, Delphinidin, Malvidin, Pelargonidin, Peonidin, Petunidin	Red, blue and purple berries, red and purple grapes, red wine
Flavonols	Quercetin, Kaempferol, Myricetin, Isorhamnetin	yellow onions, scallions, kale, broccoli, apples, berries, teas, etc.
Isoflavones	Daidzein, Genistein, Glycitein	Soybeans, soy foods, legumes

Carotenoids

- yellow, orange, and red pigments in plants (and egg yolks of birds that eat them)
- High anti-oxidant activity
- most common carotenoids are alpha-carotene, beta-carotene, beta-cryptoxanthin, lutein, zeaxanthin, and lycopene
- that diets high in carotenoid-rich fruits and vegetables are associated with reduced risk of cardiovascular disease and some cancers

Glucosinolates

- Cruciferous vegetables (*cabbage, bok choy, broccoli, kale, cauliflower, arugula, turnip, etc.*) are rich sources of sulfur-containing compounds known as glucosinolates.
- Glucosinolates can activate liver detoxification enzymes and provide protection against carcinogens, mutagens and other toxins
- They are being studied for their cancer-preventive properties and tumor-reducing capacity.

How do phyto-chemicals act in the body?

- take part in biochemical reactions in the body
- bind to and eliminate undesirable compounds in the intestine
- act as anti-oxidants
- enhance the absorption of essential nutrients
- aid growth of beneficial gastrointestinal bacteria
- selectively inhibit harmful intestinal bacteria

*Dillard (2000) *J. Science of Food & Ag*

How can we maximize the
beneficial phyto-chemical
content of our diet?

1. Minimal processing prevents loss of phyto-chemicals

2. Method of production affects the phyto-chemical content of plant foods

Organically grown

Conventionally grown



When comparing foods by their method of production...

- Plant foods do not differ significantly in amounts of essential nutrients, like vitamins and minerals
- A key source of difference lies in the types and levels of phyto-chemicals, or “secondary metabolites” in plant foods

Levels of phyto-chemicals in a plant vary by species, variety, soil conditions, tillage, pest infestation, use of pesticides and fertilizers, weather (irrigation, light, drought, etc.)

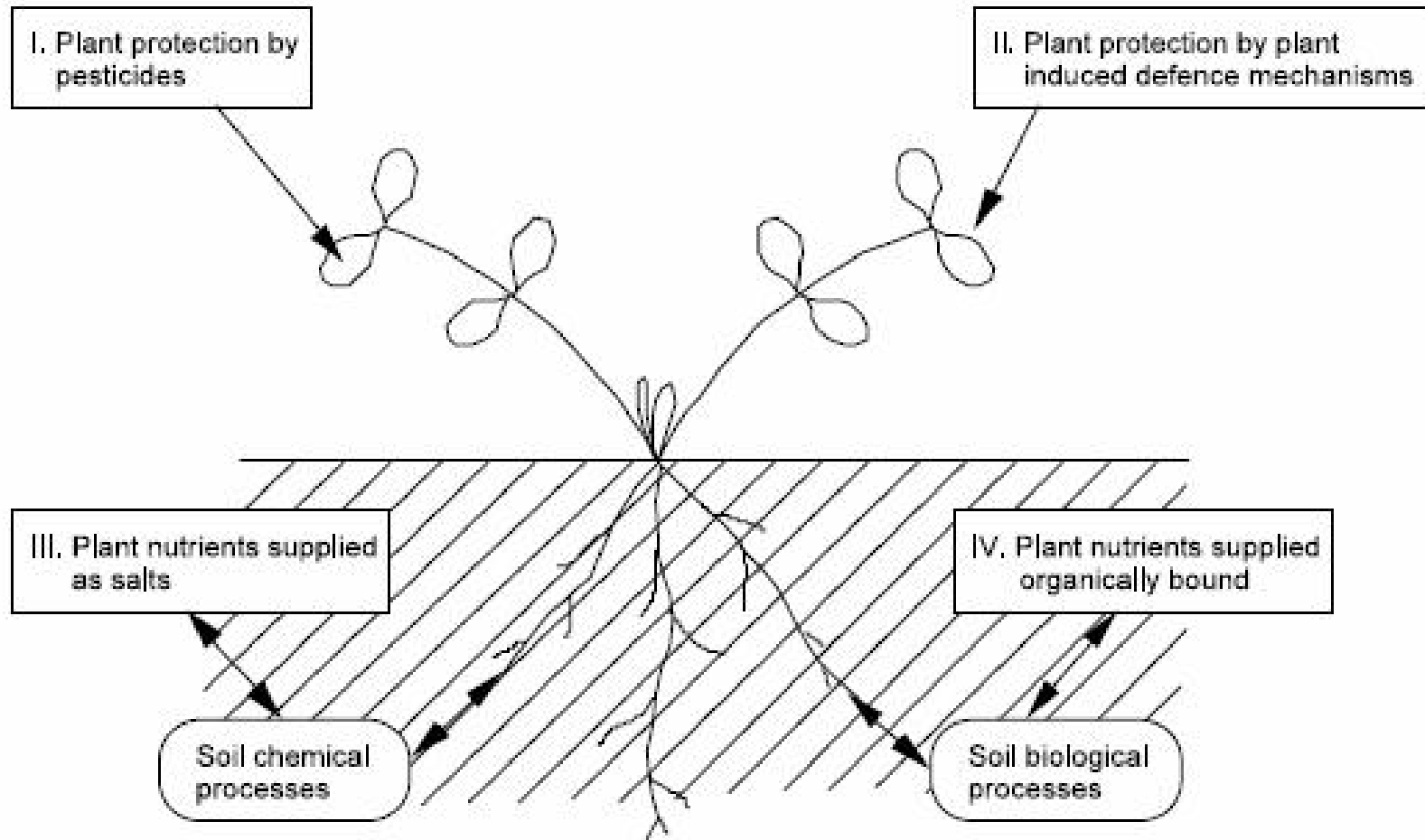
What determines nutritional value of food plants?

Organic farming supports:

- greater activation of the plant defence mechanisms (without pesticides)
- an active soil life where plants and microbes interact, exchanging metabolic compounds
- a balanced mineral nutrient uptake, avoiding excesses of easily available nutrients (N, P, K)

Conventional farming

Organic farming



N, P, K

Lundegardh, B (2003). Organically produced plant foods - Evidence of health benefits, *Acta Agriculturae Scandinavica B – Soil and Plant Science* 53(1)

Is there scientific support
for increased phyto-chemicals
in organic foods?

Recent Review articles

Winter C and Davis S (December 2006)

Organic Foods: Scientific Status Summary

Journal of Food Science Vol. 71, No. 9

pp. R117-124

Recent Review articles

Zhao X, et al. (July - Sept 2006)

Does organic production enhance phytochemical content of fruit and vegetables? Current knowledge and prospects for research

Hortechnology, Vol. 16, No. 3

pp. 449 - 456

Recent studies that compare phytochemical levels of organic and conventional foods

Tarozzi, A 2006	Red oranges	Phenolics, Anthocyanins Ascorbic acid Total anti-oxidant activity	All significantly higher in organic
Young, JE 2005	Bok choy Lettuce, collards	Phenolics	Higher in organic No difference
Veberic et al 2005	Apple pulp Apple peels	Phenolics	Higher in organic No difference

Recent studies that compare phytochemical levels of organic and conventional foods

Caris-Veyrat, C et al. 2004	Tomatoes	Vitamin C Carotenoids Polyphenols	All significantly higher in organic
Lombardi-Boccia, G et al. 2004	Yellow plums Conventional: Tilled soil Organic: Soil with trifolium Natural Meadow	Polyphenols, Quercetin Phenolic acids Anti-oxidants	Higher in conventional Higher in organic
Asami et al. 2003	Marionberries Strawberries Corn	Phenolics Vitamin C	Both higher in organic

Recent studies that compare phytochemical levels of organic and conventional foods

Magkos, F 2003 (review)	Potatoes, Leafy vegetables	Vitamin C	Consistently higher in organic
Caronaro, M et al. 2001 and 2002	Peaches Pears	Polyphenols Phenolics Vitamin C	Both higher in organic Higher in organic peaches, not pears
Tinttunen, S and Lehtonen, P 2001	Fr., German Red wine (Burgundy) White wine	Phenolic compounds	Higher in organic No difference

The bottom line...

Does organic production enhance phyto-chemical content of fruit and vegetables?

Critical review (Zhao, 2006): **“The evidence overall seems in favor of enhancement of phyto-chemical content in organically grown produce.”**

“However, there has been little *systematic* study of the **factors that may contribute to increased phytochemical content** in organic crops, and the extent to which biotic and abiotic stresses, soil biology, etc. contribute to those differences.”

What does this mean?

- The enhanced phytochemical content of organic foods in general may pay off in terms of health benefits when those foods are incorporated into the **whole diet** over the long term.

What counts is the total diet over time

From Peter Menzel, *The Hungry Planet*

What counts is the total diet over time

From Peter Menzel, *The Hungry Planet*

Health benefits come from whole foods,
not isolated components

