

# Field study on the uptake, accumulation and risk assessment of perchlorate in a soil-chard/spinach system: Impact of agronomic practices and fertilization

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The application of excessive fertilizer represents a primary source of entry for perchlorate into crop systems and thus has raised widespread concern regarding food safety. Several studies have reported the occurrence of perchlorate in vegetables. However, limited information is available on the fate of perchlorate in the soil-plant system. In this study, we performed field experiments to evaluate the effects of the application rate of Chilean nitrate fertilizer and the type of fertilization (manual or fertigation) on the uptake of perchlorate by plants grown in open fields. Interestingly, in the control, chard and spinach accumulated 21.3 and 25.9  $\mu\text{g kg}^{-1}$ , respectively. For both agronomic practices, the content of perchlorate in chard and spinach increased as the fertilizer application rate increased, with fertigation promoting more significant accumulations. Spinach accumulated almost two times more perchlorate than chard for all treatments; however, the concentrations generally remained below regulatory values. The intake of spinach and chard presented a low risk to human health for all age groups. These findings enhance our understanding of the environmental impact of the use of fertilizers in agriculture and food safety. © 2020 Elsevier B.V.

Agronomic practices

Chard

Fertilizers

Perchlorate

Spinach

Uptake

Agronomy

Fertilizers

Food safety

Health risks

Inorganic compounds

Risk assessment

Safety engineering

Agronomic practices

Chard

Perchlorate

Spinach

Uptake

Soil pollution

fertilizer

perchlorate

perchlorate

agronomy

bioaccumulation

fertilizer application

perchlorate

pollution exposure

risk assessment

source apportionment

vegetable

Article

bioaccumulation

bioaccumulation factor

calibration

chard

climate change

concentration (parameter)

controlled study

dry weight

fertigation

high performance liquid chromatography

human

limit of detection

limit of quantitation

liquid chromatography-mass spectrometry

nonhuman

plant growth

priority journal

risk assessment

soil fertilization

spinach

vegetable consumption

agriculture

beet

Chile

risk assessment

soil

Chile

Beta vulgaris cicla

Spinacia oleracea

Agriculture

Beta vulgaris

Chile

Fertilizers

Perchlorates

Risk Assessment

Soil

Spinacia oleracea