

EFFECTS OF COMPETING SOIL ANIONS AND pH ON PERCHLORATE UPTAKE AND ACCUMULATION BY LETTUCE

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Introduction

Perchlorate (ClO_4^-), an emerging contaminant, has been detected in a variety of food products, including fresh produce

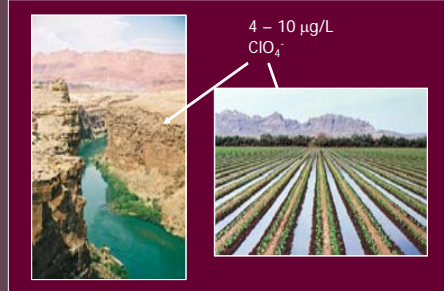
Perchlorate interferes with normal iodide functioning

Pregnant mothers and neonates are especially vulnerable

Exposure from fresh produce may be more important than drinking water

The mechanisms of perchlorate entry into higher plants is unclear

Perchlorate enters fresh produce through the use of contaminated irrigation water, which includes the Colorado River



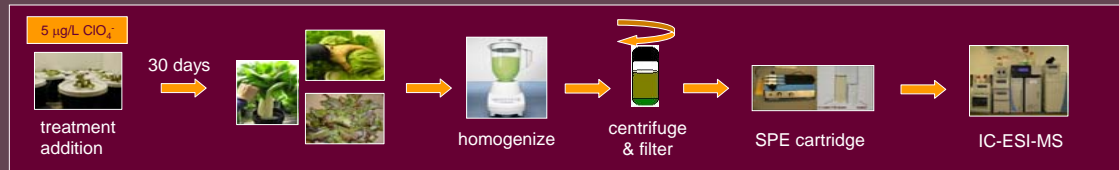
Previous Work

- I. Genotypic differences in perchlorate uptake and accumulation exist within lettuce
 - crisphead > butter head > green leaf
- II. More perchlorate accumulates in the older, outer leaves than the younger, inner leaves
- III. The amount of accumulated perchlorate depends in part on the transpiration rate

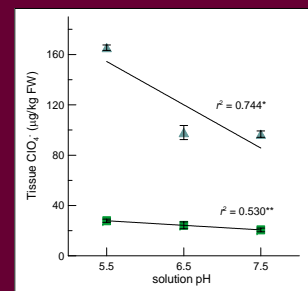
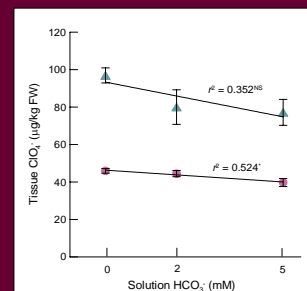
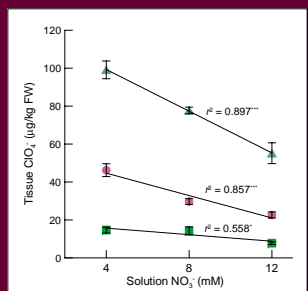
Project Objectives

- To understand the effect of the following common soil components on ClO_4^- uptake and accumulation in lettuce
 - Nitrate
 - Chloride
 - Sulfate
 - Bicarbonate
 - pH

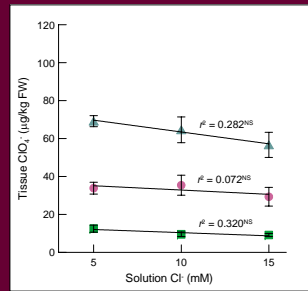
Methods



Results



Increasing either nitrate, bicarbonate, or pH significantly decreases perchlorate uptake and accumulation in lettuce

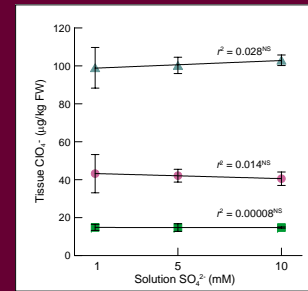


Legend

- green leaf
- butter head
- ▲ crisphead

***P < 0.001
**P < 0.01
*P < 0.05
NS P > 0.05

Increasing sulfate or chloride has **no effect** on perchlorate uptake and accumulation



Conclusions

- Perchlorate uptake is reduced by an increase in soluble buffer or pH
- Results indicate perchlorate is taken up via H⁺/anion cotransport
- Profound competitive effect of nitrate suggests perchlorate and nitrate share a common ion transporter in lettuce

References

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