

Periodic Graphics

A collaboration between C&EN and
Andy Brunning, author of the popular
graphics blog *Compound Interest*

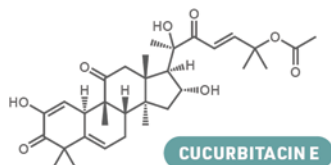
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Brunning's work, go to
compoundchem.com.
To see all of C&EN's
Periodic Graphics,
visit **cenm.ag/
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TOXINS IN FRUITS AND VEGETABLES

People often worry about the safety of chemicals added to their food. But sometimes, nature itself can produce harmful compounds in the foods we eat. Here we look at a selection of toxins found in common fruits and vegetables.

GOURDS



Pumpkins and other gourds and squashes produce cucurbitacins to deter insects. In rare cases, cross-pollination or inadequate growing conditions result in elevated levels of cucurbitacin E. This compound leads to a bitter taste and can cause toxic squash syndrome, which includes nausea, vomiting, and diarrhea.

KIDNEY BEANS



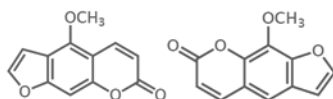
HEMAGGLUTINATION UNITS*

70,000 : 200-400
UNCOOKED : COOKED

*A Measure of phytohemagglutinin content in one kidney bean.

Kidney beans contain phytohemagglutinin, a plant protein that in high amounts causes nausea, vomiting, and diarrhea. As few as five raw beans can be enough to cause sickness. Thorough cooking is required to reduce the quantity of phytohemagglutinin in the beans to safe levels.

PARSNIPS



BERGAPTEN

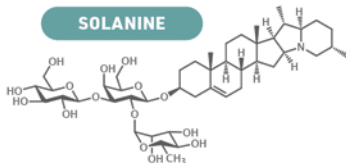
XANTHOTOXIN

Parsnips and celery contain furanocoumarins, such as bergapten and xanthotoxin, to defend against organisms that might eat the plants. The higher levels of furanocoumarins in the vegetables' shoots and leaves can cause phytophotodermatitis, which makes the skin sensitive to sunlight, when people handle the vegetables.

POTATOES

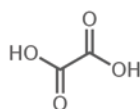


SOLANINE

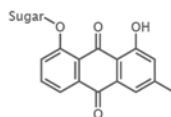


Potatoes produce solanine as a defense against insects. It's harmless to people at the levels normally found in potatoes. However, when potatoes are exposed to light, they turn green and produce solanine at potentially harmful levels. Solanine poisoning can cause vomiting and diarrhea.

RHUBARB



OXALIC ACID



ANTHRAQUINONE GLYCOSIDES

Eating rhubarb leaves can result in nausea and vomiting because of the high levels of oxalic acid. Some scientists think that other poisonous compounds in the leaves, such as anthraquinone glycosides, may contribute to the leaves' toxicity. The stalks are safe to eat because they contain lower oxalic acid levels.