

## Information and statement on phosphonate/phosphonic acid residues

In collaboration with FiBL (Research Institute of Organic Agriculture)  
December 2020

**Despite being banned in organic production, phosphonates are frequently found in trace amounts. Some causes of phosphonate residues can be avoided by organic producers, others not. This paper offers guidance on how the causes can be identified and residues avoided, and summarises the stance adopted by Bio Suisse in various cases.**

### Background

Potassium phosphonate can be used as a fungicide, but this use generally results in residues of phosphonic acid in the harvested crops. In perennial crops, the phosphonic acid is transported to the wood in autumn and remobilised the following spring, which is why residues of phosphonic acid can often still be measured several years after use. Fosetyl-aluminium is a similar substance that can also be used as a fungicide, but in this case is slowly converted into phosphonic acid in the plant after use. The fosetyl residues are present for several weeks to months, after which point only phosphonic acid remains.

Phosphonic acid is actively transported within plants and accumulates in some of the tissue, with the result that residues of phosphonic acid are higher than with other pesticides. In the case of phosphonic acid, therefore, specific rules may be applied that diverge from those applicable to other pesticides (see below for further information).

While phosphonates have never been used on a regular basis in organic farming in Switzerland, their use in biostimulants was permitted outside Switzerland until 2013, when they were then also banned from use in organic cultivation.

Following use as a fungicide, residues of several mg/kg of phosphonic acid are generally found. While phosphonic acid is relatively non-toxic, this level is nevertheless well above the intervention limit for organic products, and such residues necessitate extensive clarification, which can lead to delivery delays and may result in the declassification of the product as "organic", which in turn can cause significant costs.

### Analyses and analysis reports

Phosphonic acid and fosetyl cannot be identified in pesticide screening, but only by means of an individual method in which the laboratory measures phosphonic acid and fosetyl levels separately. In order to determine whether the legal limit has been respected, the laboratory must then convert the phosphonic acid level into fosetyl, and then add this to the measured fosetyl to calculate the "Fosetyl (total)" content.

When it comes to identifying causes, separate values for phosphonic acid and fosetyl content are needed. If these values are not listed individually in the analysis report, a new report should be requested from the laboratory, indicating both the total content and the actually measured phosphonic acid and fosetyl levels.

### Sources of phosphonic acid

- Fungicides with phosphonate or fosetyl-aluminium.
- Plant protection products, fertilisers, or biostimulants that contain phosphonate. In most cases, this is not declared, with only the word "Phosphorous" written on the label.
- Detergents (see below).
- There are indications that phosphonic acids can form in low-oxygen bodies of water. In practice, this contamination route is primarily relevant for wet rice. It is currently unclear as to whether irrigation with such water can result in measurable residues.

*Remarks on other alleged sources*

Various claims are circulating with regard to other alleged sources of phosphonic acid. We are referring to this issue here with a view to clearing up any misunderstandings, although the remarks cannot be considered an explanation for contamination cases, and are therefore not considered further.

- Chicken manure and compost may also contain traces of phosphonic acids. Given the small quantities involved, it is currently assumed that these do not result in measurable residues in harvested crops.
- Certain claims have been made that residues are caused by irrigation. However, water never contains enough phosphonate to lead to measurable residues in harvested crops.
- It is regularly claimed that phosphate is converted into phosphonate. This is not true. Nor is it true that phosphonate is naturally present in soil.

**Possible pathways into organic products, possible approaches to clarification**

Based on the sources mentioned above, there are various ways in which organic products can be contaminated with phosphonic acid. The known pathways are summarised below, with an indication of which pathways are considered likely in each case. This list is not intended for use as the sole basis for decision-making, but as a guide in specific clarifications. If the causes cannot be clearly identified, the evaluation is based on the most likely cause. Knowledge of phosphonic acid is as yet incomplete, and this list may therefore be revised periodically.

*Contamination due to previous use prior to the conversion or to the introduction of the ban in organic farming (2013)*

It has been observed that phosphonic acid is transported to the woody parts of plants, and from there to the harvested crops during the growing season. Experiments have shown that these residues remain present for at least six years [1]. In cases of use over many years this duration may be significantly longer, but the relevant scientific data are unavailable. Features:

- Applies only to perennial crops.
- Concrete indications of use in the last 10 years.
- Farm/plot was converted in the last 10 years.
- Residue generally below 5 mg/kg. According to the pilot study by Bögli and Speiser [1], it took six years for residues to fall below 0.1 mg/kg.

*Contamination resulting from use in saplings/seedlings*

As phosphonic acid is stored in plant tissue, it can be imported to organic farming operations via saplings or seedlings. Features:

- Applies only to cultures propagated via saplings/seedlings.
- Saplings/seedlings were produced externally. Concrete indications of use of phosphonate or fosetyl.
- The plant was planted less than five years ago.
- Residues are below 5 mg/kg.

*Drift from conventional neighbours*

Drift may occur when organic and conventional plots are close together, independently of the pesticide used. Features:

- The organic plot is directly adjacent to a conventional one.
- Use of phosphonates or fosetyl on the neighbouring plot is known or suspected.
- Residue levels are greater at the edge of the plot than in the centre (sampling in field).

*Contamination via water*

It is suspected that phosphonate may occur in rice fields due to the low-oxygen conditions, but this is still unclear. It is also not yet clear whether the use of such water for irrigation results in residues. Features:

- Applies to wet rice, and potentially also to cultures irrigated using water from rice fields or similar bodies of water.
- Phosphonic acid has been identified in the water.

*Contamination via detergents*

Some detergents contain traces of phosphonic acid, and as these detergents need to be rinsed away after use, the traces of phosphonic acid are rinsed away as well. If used correctly, therefore, these detergents do not leave residues. Features:

- No other apparent explanation for residues.
- There are indications that the equipment used has not been rinsed sufficiently following the use of detergents.
- Possible analysis of detergents used.

*Contamination from plant protection products, fertilisers or biostimulants for which the phosphonate content is not declared*

Unfortunately, phosphonates are often added to plant protection products, fertilisers or biostimulants. As this is generally not declared on the label, the organic producer cannot be considered at fault. Features:

- If the cause of the residues is unclear, all auxiliary input must be investigated. In some cases, a plausibility test will suffice; suspicious products must be examined in detail (with analysis if necessary).
- All types of auxiliary input must be considered, e.g. fertilisers and fertiliser additives, biostimulants, and less frequently plant protection products (copper fungicides, for example).
- Particular attention should be paid to auxiliary input whose advertising or label refers to a fungicidal effect that is not explicable based on the declared composition.
- Fertilisers that refer only to "phosphorous" without indicating its exact form (e.g. rock phosphate) are especially suspicious.

Note: Manure and compost may naturally contain traces of phosphonate (minimal mg/kg). Based on current knowledge, such small quantities do not result in measurable residues of phosphonic acid, however, and are therefore not considered a possible cause.

*Deliberate use of phosphonate or fosetyl*

While phosphonate and fosetyl are effective treatments for various plant diseases, their use represents a serious violation of the standards and is risky, as it results in residues.

- In general, phosphonic acid residues of above 5 mg/kg [1]; possibly residues of fosetyl (level unspecified).
- Exception: In cases of potential drifting, deliberate use is not to be assumed.
- The syringe can be sampled in order to substantiate the suspicion. The producer can also be questioned, or the accounts examined.

**Avoidance of residues***Contamination resulting from use before conversion*

- Before taking over plots with permanent crops from another producer, ask directly whether phosphonate or fosetyl-Al have been used in the past. In case of doubt, analyse a sample before taking on the plot.
- It is currently not yet known how long it takes for contamination to disappear following conversion. In case of doubt, analyse a sample before taking on the plot.
- The only sure approach is to plant on a completely new site.

*Contamination resulting from use in saplings/seedlings*

- Use organic seedlings/saplings wherever possible.
- If conventional seedlings/saplings must be used, ask directly whether phosphonate or fosetyl-Al have been used in the past.
- In case of doubt, analyse the seedlings/saplings on receipt.

*Drift from conventional neighbours*

A separate information note is available on this subject (see [Avoiding drift in organic production](#)).

*Contamination via water*

- In the case of wet rice: if the water does indeed contain phosphonate, residues cannot be avoided.
- Irrigation: if the water does indeed contain phosphonate, use a different source of water.

*Contamination via detergents*

- Rinse equipment thoroughly following use of detergents.

*Contamination from plant protection products, fertilisers or biostimulants for which the phosphonate content is not declared*

- In countries for which an auxiliary input list exists: use only products included in the list.
- In other countries: use only products from respectable suppliers. Particular attention should be paid to liquid phosphorus-based fertilisers and products whose advertising or label refers to a fungicidal effect that is not explicable based on the declared composition.
- In case of doubt, analyse the auxiliary input before using.

*Deliberate use of phosphonate or fosetyl*

- It is in producers' own interests to avoid the use of phosphonate or fosetyl, as it results in residues and can therefore be identified far into the future.
- Inspection bodies and buyers prevent the use of phosphonate by carrying out regular residue analysis and informing producers accordingly.

**The stance adopted by Bio Suisse**

This section will summarise the stance adopted by Bio Suisse on the evaluation of phosphonic acid residues. Any products marketed under the Bud label must be released by the responsible certification body, and if appropriate by the responsible enforcement agency, according to the applicable organic regulations.

Bio Suisse has defined the appropriate procedure concerning residues in the [Bio Suisse decision chart for assessing pesticide residues and contaminants in Bud products](#). Bio Suisse assess the various causes differently, taking into account whether the residue is technically unavoidable, or can be attributed to the producer. The assessment also includes the consumer's right to expect low-residue products, and the context of international conventions.

*Contamination resulting from use before conversion*

Contamination resulting from use before conversion is tolerated. Products may continue to be marketed with the Bud label, provided the cause is beyond doubt, and any violations can be ruled out. The producer's duty of care dictates, however, that even in this case the residues are monitored on a regular basis. If they fail to decline over the years, the causes must be investigated further and discussed with the certification body.

*Contamination resulting from use in saplings/seedlings*

Contamination resulting from *saplings/seedlings already planted* is tolerated. Products may continue to be marketed with the Bud label, provided the seedlings were used in accordance with the applicable standards, the cause is beyond doubt, and any violation can be ruled out. The producer's duty of care dictates, however, that even in this case the residues are monitored on a regular basis. If they fail to decline over the years, the causes must be investigated further and discussed with the certification body.

*Drift from conventional neighbours*

Organic producers should take measures to minimise the risk of drift (see information note [Avoiding drift in organic production](#)). In some cases, however, drift is unavoidable for the organic producer, and can also be tolerated on a case-by-case basis.

*Contamination via water*

While contamination via water is currently tolerated, producers must be able to prove that they have met their duty of care, and that such an origin is likely (water analyses).

*Contamination from auxiliary input for which the phosphonate content is not declared*

The use of auxiliary input with phosphonates represents a violation of the standards, and must be avoided. In the case of undeclared content, however, the fault lies not with the organic producer but with the manufacturer of the product concerned. If damage is caused as a result of use, it should be determined whether the manufacturer can be held liable.

If such auxiliary input has been used, it will be considered on an individual basis whether the products can be marketed under the Bud label, taking into account whether the duty of care has been met. At any event, it must be possible for any future use to be ruled out.

*Contamination through deliberate use of phosphonate or fosetyl*

Deliberate use of phosphonates or fosetyl represents a serious violation of the standards, and the products concerned may not, under any circumstances, be marketed under the Bud label. Further sanctions may be imposed.

### **Additional information**

[Possible phosphonate residues despite conversion to organic viticulture](#)

[Risk of phosphonic acid and phosphonate residues in detergents and disinfectants](#)

[BNN factsheet "Phosphonic acid, potassium phosphonate \(the potassium salt of phosphonic acid\), fosetyl-aluminium"](#)

[DECRETO 10 luglio 2020, Modifica del decreto 13 gennaio 2011, recante «Contaminazioni accidentali e tecnicamente inevitabili di prodotti fitosanitari in agricoltura biologica».](#)

[EOCC Factsheet on Phosphonic Acid](#)

[Procedure in the event of the verification of residues – harmonisation of procedure in the event of the verification of residues of banned plant protection products and cleaning and disinfectant products in accordance with Article 16, para. 1\(a, e, f\) of Council Regulation \(EC\) no. 834/2007 in organic production. Supervisory committee in accordance with section 5 of the Austrian enforcement act on EU quality regulations \(EU-QuaDG\)](#)

[EGTOP Final Report On Plant Protection Products \(III\)](#)

### **Sources**

- [1] S. Bögli und B. Speiser, «Mögliche Rückstände von Phosphonaten auch nach der Umstellung auf Bioweinbau,» 2019.