Not Too Much Pepper, Thank You

By Keith Barrons

For dinner last evening my wife and I had sauteed shrimp with mushrooms. In addition to the arsenic that came with the shellfish, the mushrooms provided us with hydrazine, the baked potato with solanine and the celery with furocoumarin. All three compounds are carcinogenic.

The carrots in our mixed vegetables contained carotene, which converts to Vitamin A in the body. This vitamin, essential in the amounts we ordinarily ingest, is a tertagen and harmful to the liver at highly excessive levels. The alfalfa-sprout topping on our salad contained canavanine, which is associated with defects in the immune system. The black pepper carried the mutagen safrole. Chocolate cake provided theobromine, which can activate various carcinogens, and in addition to caffeine, the coffee contained about 250 milligrams per cup of the mutagen cholorgenic acid.

The world around us abounds in nature's toxic substances, and our food is no exception. The scientific literature lists many natural components of food that are known to be harmful to laboratory animals, but only at dietary levels considerably in excess of likely human intake.

Nonethless, many Americans have succumbed to a new fear — and one that could in the long run lead to an ever-lowering quality of life. I refer to the current epidemic of 'microchemophobis," or the fear of minute traces of chemicals.*Grains and Nuts:* In defining a poison, my old biochemistry teacher told his classes, "a poison is too much." Yet my wife and I have not consumed too much of nature's chemical oddities. How, pray tell, have we each passed three score and ten while indigesting a myriad of natural toxins, including a flatoxin, an exceedingly potent carcinogen sometimes found in grains and nuts as well as nitrosmines formed in the curing of meats? The answer: our natural defense mechanisms. Were it not for these remarkable biochemical systems we would long since have succumbed.

In tests with laboratory animals some of nature's toxic substances have proven more poisonous than any man-made chemicals, and their concentrations in food are generally much greater than the synthetic impurities that have generated so much fear. In a notable paper in Science, Dr. Bruce N. Ames, Chairman, Biochemistry Department, University of California, Berkley, concludes that our intake of natural toxins is "...probably at least 10,000 times higher than the dietary intake of man-made pesticides."

If our built-in defense mechanisms can handle relatively large amounts of toxic chemicals that happen to be synthesized by the most accomplished chemist of all, a living plant, there is every reason to believe we can cope with the far lesser amounts of man-made compounds, traces of which occasionally find their way into our food. Our fears should be quelled by the fact of our ever-increasing longevity — now more than 74 years compared with 50 years or less before chemcicals were used to help assure an abundance of food.

Microchemophobia has multiple origins. There is the anti-chemicals "lobby" that nurtures and magnifies each report of a real or speculative risk. Parts per billion are often equated with an imminent hazard regardless of the magnitude required to harm laboratory animals. There is never a reminder of the minuscule nature of one part per billion.

A recent example of an overblown perticide episode contributing to microchemophobia was the flap over EDB residues in grain. Today's knowledge of the carcinogenicity of this compound may well support the cessation of its use as an insecticide. Some food samples analyzed exceeded current safety guidelines, but the destruction of foodstuffs because they contained lesser amounts was uncalled for. With few exceptions, the contaminated samples had less than one thousandth the level of EDB that was found to cause cancer in rats. Add to this margin of safety the fact that grain-derived foods are only a portion of the human diet, and further, that much of any EDB present would be reduced on cooking for baking, and the risk fades into insignficance.

Also contributing to the fear of minute traces of chemicals is an overly cautious interpretation of the so-called Delaney Clause in the law dealing with safety of foods. It states that no substance will be permitted in food. "...If it is found after tests which are appropriate for the evaluation of the safety of food additives, to induce cancer in man or animals..." Note the word *appropriate.* Is it not appropriate to consider safety margins or the spread between likely human exposure and the amount required to induce cancer in the laboratory when analysts interpret toxicological data?

Potato Blight: if we are to avoid pest-induced food shortages and vector-transmitted diseases, manking must defend itself by one means or another. In site of much progress with nonchemical controls, pesticides are still vital to most integrated pest-management programs and, indeed, are often our first line of defense. For example: we can control potato late-blight, the same disease that caused the great Irish potato famine of the 1840's.

We will continue to ingest nature's toxins, including, no doubt, many yet to be discovered in our everyday foods. But if we are to continue to have the abundance we have

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Micronutrients In Pot Culture

ATLANTIC-FEC FERTILIZER CO.

"A little neglect may breed mischief; for want of a nail the shoe is lost, for want of a shoe the horse is lost, for want of a horse the rider is lost." This quote from Poor Richard's Almanac best sums up the role micronutrients play in plant production. Micronutrients are to plants as vitamins and minerals are to animals. One may survive without them but growth is less than optimum. Some of the functions of these minor elements are:

MANGANESE: Acts as a catalyst to promote and regulate certain functions, activates enzymes that control plant metabolism and functions with iron in the formation of chlorophyll.

IRON: Essential in chlorophyll formation, involved in oxidation-reduction processes and is a vital part of the oxygen carrying system. May also play an important role in nucleic acid metabolism.

ZINC: Vital in oxidation processes and for the transformation of carbohydrates. Regulates sugar consumption and is a key in various enzyme systems that regulate metabolic activity. Also needed for the formation of auxins which promote plant growth.

COPPER: Activates enzymes, some of which function in respiration. Important in protein utilization and indirectly effects cholorphyll production.

BORON: Important in plant growth associated with cellular activity that promotes maturity, flower set, fruit yield and quantity. Some foliage plants are quite sensitive to boron and toxicity can occur where levels are excessive.

MOLYBDENUM: Required for the assimilation of nitrogen in plants. Plant requirement is very low.

The activity of micronutrients in plant growth has been identified to some degree but much remains to be known. We know plants respond to applications of minor elements and are essential for growing quality plants. Compared to nitrogen, phosphorous and potassium, micronutrients are required in relatively small amounts.

Plant requirements vary for each element and in excessive amounts they can cause plant injury or even death. The sensitivity of certain plants to some elements, particularly boron, is known. Where ever these are a problem the fertilizer programs must be adjusted to insure these elements are eliminated or restricted.

Micronutrients come from many sources. The ability of the plant to absorb these elements depend on the source, soil environment and plant metabolism. Micronutrient sources include oxides, sulfates and chelates. Oxides are generally unavailable because of lower water solubility. Sulfates are more water soluble and tend to be preferred over oxides, however, the cost is greater. Chelate refers to a process by which metal elements are combined with chemicals, either natural or synthetic, to create a more available form of the metal.

Chelates are more expensive and their effectiveness greatly varies depending on the chelating agent used. However, they are the most available source.

The soil environment effects nutrient availability in many ways. The best Ph range for growing most plants and providing optimum conditions for nutrient availability is 6 to 7. Excessive calcium and soil colloids can combine with metals to create unavailable forms. Chelates are most desirable under these conditions. Soils must be tested to determine Ph level and adjusted accordingly.

Plant metabolism is important as it effects nutrient absorption. An active plant will absorb more nutrients. Cold weather will slow plant metabolism and nutrient uptake will be diminished.

Soil applications and foliar sprays are both effective ways of applying micronutrients. Even though micronutrients are not used in large amounts, their availability may mean the difference between average and optimum plant growth. Make sure your fertilizer program does not neglect the "nail" (micronutrients).■

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been blessed with in recent decades, traces of man-made chemicals will certainly find a way into our food — from pest control, packaging, protection in storage and other sources. Given today's highly sophisticated analytical techniques, these miniscule amounts can be detected, even at the parts per million level.

The only sensible course is to follow the recommendations of authorities and eat a varied diet with less fat than is now commonly consumed and include plenty of fruits, vegetables and fiber-rich cereal products. I would also put some faith in our laws and our regulators. On the whole, I think they have served us well. Remember never have people lived as long and amid such abudance as the technically advanced world of 1984.

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—CHEMICALLY SPEAKING
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