

Spinach

- 1. Vitamin K is a fat-soluble vitamin. The “K” is from the German word “koagulation.” Coagulation refers to the process of blood clot formation. Describe how vitamin K causes blood to clot.**

Primary-level response:

Vitamin K helps make certain proteins for your blood and these proteins work together to stop bleeding through clot formation.

Secondary-level response:

Vitamin K plays an important role in synthesizing several proteins that are involved in blood coagulation. The proteins bond with membrane surfaces (e.g., skin cells) to stop bleeding.

- 2. Research the nutritional benefits of vitamin K. List at least five food sources that contain vitamin K.**

Primary-level response:

Vitamin K helps stop cuts and scrapes from bleeding and starts the healing process. Together with calcium, vitamin K helps build strong bones. Five food sources of vitamin K are asparagus, broccoli, celery, cooked greens (e.g., spinach), and peas.

Secondary-level response:

Vitamin K helps stop cuts and scrapes from bleeding too much and starts the healing process. Together with calcium, vitamin K helps build strong bones. Vitamin K may also help keep blood vessels healthy. It helps your body make proteins for your blood, bones, and kidneys. Because it is widely available in foods, vitamin K deficiency is uncommon in healthy adults. Common food sources of vitamin K are leafy green vegetables (spinach, mustard greens, Swiss chard, celery), cruciferous vegetables (broccoli, Brussels sprouts), and legumes (peas, soybeans).

3. **How does cooked spinach compare in protein content versus other green vegetables, such as broccoli, leaf lettuce, green beans, and avocados?**

Primary/Secondary-level response:

Green Vegetable	Serving Size (g)	Protein (g)
Spinach	½ cup cooked (90 g)	3 g
Broccoli	½ cup cooked (78 g)	2 g
Green beans	½ cup cooked (63 g)	2 g
Romaine	1 cup shredded (47 g)	1 g
Avocado	½ cup sliced (73 g)	3 g

4. **Spinach contains oxalic acid, which binds with iron and calcium and reduces the absorption of these minerals. Ask students to provide ways that help to improve absorption of these minerals while eating spinach.**

Primary/Secondary-level response:

To improve absorption, spinach should be eaten with foods that are rich in vitamin C, such as orange juice, tomatoes, and citrus fruits.

5. **Ask students to research chlorophyll and its role in the growth process of plants and vegetables.**

Primary-level response:

Chlorophyll is a green pigment found in almost all plants. It plays an important role in photosynthesis, a process in which plants obtain energy from light in order to grow. Chlorophyll absorbs the light and then uses the energy to convert carbon dioxide and water into carbohydrates and oxygen, causing plants to grow.

Secondary-level response:

Chlorophyll is a green photosynthetic pigment found in plants, algae, and cyanobacteria. The first step in photosynthesis is when incoming light is absorbed by chlorophyll, which ionizes the light. The resulting chemical energy is then captured in the form of ATP, and ultimately used to convert carbon dioxide and water to carbohydrates and oxygen. Chlorophyll absorbs most in the red and blue portions of the electromagnetic spectrum, resulting in its intense green color. Chlorophyll also receives energy indirectly from accessory pigments, such as the carotenoids, which also absorb light and transform it to electropotential. but whose function is to transfer that energy to chlorophyll.

- 6. Determine how much of the spinach harvested in California goes into processed and frozen foods versus how much is available to be sold whole/fresh.**

Primary/Secondary-level response:

Almost 75% of California grown spinach is used for processed foods.

Sources:

www.leafy-greens.org/greens/spinach_nn.html

www.ipmcenters.org/cropprofiles/docs/caspinach.html

www.fruitsandveggiesmatter.gov/month/spinach.html

<http://lpi.oregonstate.edu/infocenter/vitamins/vitaminK/>

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