Association of organic Food Processors (AöL) – Information for Members

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AöL information about residues of phosphonate and fosetyl-aluminium in organic food

1) Problem / Starting point

During investigations, including by the Chemical & Veterinary Investigation Office in Stuttgart (CVUA Stuttgart) [1], residues of fosetyl-al (a substance comprising fosetyl and phosphonic acid commonly known as Fosetyl) was detected in various organic foods from a variety of countries of origin. Residues are found in many products including fruit, vegetables, nuts, rice, pseudo-cereals, leguminous grains such as lentils or beans, maize and potatoes. Fosetyl-al and phosphonic acid are active ingredients approved in the EU that fall within the scope of Regulation (EC) No. 396/2005. Neither of these active ingredients may be used in organic farming. The AöL is aware that, in Italy on 10 July 2020, a decree [2] was issued on the provisional procedure for tackling discoveries of phosphonic acid without concurrent verification of fosetyl-al (more on this under 5), legal aspects).

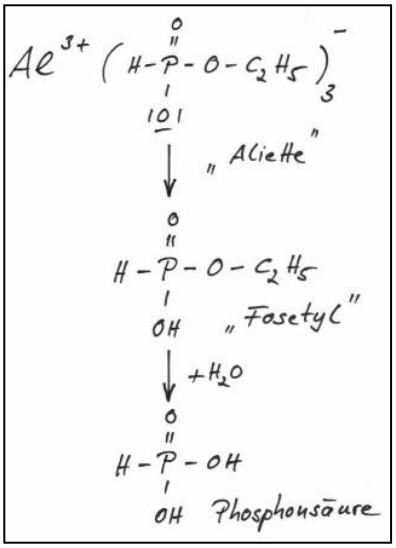
Phosphonate residues can originate from the unlawful use of pesticides containing sodium/potassium phosphonate or fosetyl-al. According to this study during the BIOFOSF project in Italy, 2020 [5], phosphonates are often found unlawfully in pesticides and fertilisers containing copper that are approved for use in organic farming. It could also be due to the inclusion of fertilisers (e.g. leaf-based fertilisers) that contain unlawful phosphonates. Raised levels of phosphonic acid can originate from perennial plants due to their prolonged exposure to a previous application at an earlier time. A few institutions tend to think that this substance can enter annual plants accidentally from micro-organisms (surface water, organic fertiliser, irrigation water, soil enhancers) [4].

2) Toxicology

A fairly long time ago, EFAS, the European Food Safety Authority, defined an acceptable daily dose (ADI) of 2.25 mg/kg of body weight. According to the EFSA, there is no need to define a value for an acute reference dose (ARfD) [3]. Essentially, even on the basis of current exposure data, the EFSA perceives no health risk for consumers through the absorption of phosphonate residues in food [7]

3) Ingress routes

In conventional crop agriculture, phosphonate (e.g. through fosetyl-al or potassium/sodium phosphonate) can be used as a fungicide, especially in special cultures. Fosetyl-al is hydrolysed/broken down rapidly into phosphonate (see Fig. on right). This can also give rise to 'drifting' to organically farmed land.



According to this study during the BIOFOSF project in Italy, 2020 [5], phosphonates are frequently found unlawfully in pesticides and fertilisers containing copper that are approved for use in organic farming.

Since 1 October 2013, phosphonates are no longer approved for use in organic farming in the EU (Reg. (EU) No. 369/2013 dated 22 April 2013). Raised phosphonate levels may also originate from an application at a much earlier date in relation to plants that are several years old [1, 6]. They can store phosphonic acid in wood and in roots which they then release in the course of time through leaves and fruit. Phosphonate residues can also be absorbed from fertilisers (e.g. leaf fertilisers) or possibly also from plants from land previously used for other applications, and from plant or root residues.

Nader et. al, 2020 [4] assumes when low levels of phosphonate residues occur in annual plants (e.g. rice, buckwheat, maize, vegetables) where it is possible to eliminate contamination from pesticides and fertilisers that these may be formed from micro-organisms in water. By way of example, residues could occur in rice from flooded paddy fields. Equally, phosphonate residues could also originate from irrigation water. Phosphonate concentrations of 0.2 mg/kg have also been detected in organic fertilisers made of dung from cattle and sheep, presumably originating from micro-organisms in their digestive organs. Other unintended sources of ingress may be soil enhancers approved for organic products that contain chelate-forming agents made from seaweed or grapes, especially from conventional points of origin (e.g. pomace or compost made from it).

4) Analytical aspects

Over the last few years, analytical techniques for phosphonate and fosetyl have become much more precise over the last few years. Both substances can be detected in an analysis process using LC-MS/MS after preparation of samples, based on the QuPPE method for polar substances. Today, the detection level for each component in food is at 0.01 mg/kg. Due to their water-soluble properties, neither of these active ingredients can be integrated in the QuEChERS multi-method for pesticides.

5) Legal aspects

The maximum contents of phosphonates and of phosphonic acid as a residue in fruit and vegetables are currently defined in terms of 'Fosetyl-Al (total of fosetyl and phosphonic acid and its salts, expressed as Fosetyl)' and this is stipulated in Regulation (EU)

No. 396/2005 that defines maximum residue levels.

Phosphonates are not approved for organic farming and cannot be used.
The AöL is aware that, in Italy on 10 July 2020, a decree [2] was issued on the provisional procedure for tackling discoveries of phosphonic acid without concurrent verification of fosetyl-al. Accordingly, the marketing of any products in which a level higher than 0.05 mg/kg is detected is prohibited. For conversion products and organic products (up to 31.12.2022), deviating values of 1.0 mg/kg for perennial (tree-like) plants and of 0.5 mg/kg for annual plant products are applicable. In this regard, the conversion period may also get extended by up to two years.
No similar regulations in Germany or across the EU are known.

Guide values for private business:

Based on the latest fact sheet published by the association of natural food and natural goods, the *Bundesverband Naturkost Naturwaren* (BNN) [8], recommends the following procedure after an evaluation of a comprehensive range of analysis results: In a verification of phosphonic acid, the equipment should be examined in all cases. For one-year and two-year cultures from a content of 0.05 mg/kg, and from a content of 0.1 mg/kg for multi-year perennial cultures. Where possible, contents below these levels should be reduced yet further. In particular for perennial cultures, a medium-term target corridor of 0.05 - 0.1 mg/kg would be a desirable goal. Up until 31.12.2022, the BNN orientation value in relation to phosphonic acid and/or its salts is deemed to have been achieved: for one-year and two-year cultures, the target is a maximum content of 0.05 mg/kg, and a maximum content of 0.1 mg/kg for perennial cultures.

6) Recommendation/Conclusion

The residue situation of phosphonic acid and phosphonates should be recorded on a regular routine basis. In the view of the AöL, it is reasonable to assume if values drop below 0.1 mg/kg that, very probably, phosphonic acid and phosphonates (e.g. potassium phosphonate) were not used in the culture being considered. However, if evidence of the presence of fosetyl-al is detected, it is probable that this medium has been used, and/or that 'drifting' has occurred. In a few annual cultures such as dried pulses (e.g. lentils, beans, chickpeas) and pseudo-cereals, values of more than 0.1 mg/kg are detected frequently, although the use of phosphonic acid preparations can be eliminated as a possibility. An urgent need for research is perceived here.

The media used for bio-cultures (fertilisers and pesticides) must not contain any phosphonic acid or phosphonates. Where necessary, individual batches of these media can be investigated. In future, always ensure in the FiBL list of media that all of them are free of phosphonates. (www.betriebsmittelliste.de)

Further research needs to be conducted into the extent to which phosphonates can be formed by micro-organisms present in waterways, approved soil enhancers, composts and organic fertilisers.

Due account needs to be taken of the problems associated with these residues (enrichment and reduction in the plant) of phosphonic acid and phosphonates on plants that have been being cultivated for several years.

There are still many questions to answer in relation to phosphonate residues in organic products. This paper reflects the current status. As soon as new insights are gained into how to deal with phosphonate residues, we shall update this paper without undue delay.

Bibliography

[1] Ökomonitoring Baden -Württemberg 2018 – Ergebnisse der Untersuchungen von Lebensmitteln aus ökologischem Landbau, Hrsg: Ministerium für Ländlichen Raum und Verbraucherschutz Baden-Württemberg; Redaktion durch CVUA Stuttgart

[2] DECRETO del 10 luglio 2020 n. 7264 "Modifica del decreto del 13 gennaio 2011 recante "Contaminazioni accidentali e tecnicamente inevitabili di prodotti fitosanitari in agricoltura biologica".

[3] EFSA (European Food Safety Authority), 2012b. Conclusion on the peer review of the pesticide risk assessment of the active substance potassium phosphonates. EFSA Journal 2012;10(12):2963, 43 pp

[4] Nader, W.F., Maier, M., Miebach, M. and Linder, G.: Pesticide residue legislations challenge international trade of food and feed. Cereal Technology, 2: 84-99 (2020)

[5] Assessing the Origin of Phosphonic Acid Residues in Organic Vegetable and Fruit Crops: The Biofosf Project Multi-Actor Approach, Alessandra Trinchera Ital. 2020

[6] Bögli S., Speiser B. (2019), "Mögliche Rückstände von Phosphonaten auch nach der Umstellung auf Bioweinbau", Agrarforschung Schweiz 10 (9): 344–345.

[7] EFSA (, 2020. Modification of the existing maximum residue levels for fosetyl/phosphonic acid in various crops. EFSA Journal 2020;18(1):5964, 33 pp.

[8] Bundesverband Naturkost Naturwaren (BNN) Factsheet Phosphonsäure Kaliumphosphonat, Fosetyl-Aluminium v. Sept. 2020

Further information

Phosphonic acid in organic products: The way forward: Proposal bei the Anti Fraud Initiative (AFI), 15.10.2020 from GFRS (Gesellschaft für Ressourcenschutz), Agro Eco Louis Bolk and FiBL (Forschungsinstitut für biologischen Landbau)

Bio Suisse, Dez. 2020 in Zusammenarbeit mit FiBL: Informationen und Stellungnahme zu Rückständen von Phosphonat/Phosphonsäure

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AöL information

The Association of Organic Food Processors [*Assoziation ökologischer Lebensmittelhersteller (AöL)*] is a consortium of more than 110 companies involved in the food business. Its European members generate annual bio-sales revenues in excess of four billion euro. Their work focuses on the representation of their interests at a political level and the promotion of dialogue and cooperation between its members.

This information was produced with the collaboration of the Scientific Committee of the AöL.

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