

Translocation of phosphonate from frigoplants to fruits in strawberries

Introduction

- In conventional agriculture, phosphonates are widely used as fungicides.
- This usually leads to residues. There is evidence that phosphonates are stored within plants and may be translocated into fruits in the subsequent growing period(s).
- In organic farming, the use of phosphonates is currently not allowed.
- Organic strawberry production must use organic vegetative material. Nevertheless, there may be situations where frigoplants of a given strawberry cultivar are not available in organic quality. In this case, growers may obtain a permit for using non-organic seedlings.
- We tested the prevalence of phosphonate residues in strawberry frigoplants and their translocation to fruit in the year of planting and in the year after planting. This experiment explores whether the use of non-organic frigoplants poses a residue risk for organic strawberry growers.

Material and Methods

- We investigated conventionally grown frigoplants from four different cultivars.
- In April 2016, the frigoplants were planted in the field, and received no treatment with phosphonates thereafter.
- Fruits were harvested in the seasons 2016 and 2017.
- Samples of frigoplants (thoroughly washed) and of fruits were sent to a commercial lab for analysis of phosphonic acid and fosetyl-Al.



Strawberry frigoplant, thoroughly washed for residue analysis (Photo: B. Speiser, FiBL).



Strawberries, harvest 2017 (Photo: FiBL).

Results

- Fosetyl-Al was not detected in any of the samples and is therefore not further discussed.
- All frigoplants contained phosphonic acid (range: 1.3–24 mg/kg) (see table 1).
- All fruit from the year of planting contained phosphonic acid (range: 0.02 – 0.34 mg/kg).
- None of the fruit from the year after planting contained phosphonic acid.

Cultivar	Origin	Phosphonic acid (mg/kg)		
		Frigoplants 2016	Fruit 2016	Fruit 2017
Cultivar A	Italy	1.3	0.03	nd
Cultivar B	France	2.0	0.02	nd
Cultivar C	The Netherlands	18.0	0.34	nd
Cultivar D	France	24.0	0.12	nd

Table 1: Levels of phosphonic acid residues in strawberry frigoplants and fruits (nd = not detected).

Conclusions

- The results confirm that conventional strawberry frigoplants are often treated with phosphonates.
- Phosphonic acid is stored in the roots of frigoplants from where it can be translocated to the strawberry fruit.
- Measurable residues were found only in the year of planting.

Implications for organic strawberry production

- Organic strawberry growers who use conventional frigoplants may be confronted with phosphonate residues in the harvest, even if they have not applied phosphonates themselves.
- The risk of phosphonate residues can be minimized effectively, if the harvest from the year of planting is not marketed as organic. Bio Suisse already has such a requirement, if conventional frigoplants are used.
- In strawberries grown from conventional frigoplants, residue analyses should not be restricted to pesticide screenings, but should additionally cover phosphonic acid.

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