International Webinar

Residue testing in organic production: Investigations after detection of phosphonic acid and its salts

Phosphonic acid (and its salts): overview of known sources

Alliance for Organic Integrity

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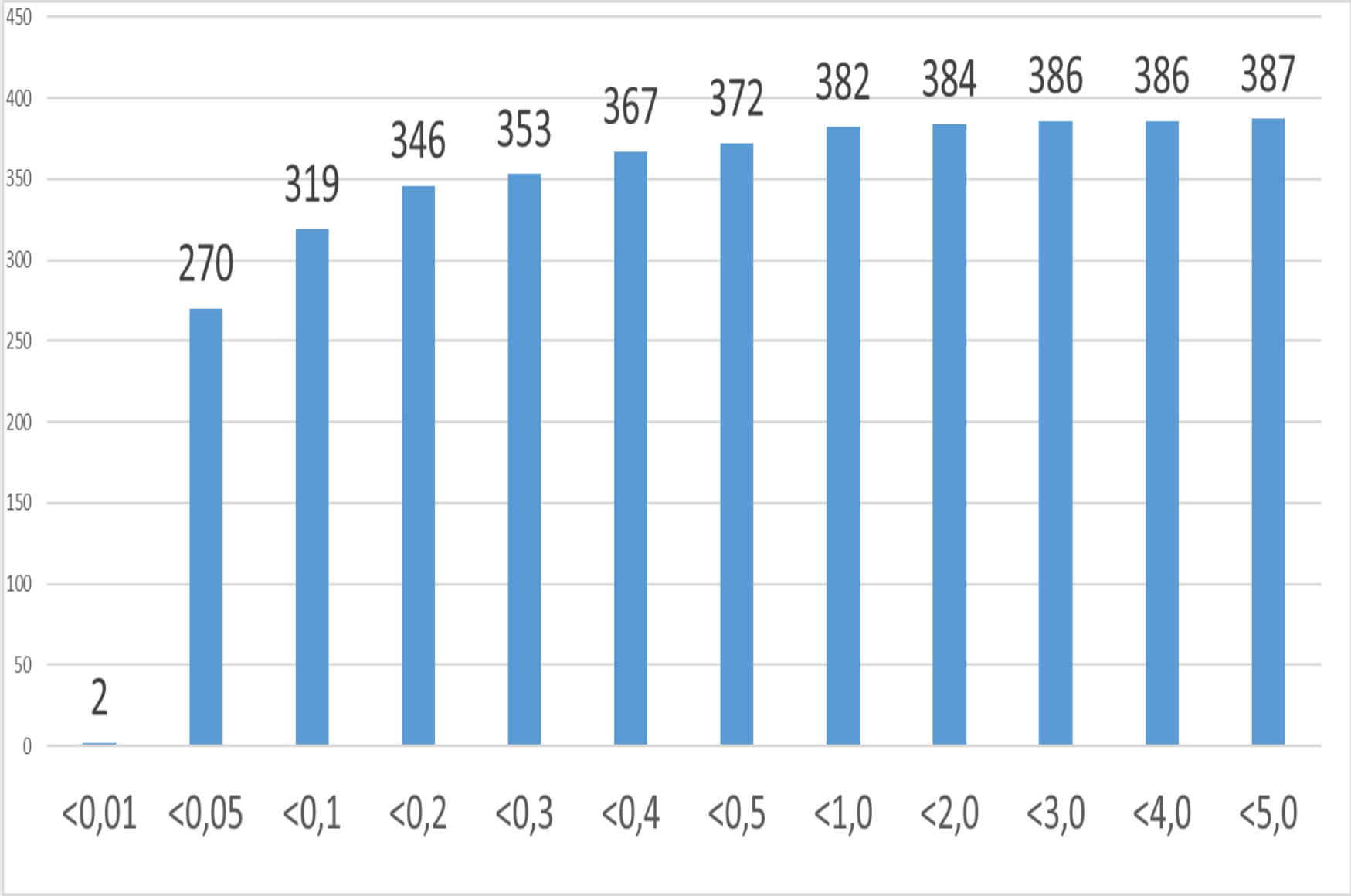
Phosphonic acid (and its salts)

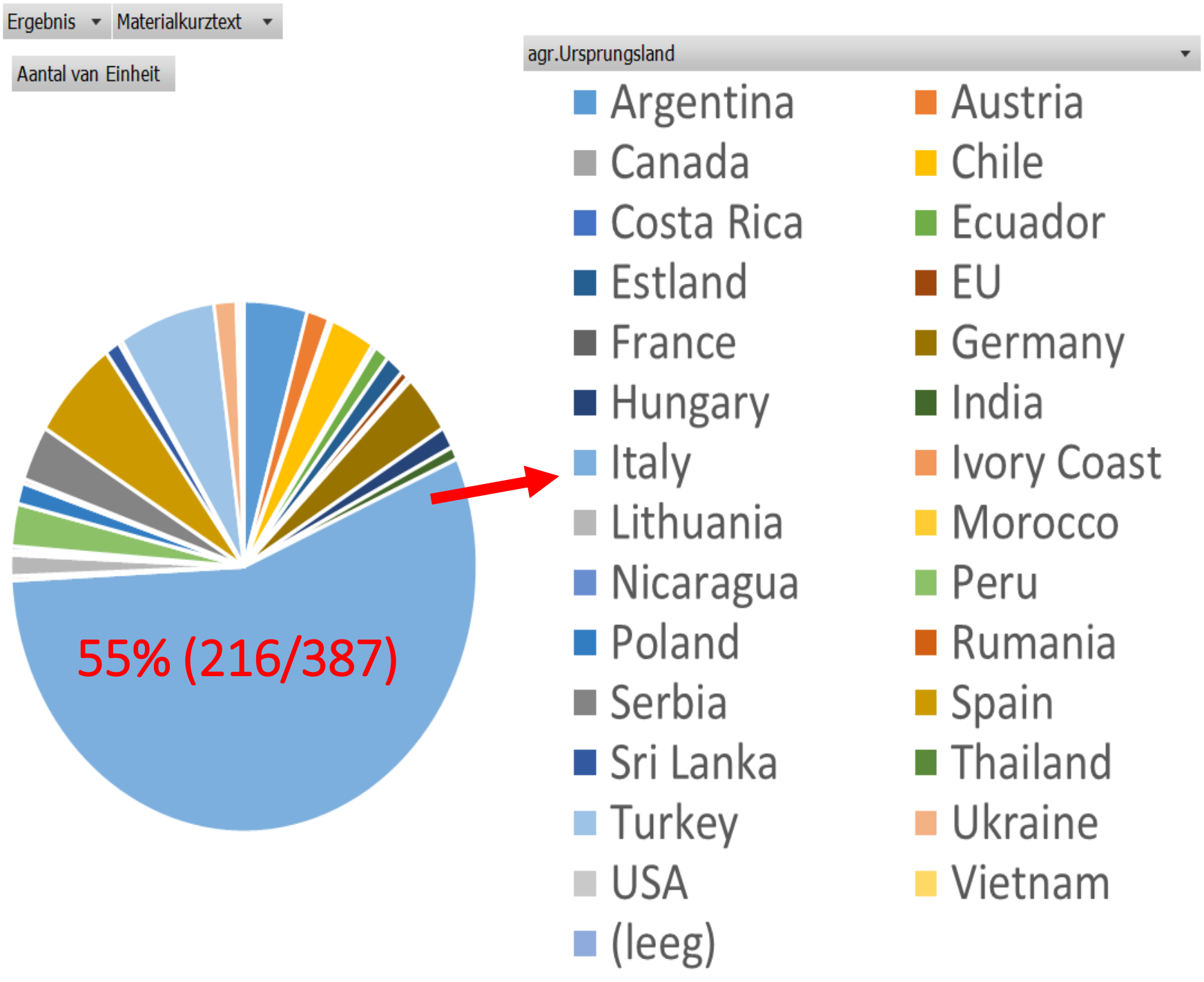
1. Some data
2. The uptake by a plant
3. The sources

1. Some data

Test results of **raw materials for organic food**

96% contain only phosphonic acid and less than 0,5 mg/kg





Dünger wird Fungizid

In Italien wurde Kaliumphosphonat im Apfelanbau bis 2017 als Blattdünger verwendet. Mit der Registrierung des Handelsproduktes Century Pro am 8. März 2018 hat das italienische Gesundheitsministerium diesen Blattdünger auch in Italien auf den Kulturen Apfel und Birne als Pflanzenschutzmittelwirkstoff gegen Apfel- und Birnenschorf mit 35 Tagen Wartezeit eingestuft. Das Mittel darf höchstens 6 Mal pro Jahr mit einer maximalen Aufwandmenge pro Behandlung von 1,9 Liter/ha eingesetzt werden.

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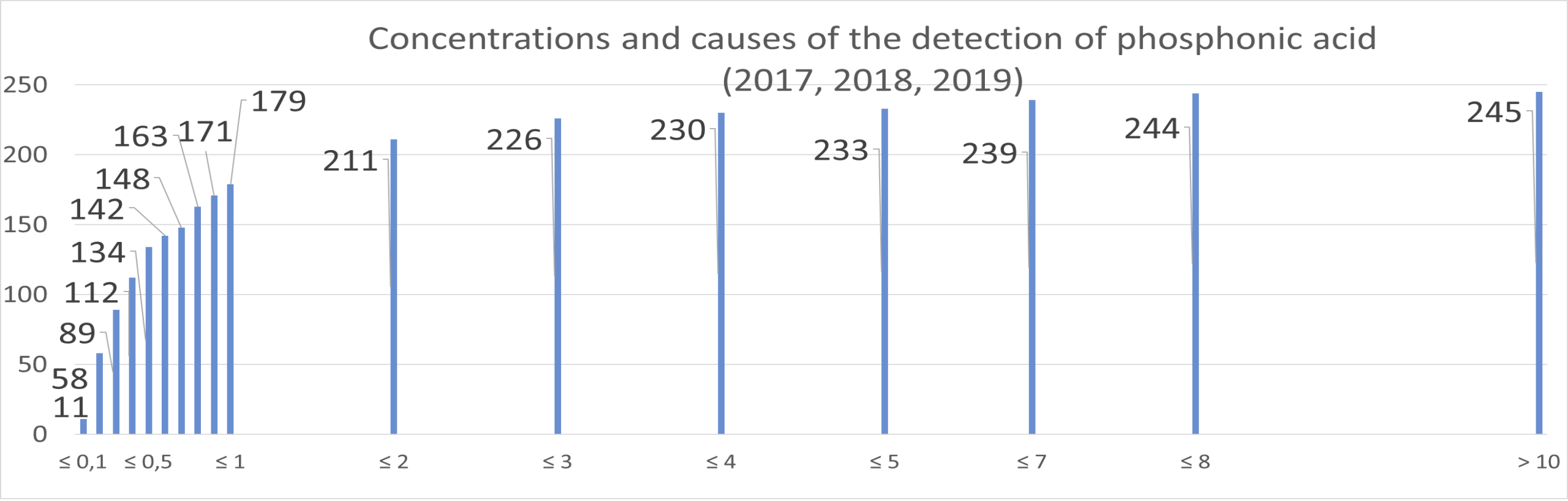

Test results of certifiers (EOCC)
73% (179/245) contain phosphonic acid at 1,0 mg/kg or less

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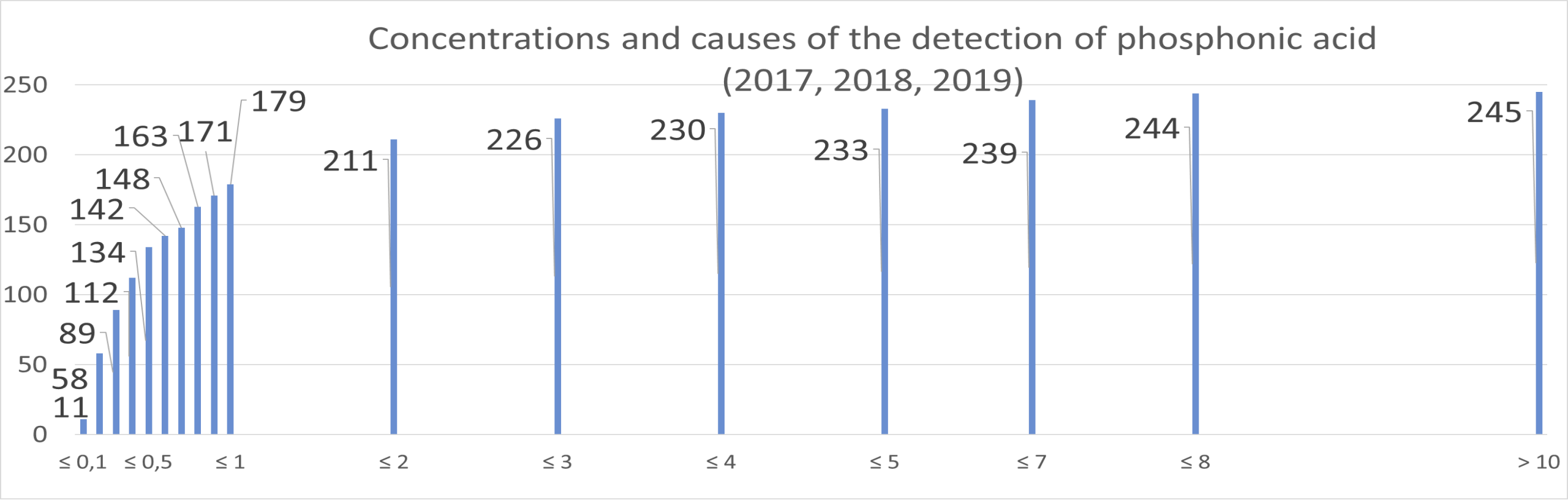
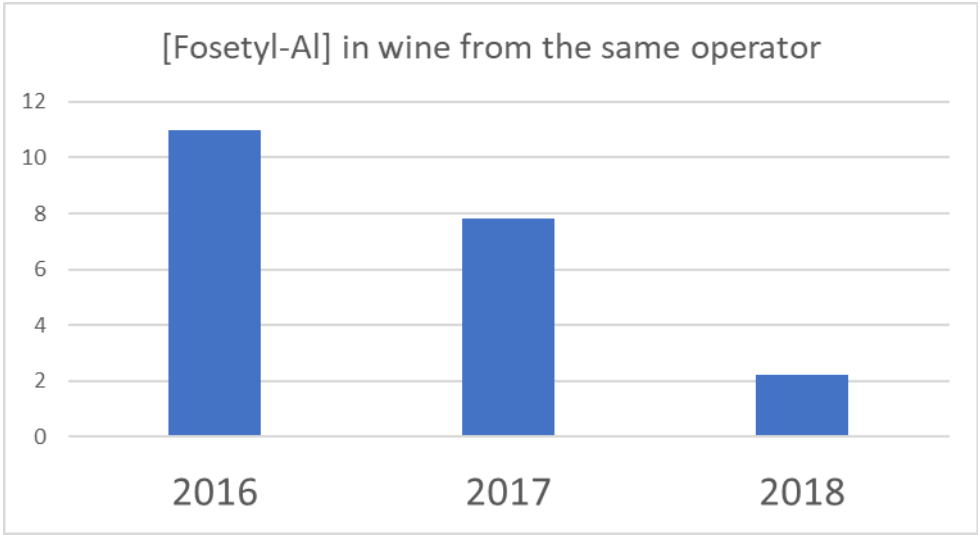


(245) Test results of certifiers (EOCC)

73% (179/245) contain phosphonic acid at 1,0 mg/kg or less

3 Test results of red wine from one operator. Start of conversion period 2009. End of conversion period 2012, 2014 and 2016…

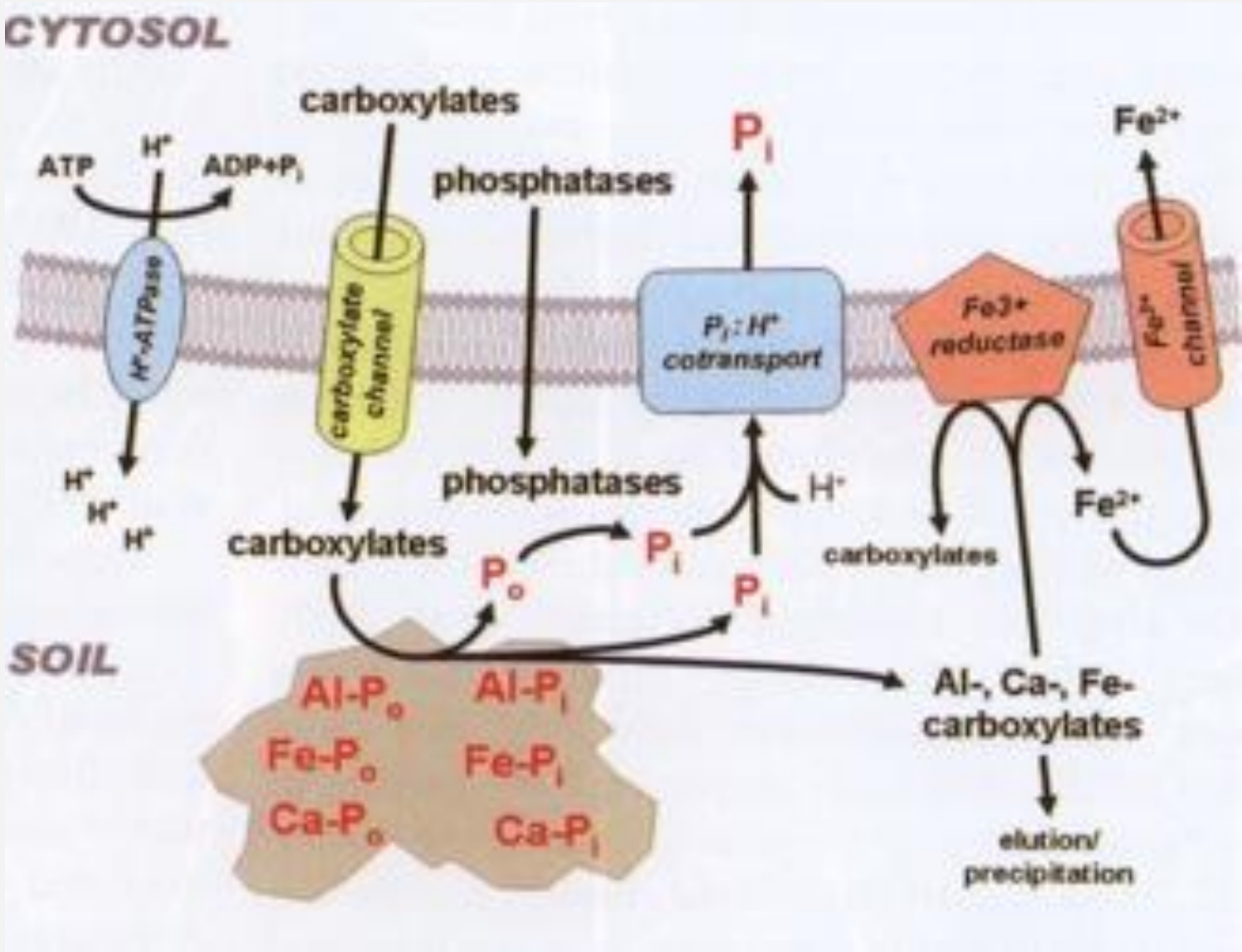


2. The uptake

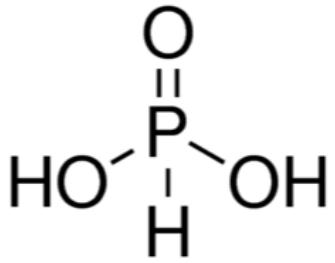
-Plants need to take up phosphorous (P) in high quantities especially in relation to growth

-P enters the plant via the Pi Transporter proteins located in the cell membrane in leaves and roots.

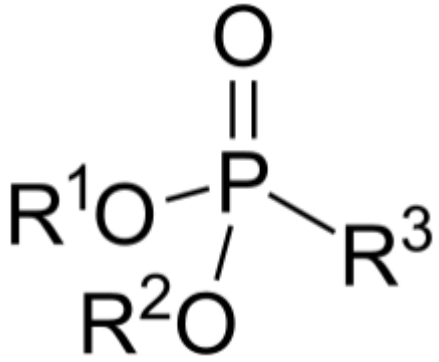
-Pi Transporters can “pump” inwards phosphate (Pi), phosphonate and organophosphonates



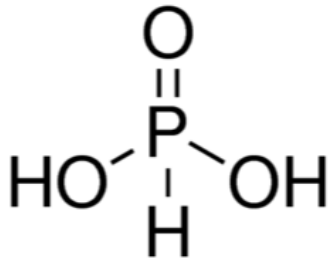
3. The potential sources of



Phosphonates and organo-phosphonates

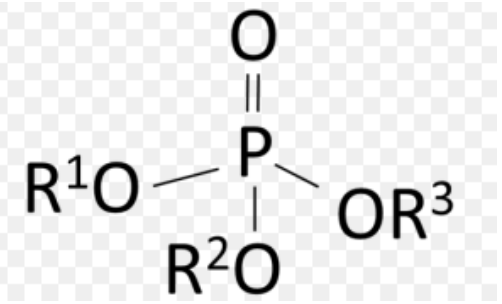


The potential sources of

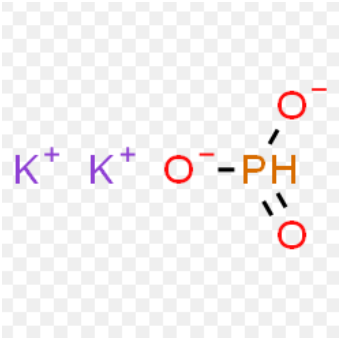


“Phosphonate salts”

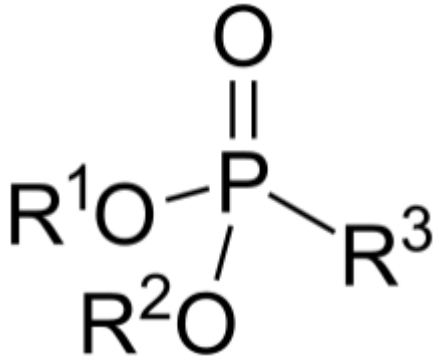
“Phosphates” and “organo-phosphates”



“R” represents a hydrogen (H) or the start of Carbon chain
“P” is phosphorous and
“O” is oxygen



Phosphonates and organo-phosphonates



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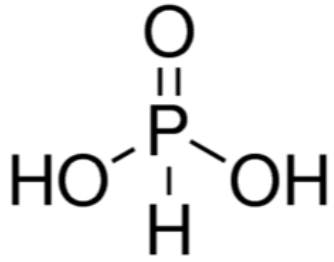

"Phosphonate salts"

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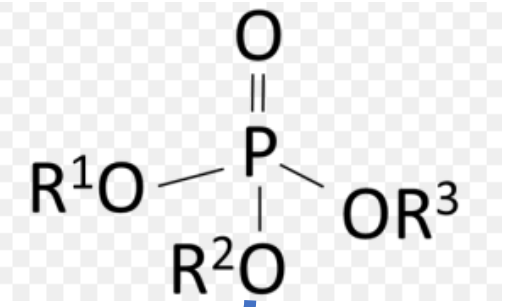

Only in anaerobic environment
e.g. rice field and algae production units

"R" represents a hydrogen (H) or the start of Carbon chain
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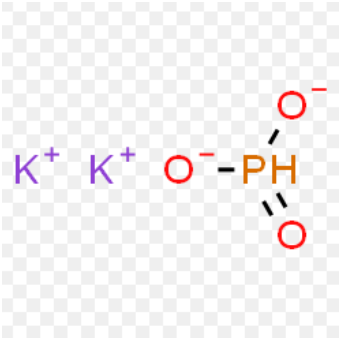
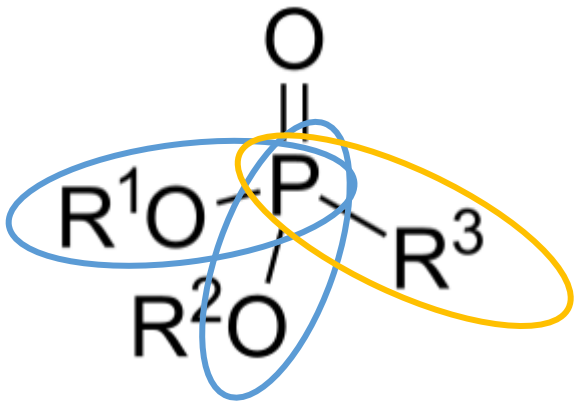
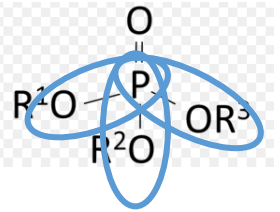
"O" is oxygen



Phosphonates and organo-phosphonates



“Phosphates” and “organo-phosphates”



They are only potential sources of phosphonic acid in plants when grown in anaerobic environment

The potential sources of phosphonic acid

“Phosphonate salts”

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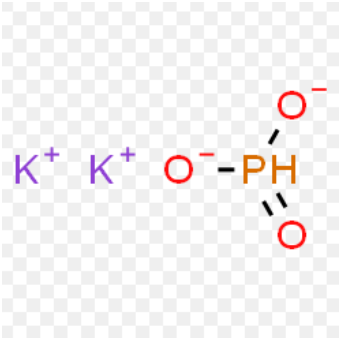
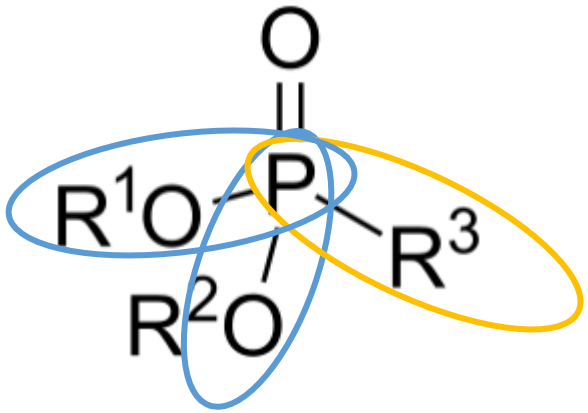


“O-P” phosphonates

“C-P” phosphonates



“R” represents a hydrogen (H) or the start of Carbon chain
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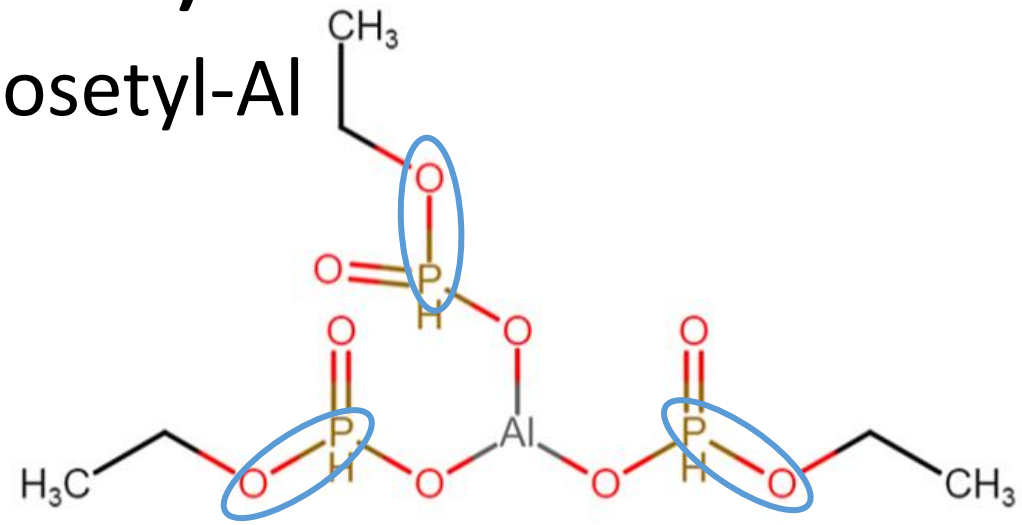
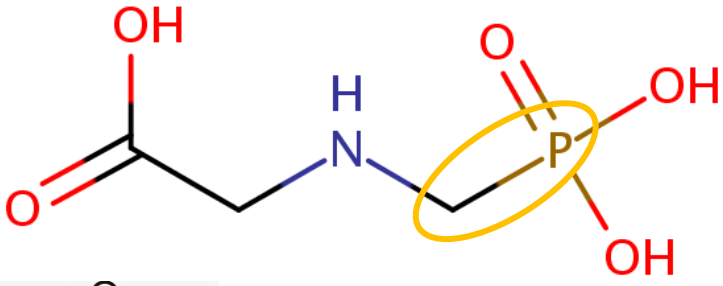
“O-P” phosphonates (esters)

-Fosetyl-Al

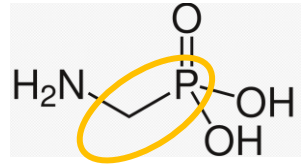


“C-P” phosphonates

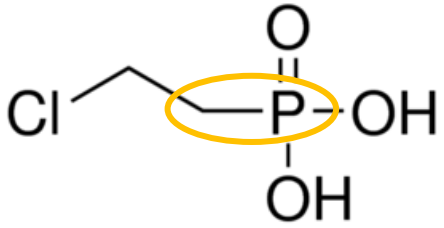
-Glyphosate



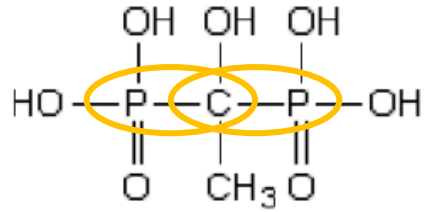
-AMPA



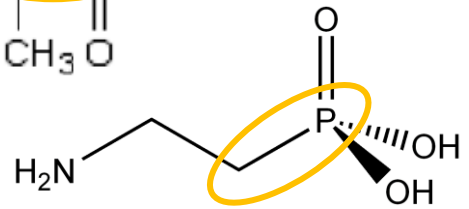
-Ethephon



- HEDP



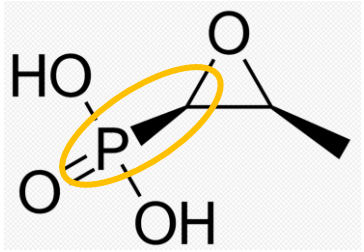
-AEPA*

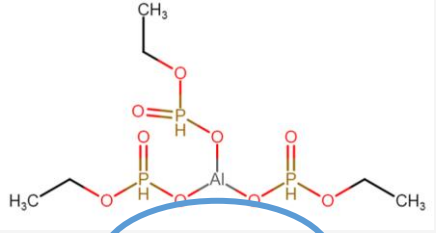


-Fosfomycin*°

* Naturally occuring

° Antibiotic

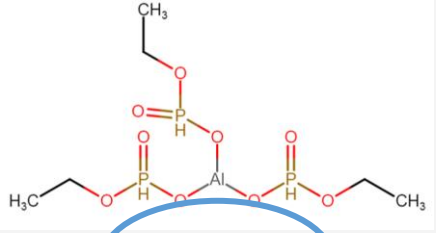




“O-P” phosphonates

! The “O-P” bond of fosetyl can be easily broken in the soil (hydrolysis)

! The result is phosphorous acid and ethanol



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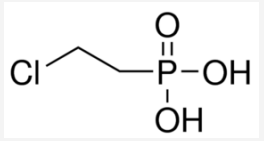
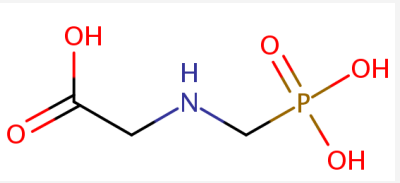
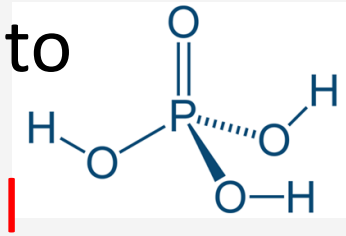




“C-P” phosphonates

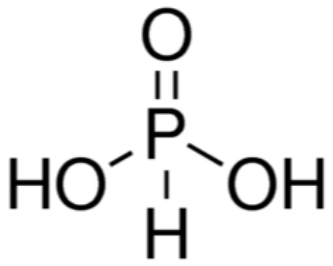
! The C-P bond is only broken after secretions of certain soil micro-organisms.

! The result of the enzymatic cleavage is oxydation of P (from P^{+III} to P^{+V}) to phosphate

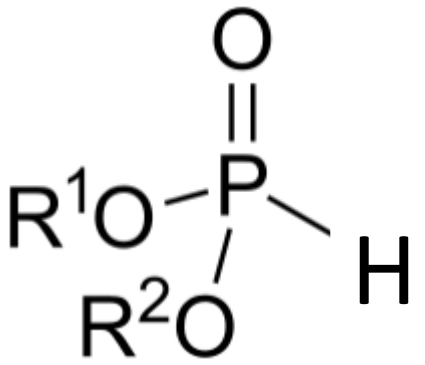


They are not potential sources of phosphonic acid in plants

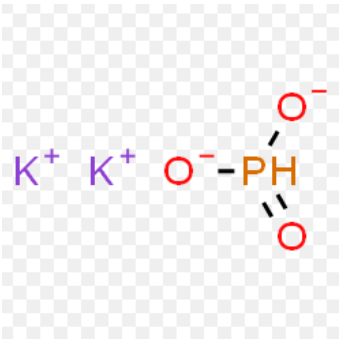
The potential sources of



Phosphonate and organo-phosphonate esters (e.g. fosetyl-Al)



“Phosphonate salts”



Use during the growing season, or the past growing seasons

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Sources of phosphonic acid

1. Fosetyl-Al, potassium phosphonate and disodium phosphonate may be used as active substances in **plant protection products**. The presence of these substances has to be mentioned in the labelling.
2. Potassium phosphonate and disodium phosphonate may be present in **fertilizers**. The presence of these substances can not be deducted from the labelling of the fertilizer (EU Reg 2003/2003, art 6). From 15/07/2022, "*phosphonates shall not be intentionally added to any fertilising product. Unintentional presence of phosphonates shall not exceed 0,5% by mass*." (EU Reg 2019/1009, Ann I, part II.)
3. Empirical and research data show that phosphonic acid can remain present in plant tissue even **after the end of the conversion period** towards organic farming. (A similar scenario occurs with chlormequat in pears)
4. Phosphonic acid may be integrated in organic production via the authorised use of non-organic **vegetative propagation** material

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Thank you for your attention

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