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Our August 2018 Newsletter for Healthy Living

Insects and Ecosystems

Corn and soybean seeds colored red and blue, respectively, have become an all-too-common sight on U.S. farms. The seeds are given a colorful hue because they've been treated with neonicotinoid pesticides, and the coloring is one of the only ways to tell them apart from their untreated, yellow counterparts. In 2018, nearly every field corn seed sown in the U.S. contained the insecticides, along with about half of soybeans and most of the cotton.

For clarification, there are three kinds of corn: field, sweet and popcorn. Popcorn is never genetically modified, although some brands may include GMO ingredients, for example, if you purchase preflavored bags. Sweet corn is that tasty corn you eat right on the cob every summer, and it's moist when it's harvested, unlike field corn, which is left on the stalk longer so it can dry out in preparation for processing. Field corn is then used to make processed food products and animal feed.

According to John Tooker, associate professor of entomology at Pennsylvania State University, "... [T]hese insecticides will be used across at least 150 million acres of (field corn) cropland, an area about the size of Texas." While some attention has been given to neonicotinoids' potential role in bee decline, Tooker believes the chemicals are having an even greater pernicious influence on insects, such that entire ecosystems could be in jeopardy.



What's more, neonicotinoids are only one type of agricultural chemical that's being used in excess while the environmental consequences begin to unfold all around us. In recent years, the acreage of crops treated with neonicotinoids has skyrocketed, as has the volume used. From 2011 to 2014, Tooker says, seed suppliers doubled the amount of insecticide applied to each seed. During that

like black cutworm, giving another example of how using neonicotinoids may actually lead to reduced crop yields for farmers. There are other alarming effects as well, particularly since only about 2 percent of the chemical is taken up by the plants. The critical question is where the rest goes, and it's known that some of it ends up in nearby waterways where the chemicals are now polluting rivers

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time, the number of pests have stayed largely the same, as they have since the 1990s, when only 35 percent of U.S. corn acres and 5 percent of soybean acres were treated with neonicotinoids.

Even at those levels, "pest populations did not cause economically significant harm very often," according to Tooker. "This suggests that it is not necessary to treat hundreds of millions of acres of crops with neonicotinoid seed coatings." Further, while the chemicals are very effective at killing insects, this is part of the problem. Not every insect is a pest; in fact, many are beneficial.

Research by Tooker and colleagues found that planting neonicotinoid seeds kills off insects that prey on slugs — prominent corn and soybean pests — thereby reducing crop yields. Other research revealed that planting seeds coated with neonicotinoids reduced predatory insects by up to 20 percent. Such insects help to reduce pest infestations on crops from insect pests

and streams and killing off aquatic insects that other species depend on for food.

Not only can the treated seeds directly kill birds if they pick one up for a snack, but research suggests that declines in insect-eating birds are associated with high usage of neonicotinoids. An investigation by the U.S. Environmental Protection Agency (EPA) even found that treating soybean seeds with neonicotinoids provides no significant financial or agricultural benefits for farmers. The researchers also noted there are several other foliar insecticides available that can combat pests as effectively as neonicotinoid seed treatments, with fewer risks.

There's little doubt that the ever-increasing rate of pesticide usage is a ticking time bomb for environmental and human health — but there are other solutions that are far healthier (and productive) for everyone involved. Tooker, among other experts, recommends the use of integrated pest management (IPM) as

continued on page 2

What's Inside This Issue

- **Insects and Ecosystems, *continued***
- **Potassium and Your Vegetables**
- **Counting on Chlorophyll**
- **August Specials and Monthly Coupon**

Potassium and Your Vegetables

Potassium is one of the major minerals that your body needs in large amounts in order to continue functioning properly. It's widely available in a diverse array of foods. But despite its abundance, statistics show that less than 3 percent of the U.S. population is actually getting the recommended daily intake for potassium. The widespread defi-

ciency in potassium even prompted the Dietary Guidelines Advisory Committee to declare it as a nutrient of public health concern in 2015. Sometimes referred to as the "good salt," potassium is a mineral that helps support a variety of essential body functions, including the contraction of muscles, regulation of body fluids, transmission of nerve impulses, and maintenance of normal blood pressure and blood sugar levels. It also helps balance your body's chemical and electrical processes, since it's an electrolyte. Since your body does not have the ability to produce potassium naturally, one of the ways for you to maintain optimum levels of it is to eat potassium-rich foods, such as beet greens, wild salmon, dried apricots and plain yogurt, to name a few. Unfortunately, today's standard American diet, which commonly consists of unhealthy processed foods, doesn't really provide much of this nutrient. Ideally, an adult with healthy kidneys should consume 4,700 milligrams (mg) of potassium daily, according to a National Institutes of Health panel's recommendation in 2005. The panel said they based their recommendation on studies that show potassium obtained from your diet may help "lower blood pressure levels, reduce the adverse effects of so-

dium chloride intake on blood pressure, reduce the risk of kidney stones and possibly decrease bone loss." The panel advised that, preferably, you should get your potassium from dietary sources, such as vegetables, fruits and root vegetables. Spinach, cantaloupe, dry roasted almonds, Brussels sprouts and mushrooms are just a sample of the foods that

have high amounts of potassium. Running low on potassium may cause heart palpitations and make you feel nauseous and weak, so if you can't obtain enough potassium from your diet, you may also opt to take potassium supplements after consulting with your health professional. The normal amount of potassium in the blood ranges from 3.5 to 5.2 millimoles per liter (mmol/L). If your body's potassium levels go below or above this range, then you may experience the following conditions: **Hypokalemia:** Characterized by potassium levels that fall below 3.5 mmol/L, hypokalemia may be caused by a low-potassium diet. It may also be a side effect of other underlying health problems, such as dehydration, diarrhea and excessive sweating (hyperhidrosis). **Hyperkalemia:** A condition wherein the potassium levels exceed 5.2 mmol/L, hyperkalemia is usually caused by a high-potassium diet or excessive intake of potassium supplements. The symptoms of low or high potassium levels are usually mild and nonspecific, making them hard to diagnose. The warning signs of low potassium levels are: irritability, abnormal heartbeat, muscle weakness, constipation, muscle cramping and fatigue. Seek immediate medical attention if you experience any of the symptoms mentioned above, as a delay in treatment may cause severe potassium deficiency. Potassium levels lower than 2.5 mmol/L are considered life-threatening and may cause paralysis, respiratory failure, breakdown of muscle tissue and ileus (also known as lazy bowel). Severely low levels of potassium may also increase your risk of heart attack and stroke.

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When it comes to increasing your potassium levels through diet, one of the first foods that may come to mind are bananas — one medium banana contains 422 mg of potassium. However, bananas are far from being your only source of potassium, since you can also obtain this nutrient from the following foods: beet greens, Swiss chard, acorn squash, avocado, spinach, baked potato, wild-caught Alaskan salmon, and plain yogurt. Other potassium-rich foods include carrots, radishes, tomatoes, cucumbers, zucchini, eggplant and kale. Maintaining normal potassium levels in the body not only helps support a number of vital body functions, but also leads to the following health benefits: improved cardiovascular health; healthier bones and muscles, and improved kidney and adrenal functions. Dietary sources also provide higher amounts of potassium than supplements. The dietary forms of potassium, such as potassium citrate or potassium malate, are also more beneficial than that found in supplemental potassium, since they help your body produce alkali, which leads to better bone health and muscle mass.



Reference: *Health.gov* January 12, 2018. National Academies Press, *Dietary Reference Intakes for Water, Potassium, Sodium, Chloride and Sulfate*, 2005. *MayoClinic.org*, March 1, 2017. *Healthline* November 15, 2016. *Medical News Today* September 26, 20

Insects and Ecosystems

one tool. A 2015 study found that IPM techniques reduced pesticide use while boosting crop yields in a meta-analysis of 85 sites in 24 countries. Some were even able to eliminate pesticide use entirely using techniques such as crop rotation and pheromone traps to capture insect pests.



In order to work, however, seed companies must cooperate and admit to their mistakes. Unfortunately, as it stands, an estimated 7.7 billion pounds of pesticides are applied to crops each year, and that number is steadily increasing. Rather than acknowledging that pesticide usage is overkill, companies like Monsanto incentivize the use of more harmful chemicals to farmers by offering cash back for purchasing more chemicals.

(continued from page 1)

You can get involved by actively seeking out certified organic and non-GMO foods, and supporting organic, regenerative farmers who have decided that avoiding chemicals and excessive spraying is essential to nurturing soil health, protecting the environment and growing nutritious food.

Reference: *The Conversation* June 26, 2018. *Journal of Applied Ecology* December 4, 2014. *Nature* volume 511: 341-343 (July 17, 2014). *EPA Memorandum* October 5, 2014. *Insects* 2015, 6(1):152-82. *Frontiers of Environmental Science* February 14, 2018.

Counting on Chlorophyll

Photosynthesis is the process in which plants absorb light from the sun — along with water and carbon dioxide — and transform it into the food they need for growth. Oxygen, the nutrient that cells require to generate

fits of chlorophyll include: cleansing elimination systems such as your bowel, liver and blood; improving transport of oxygen throughout your body; relieving inflammation and pain; stimulating your immune system, and boosting beneficial

“Ubiquinol is a plasma antioxidant. The mechanisms responsible for maintenance of plasma ubiquinol are poorly understood. Here, we show that metabolites of chlorophyll can be found in blood plasma of animals that are given a chlorophyll-rich diet. We also show that these metabolites catalyze the reduction of plasma ubiquinone to ubiquinol in the presence of ambient light, in vitro. We propose that dietary chlorophyll or its

“...through consumption of plant chlorophyll pigments, animals are able to derive energy directly from sunlight.”

energy in their mitochondria, is a by-product of photosynthesis. At the heart of photosynthesis is chlorophyll, a pigment that absorbs blue and some red portions of the electromagnetic spectrum and gives the plant its green color. The deeper, darker the green, the more chlorophyll the plant contains. Chlorophyll is also found in algae and cyanobacteria, both of which also use photosynthesis to create their own nourishment.

You probably know that vegetables are an important part of a healthy diet, and while plant foods contain a wide variety of plant chemicals that promote health, chlorophyll is an important part of the health equation. Chlorophyll has a number of important biological activities, several of which offer protection against cancer. This includes: binding to carcinogenic chemicals, allowing your body to safely eliminate them. (This includes polycyclic aromatic hydrocarbons from tobacco smoke, heterocyclic amines from cooked meat, and aflatoxin-B1, a mycotoxin found in moldy peanuts and other grains and legumes.); antioxidant effects, decreasing cellular damage caused by carcinogenic chemicals and radiation; and, inhibiting cytochrome P450 enzymes, which are required for the activation of procarcinogens. This is yet another way in which chlorophyll helps decrease your risk of chemically-induced cancers.

Chlorophyllin, a semi-synthetic sodium copper salt derived from chlorophyll (and the type typically found in chlorophyll supplements), has similar benefits. In addition to inhibiting cancer, it has also been shown to have deodorizing and healing effects. Topical application may also reduce signs of photoaging, in part by inhibiting the breakdown of hyaluronic acid in your skin, which is why chlorophyllin is sometimes found in antiaging remedies. Studies have also shown chlorophyllin-containing creams help reduce acne and minimize large pores. Other health bene-

fits of chlorophyll include: cleansing

bacteria in your intestines

A lesser-known effect of chlorophyll is its impact on energy production. As explained in a 2014 study published in the *Journal of Cell Science*: *“Sunlight is the most abundant energy source on this planet. However, the ability to convert sunlight into biological energy in the form of adenosine-5'-triphosphate (ATP) is thought to be limited to chlorophyll-containing chloroplasts in photosynthetic organisms. Here we show that mammalian mitochondria can also capture light and synthesize ATP when mixed with a light-capturing metabolite of chlorophyll. The same metabolite fed to the worm *Caenorhabditis elegans* leads to increase in ATP synthesis upon light exposure, along with an increase in life span. We further demonstrate the same potential to convert light into energy exists in mammals, as chlorophyll metabolites accumulate in mice, rats and swine when fed a chlorophyll-rich diet. Results suggest chlorophyll type molecules modulate mitochondrial ATP by catalyzing the reduction of Coenzyme Q, a slow step in mitochondrial ATP synthesis. We propose that through consumption of plant chlorophyll pigments, animals, too, are able to derive energy directly from sunlight.”*

In other words, the way chlorophyll helps modulate mitochondrial ATP is by capturing energy from sunlight and transferring that energy to reduce Coenzyme Q10 (CoQ10) to its active biological form, ubiquinol — a finding supported by another study published in *Photochemistry and Photobiology*. Here, they found that dietary chlorophyll, along with its metabolites and sunlight exposure, help maintain a healthy ubiquinol level in your body, which in turn helps regulate your plasma redox status — a factor that plays an important role in the aging process and can be used as an indicator of severity of disease in ill patients.

As explained by the authors:

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metabolites, together with light exposure, regulate plasma redox status through maintaining the ubiquinol pool.”

Ubiquinol is the reduced version of CoQ10, one of the most popular supplements known to optimize mitochondrial health. Ubiquinol is the electron-rich form of CoQ10 that your body produces naturally. In your mitochondria, ubiquinol facilitates the conversion of energy substrates and oxygen into ATP needed by your cells for life, repair and regeneration. It also helps mop up reactive oxygen species — harmful by-products of metabolism that can damage mitochondrial cell membranes. For these reasons, ubiquinol helps prevent diseases and conditions rooted in mitochondrial dysfunction, including heart disease and migraines. As mentioned, dark green vegetables such as spinach, parsley and arugula are rich sources of chlorophyll. Other excellent sources are wheat grass, spirulina and chlorella, a green alga also high in plant-based protein.

Reference: *Smithsonian, What is Photosynthesis? Medical News Today* July 4, 2018. *Clinical, Cosmetic and Investigative Dermatology* 2016; 9: 167-74. *Journal of Cell Science* 2014 Jan. 15; 127(Pt 2):388-99. *Photochemistry and Photobiology* 2013 Mar-Apr; 89 (2):310-13. *Ageing Research Reviews* April 2002; 1(2):257-78. *PDQ Cancer Information Summaries Coenzyme Q10*.



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