Directorate-General for Agriculture
and Rural Development

Expert Group for Technical Advice on Organic Production

EGTOP

FINAL REPORT

on

Plant Protection (VII)

and

Fertilisers (V)

The EGTOP adopted this technical advice at the plenary meeting
of 8 – 10 June 2022

About the setting up of an independent expert panel for technical advice

Regulation (EU) 2018/848[1] requires that authorisation of products and substances used in organic production may only be authorised if they comply with the principles, criteria and objectives of organic production described in that Regulation. The Commission has decided that when taking decisions on these authorisations it will take account of scientific advice by a group of independent experts. For that purpose the Commission has set up the Expert Group for Technical Advice on Organic Production by Commission Decision 2021/C343/03 of 4 August 2021.

EGTOP

The Group's tasks are:

(a) to assist the Commission in evaluating technical matters of organic production, including products, substances, methods and techniques that may be used in organic production, taking into account the objectives and principles laid down in Regulation (EU) 2018/848 and additional policy objectives with regard to organic production;

(b) to assist the Commission in improving existing rules and developing new rules related to Regulation (EU) 2018/848;

(c) to stimulate an exchange of experience and good practices in the field of technical issues related to organic production.

EGTOP Permanent Group

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The report of the Expert Group presents the views of the independent experts who are members of the Group. They do not necessarily reflect the views of the European Commission. The reports are published by the European Commission in their original language only.

https://agriculture.ec.europa.eu/farming/organic-farming_en

[1] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R0848&from=EN

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Register of Commission expert groups and other similar entities (europa.eu)

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EXECUTIVE SUMMARY

The Expert Group for Technical Advice on Organic Production (EGTOP) was requested to advise on the use of several substances with plant protection or fertilising effects in organic production. The Group discussed whether the use of these substances is in line with the objectives and principles of organic production, and whether they should therefore be included in Reg. (EU) 2021/1165.

With respect to Annex I to Reg. (EU) 2021/1165, the Group recommends the following:

- Aqueous extract from the germinated seeds of sweet *Lupinus albus* should be included in Annex I, part 2 (low risk active substances).
- Low risk active substances of plant or animal origin should be authorised generically in Annex I, part 2, provided that they are not of GMO origin. This would mean that they can be used in organic production as soon as they are approved under pesticide legislation, without the need for evaluation by EGTOP and without explicit mentioning in Annex I to Reg. (EU) 2021/1165.
- Ferric pyrophosphate should be included in Annex I, part 2 (low risk active substances).
- The entries for deltamethrin and lambda-cyhalothrin should be modified as follows: (i) for both substances, the authorisation should be limited until 2026; (ii) for the time period until 2026, deltamethrin should also be authorised against *Rhagoletis completa* with the same restrictions as for other uses, i.e. 'only in traps with specific attractants'.

With respect to Annex II to Reg. (EU) 2021/1165, the Group recommends the following:

- The entry on 'Composted or fermented household waste' should be changed to 'Composted or fermented bio-waste'.
- Recovered struvite and precipitated phosphate salts should be included in Annex II with the following restrictions: (i) Products must meet the requirements defined by Reg. (EU) 2019/1009, for products derived from waste materials. (ii) Animal manure as source material cannot have factory farming origin.
- Bone charcoal should not be included in Annex II.
- Potassium chloride (muriate of potash) should be included in Annex II with the following restriction: Only of natural origin.
- Phosphogypsum should not be included in Annex II.
- Comment on widespread environmental contamination: In the Group's opinion, circular economy is important and should be widely adopted also in organic production. However, recycled materials may be contaminated with undesirable substances such as microplastic, heavy metals, veterinary drugs or pesticides. The Group does not recommend any changes in the organic legislation at the moment. However, the Group highlights these risks and recommends that the European Commission and Member States take them into consideration within the framework of policies and regulations concerning organic farming development, circular economy and environmental protection. Moreover, these risks should be continuously monitored and preventively managed in the use of pesticides, veterinary drugs, plastic or any other potentially polluting materials and in the production of organic fertilizers from recycled materials.

  Finally, the organic sector should be aware that the proposed measures can reduce contaminations (in frequency and in amounts), but may not always completely eliminate them from the organic production chain. Under these circumstances, a certain level of contamination can be difficult to avoid in organic products. The issue of how to handle such residues is hotly debated at the moment. The Group would welcome harmonization among EU member states of control practises and on actions taken in case of detections of residues of non-allowed products on organic products and in organic farms.

1. BACKGROUND

Several Member States have submitted dossiers under Article 16(3)(b) of Regulation (EU) 2018/848 concerning the possible amendment of Annex I and Annex II to Commission Implementing Regulation (EU) 1165/2021[2] and in general, on their compliance with the above mentioned legislation.
With regard to plant protection, Italy requested the authorisation of lupin extracts, Poland requested the authorisation of ferric pyrophosphate and France requested the extension of the use of deltramethrin in traps.
With regard to fertilisers and soil conditioners, Sweden requested the expansion of the definition of household waste, Germany asked for advice on struvite, Hungary requested the authorisation of bone charcoal, The Netherlands requested the authorisation of potassium chloride and Finland requested the authorisation of phosphogypsum. A request by Italy for authorisation of frits[3] was postponed pending missing information.
Therefore, the Group is requested to prepare a report with technical advice on the matters included in the terms of reference.

2. TERMS OF REFERENCE

In light of the most recent technical and scientific information available to the experts, the Group is requested to answer if the use of the below listed substances are in line with the objectives, criteria and principles as well as the general rules laid down in Regulation (EU) 2018/848[4] and, hence, can be authorised to be used in organic production under the EU organic legislation.

- **Aqueous extract from the germinated seeds of sweet Lupinus albus (BLAD)**
- **Ferric pyrophosphate**
- **Deltamethrin (in traps): extension of uses**
- **Expansion of the term household waste**
- **Struvite**
- **Bone charcoal**
- **Potassium chloride**
- **Phosphogypsum (soil conditioner)**

For the preparation of its report the Group was invited to examine technical dossiers provided to the Commission by the Member States and suggest amendments to the current lists in Annex I and II to the Regulation (EU) 2021/1165.

[2] EUR-Lex - 32021R1165 - EN - EUR-Lex (europa.eu)

[3] Frits: vitreous masses formed by the fusion of substances such as alkali and alkaline earth silicates, borates, fluorides and feldspar)

[4] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R0848&from=EN

3. CONSIDERATIONS, CONCLUSIONS AND RECOMMENDATIONS

3.1 Plant protection (Annex I of Reg. 2021/1165)

3.1.1 Aqueous extract from the germinated seeds of sweet *Lupinus albus*

Introduction, scope of this chapter
The aqueous extract from the germinated seeds of sweet lupins has fungicidal properties. It has recently been authorised as a pesticide at EU level. As typical for plant extracts, it is a complex mixture of substances which cannot be chemically characterised. It is therefore categorized as a so-called 'UVCB substance' (Substance of Unknown or Variable composition, Complex reaction product or Biological material). The protein 'BLAD' (Banda de Lupinus albus doce) has been defined as a lead component. The Group was asked to evaluate whether it should be authorised for EU organic production (request made by Italy). For simplicity, the material is referred to as 'sweet lupin extract' in this chapter.

Authorization in general production
The active substance 'Aqueous extract from the germinated seeds of sweet Lupinus albus' has recently been authorised at EU level. It was classified as a low-risk active substance. No maximum residue levels are set.
To date (March 2022), no commercial products are registered for use yet.

Authorization in organic production
Sweet lupin extract is currently not authorised for EU organic production.

Agronomic use, technological or physiological functionality for the intended use
Sweet lupin extract is active against a range of fungi from the Group of ascomycetes. Targets include in particular powdery mildew, grey mould (*Botrytis*), *Monilia* and rice blast. Potential uses include a wide range of crops such as pome and stone fruit, berries, nuts, grapes, vegetables, herbs, hops, rice and ornamentals. As no commercial products have been registered yet, it cannot be predicted which of these uses will be registered in EU member states. Depending on crops, sweet lupin extract is applied 2 – 6 times with 7 – 14 days interval. According to the EFSA review, 'sufficient fungicidal efficacy' has been shown for the representative uses.
Sweet lupin extract has contact activity on pathogens. The lead compound BLAD binds strongly to chitin, a major component of fungal cell walls. It inhibits fungal growth and destroys fungal cells. No phytotoxic effects and no impact on yield have been observed in crops.
Because no maximum residue levels are set and because it is rapidly biodegradable, sweet lupin extract can be used until shortly before harvest.

Necessity for intended use, known alternatives
According to the principles of organic production, diseases should primarily be managed with preventive agronomic practices. Main methods for prevention of plant diseases include: balanced fertilization, proper pruning, trellising systems that facilitate ventilation and choice of robust varieties adapted to local climatic conditions. If necessary, they may be controlled with fungicides. Copper, sulphur, potassium hydrogen carbonate, sodium hydrogen carbonate, lecithins, laminarin, COS-OGA and biocontrol agents such as *Bacillus subtilis, Bacillus amyloliquefaciens* and *Aureobasidium pullulans* and also the mite *Pronematus ubiquitus* are active against similar pathogens.
However, there are numerous plant – pathogen combinations and not every substance is equally effective against each pathogen and registered for that use, so that additional and complementary fungicides are welcome. The Group expects that sweet lupin extract will be most useful for crops which must be treated until shortly before harvest, such as strawberry (grey mould), grapes (grey mould), tomatoes and herbs. As sweet lupin extract is a new fungicide not yet on the market, the Group cannot make a final judgement of its efficacy. On crops where sweet lupin extract can replace/reduce the use of copper or sulphur, this would be welcomed from an environmental point of view.

Origin of raw materials, methods of manufacture
Seeds of sweet lupin are germinated in water. To release the BLAD protein, the seedlings are milled with water. The solution is purified and concentrated (water removal).

Environmental issues, use of resources, recycling
The Group has no concerns regarding the production of sweet lupin extract. As it is readily biodegradable and no environmental hazards were identified, the Group also has no concerns over its use. Although BLAD binds to chitin, a low risk for arthropods was identified in the EFSA review.

Animal welfare issues
The Group has no concerns and emphasizes that lupins are used as animal feed.

Human health issues
The Group has no concerns (low-risk active substance) and emphasizes that sweet lupins are used also for human nutrition. The use of lupins in foodstuff has to be labelled, because of their allergenic potential. However, EFSA considered that sweet lupin extract is not skin sensitizing, so the Group has no concerns in this respect.

Food quality and authenticity
No negative impacts on food quality are reported in the dossier or otherwise known.

Traditional use and precedents in organic production
Traditional use: sweet lupin extract is a new fungicide and therefore has no traditional use, neither in conventional nor in organic agriculture.
Precedents: plant extracts have traditionally been used for plant protection (for example pyrethrins). In Southern Italy, lupin meal has traditionally been used as a fertiliser in citrus.

Authorised use in organic farming outside the EU / international harmonization of organic farming standards
Under the NOP standard, sweet lupin extract is considered as a nonsynthetic material and thus allowed.

Other relevant issues
None.

Reflections and conclusions
In organic farming it is a goal to reduce the need for plant protection by preventive measures such as crop-rotation and functional biodiversity. If plant protection products nevertheless are needed, plant-based fungicides are welcome in the Group's opinion. For sweet lupin extract, the Group has no concerns over negative impact on humans or the environment (low-risk product). In the Group's opinion, the use of sweet lupin extract complies with the objectives and principles of organic production and should be authorised.

Recommendations
The Group recommends to add a new entry in Annex I, part 2 (low risk active substances) as follows:

Number and part of Annex	CAS	Name	Specific conditions and limits
28 D	(none)	Aqueous extract from the germinated seeds of sweet *Lupinus albus*	(none)

3.1.2 Low risk active substances of plant or animal origin

Introduction
When discussing the request for 'aqueous extract from the germinated seeds of sweet *Lupinus albus*', the Group considered that for low risk active substances of plant or animal origin, a generic approach might be appropriate.

Reflections and conclusions
- The use of substances from plant or animal origin is in line with the objectives and principles of organic production, provided that they are not from GMO origin.
- Not all substances from plant or animal origin are harmless. For substances which have been classified as low risk active substances under pesticide legislation, however, the Group has no concerns.

- The Group limits its proposal to substances from plant or animal origin, because there might be low risk substances of synthetic origin, the use of which would not necessarily be in line with the objectives and principles of organic production.
- The approach proposed here for *low risk active substances* is analogous to the approach already implemented in *basic substances*.
- In the Group's opinion, low risk substances of plant or animal origin should be authorised generically. This would mean that they can be used in organic production as soon as they are approved under pesticide legislation, without the need for evaluation by EGTOP and without explicit mentioning in Annex I to Reg. (EU) 2021/1165, with the limitation of not being from GMO origin.

Recommendations

The Group recommends to add a new entry in Annex I, part 2 (low risk active substances) as follows:

Number and part of Annex	CAS	Name	Specific conditions and limits
	(none)	other low risk substances from plant or animal	Not from GMO origin

3.1.3 Ferric pyrophosphate

Introduction, scope of this chapter

The Group was asked to evaluate whether ferric pyrophosphate should be authorised for EU organic production (request made by Poland). Ferric pyrophosphate (CAS No. 10058-44-3) is a molluscicide to be used as granular baits against slugs and snails on all edible and inedible crops. It has recently been approved as a low-risk active substance at EU level according to the Commission Regulation (EU) 2020/1018. However, ferric pyrophosphate is not yet present on the EU market, because no plant protection products (formulated, commercial products) have been authorised yet in the Member States, according to the EU pesticides database (June 2022). Thus, the EGTOP does not know of any practical experiences with this new plant protection product yet.

Ferric pyrophosphate ($Fe_4(P_2O_7)_3$) is a compound consisting of multiple orthophosphate ions ($FePO_4$) and dissociates into the same iron and phosphate ions as ferric orthophosphate.

To avoid misunderstandings, this chapter refers to the newly requested substance as 'ferric *pyro*phosphate'. This should not be confounded with the already approved substance 'ferric *ortho*phosphate'.

Figure 1: Structural formulae of ferric pyrophosphate and ferric orthophosphate (sources: EFSA, 2015; 2020).

Ferric *pyro*phosphate

Ferric *ortho*phosphate

Authorization in general production

Ferric pyrophosphate is a molluscicide. It has recently been approved as a plant protection product at EU level. It is not yet present on the EU market and thus not utilized in conventional production or IPM yet. Authorization decisions were pending in Poland and UK at the time when this report was adopted (June 2022). In the longer term, the Group expects authorizations in many EU Member States. Thus, the Group does not know yet of any practical experiences with this new active substance. However, there are many similar products based on another phosphate salt of Fe (III), ferric orthophosphate (CAS No. 10045-86-6), on the market for control of slugs and snails, authorised in 23 different member states. The application patterns for ferric pyrophosphate are similar to ferric orthophosphate, and therefore the experience gained from this active substance supports also the authorization of ferric pyrophosphate.

Authorization in organic production
Ferric pyrophosphate is a new active substance in the EU and no authorizations for ferric pyrophosphate are granted for organic production yet.

Agronomic use, technological or physiological functionality for the intended use
Ferric pyrophosphate is a molluscicide to be used as granular baits in the form of dustless pellets against slugs and snails on all edible and inedible crops. Slugs and snails damage especially young plants, seedlings and sprouts. Ferric pyrophosphate pellets are applied onto soil (soil application), so there is no direct contact with the edible parts of the crop. The product can be applied manually, by mechanical broadcasting or by means of any suitable granules applicators onto the soil.
Mode of action: Ferric pyrophosphate interferes with calcium metabolism, which is directly related to the body fluid balance in molluscs. This results in inhibition of feeding and mucus production. When ingested by a mollusc, ferric pyrophosphate causes very quick feeding disturbance. As a reaction to this effect, animals might hide in shady, moist places (under plants, in soil furrows) to avoid drying. The active substance does not have to be converted to metabolite or decomposition product and it has a direct impact on the target organisms. Having ingested a lethal dose of ferric pyrophosphate, slugs/snails become less active and die within 3-7 days.
Ferric pyrophosphate has other uses as food additive, trace mineral and nutrient added to animal feed, mineral salt for addition to formulae and foods for infants and children and micronutrient for food fortification. The experience from other nutritional purposes supports the view that the use of ferric pyrophosphate in the control of slugs and snails in organic agriculture is safe to human and animal health and the environment.

Necessity for intended use, known alternatives
According to the principles of organic production, pests should primarily be managed with preventive agronomic practices. Main methods for prevention of slug damage include: rotation, adapted soil cultivation, adaptations of sowing times and sowing depth, improvement of ecological infrastructure to increase functional biodiversity, cleaning of high moisture areas in the vicinity of susceptible vegetables/berries and improved ventilation of greenhouses.
Molluscicides are needed in the control of slugs and snails in agriculture, including the control of invasive species such as *Arion lusitanius*. As a result of climate change, problems with slugs are expected to increase. This increases the risk of damages on seedlings and young plants and reduced quality of vegetables on the market. Along the biodiversity loss, the numbers of wild vertebrate and invertebrate populations dwelling in agricultural fields are decreasing, thus providing the farmers with less ecosystem service of biocontrol by eating slugs and snails. Therefore, the farmers have more need to take control measures against slug damage.

Origin of raw materials, methods of manufacture
Ferric pyrophosphate consists of iron, phosphorous, oxygen and crystalline water, hence it may occur as hydrated salts with different water content. The chemical structure of ferric pyrophosphate is similar to ferric orthophosphate, and both active substances are degrading to ferric and phosphate ions, which are natural elements in the environment and occur in minerals.
The material used for plant protection is manufactured by heating a mixture of two iron phosphate compounds in the presence of oxygen (inorganic chemical processes). Ferric pyrophosphate does also occur in natural minerals, but extraction from such minerals is not practical. Iron and phosphate ions are ubiquitous in nature and found in many foods naturally.

Environmental issues, use of resources, recycling
The application rate of ferric pyrophosphate is 0.12-1.5 kg active substance (technical) /ha 1 – 6 times per growth season. The maximum environmental load is thus 9 kg/ha per year, which is much lower than the natural content of ferric and phosphate ions in the soil. The degradation products of ferric pyrophosphate – iron ions and phosphate ions - are elements naturally occurring in both the terrestrial and aquatic environments. Ferric and phosphate ions are beneficial plant nutrients and available for the crop after the degradation of the pellets.
According to the notifications provided by companies to ECHA, in REACH registrations no hazards have been classified for ferric pyrophosphate.
The environmental profiles of the two phosphate salts, ferric pyrophosphate and ferric orthophosphate, are similar to each other.

Animal welfare issues
The ecotoxicity of ferric pyrophosphate is low and the acute and long-term risks to non-target organisms, such as birds and mammals, soil dwelling organisms or aquatic organisms are negligible. No secondary poisoning of birds and mammals is anticipated from eating slugs and snails that have ingested ferric pyrophosphate pellets in the field.

Human health issues
The consumer and user risk is negligible. Ferric pyrophosphate is used as food additive and for nutritional fortification and thus is present in human diets.
Ferric pyrophosphate is a low-risk active substance that has no specific risk mitigation measures to protect the operators and workers during and after the application. In plant protection uses, the same standards for impurities apply for human nutritional uses. As the plants are not directly treated with the plant protection product, there are no Maximum Residue Levels required for the active substance ferric pyrophosphate and hence ferric pyrophosphate is included in the Annex IV of Reg. (EU) 396/2005 (see Reg. (EU) 2021/590).
The human health profiles of the two phosphate salts, ferric pyrophosphate and ferric orthophosphate, are similar to each other.

Food quality and authenticity
There are no effects on food quality or authenticity.

Traditional use and precedents in organic production
Currently, ferric orthophosphate, which is a phosphate salt with similar chemical structure with ferric pyrophosphate, is allowed in organic production for the same uses as intended for ferric pyrophosphate.

Authorised use in organic farming outside the EU / international harmonization of organic farming standards
Under the NOP standard, ferric pyrophosphate is considered as a synthetic material. Because it is not on the list of allowed synthetic materials, it is currently prohibited.

Other relevant issues
none

Reflections and conclusions
The Group identified no major differences with respect to organic farming principles between ferric pyrophosphate and ferric orthophosphate. In the Group's opinion, the use of ferric pyrophosphate complies with the objectives and principles of organic production and should be authorised.

Recommendations
The Group recommends to add a new entry in Annex I, part 2 (low risk active substances) as follows:

Number and part of Annex	CAS	Name	Specific conditions and limits
20 D	10058-44-3	ferric pyrophosphate	(none)

3.1.4 Deltamethrin

Introduction, scope of this chapter
Deltamethrin is currently authorised in organic farming (together with lambda-cyhalothrin) with restriction to use within traps with specific attractants, against *Bactrocera oleae* and *Ceratitis capitata*. It can be used in olive groves and in fruit trees respectively. EGTOP is asked to evaluate the extension for use of deltamethrin with the same restrictions (in traps with specific attractants), against *Rhagoletis completa* on walnut (request made by France).

Authorization in general production
Deltamethrin is authorised in EU in conventional agriculture since decades on several crops, including walnut, and with no restriction for use within traps.

Authorization in organic production
Deltamethrin is authorised in EU organic farming only in traps. Until now, it is only authorised for the control of olive fruit fly (*Bactrocera oleae*) and the Mediterranean fruit fly (*Ceratitis capitata*) and has never been authorised for use against the walnut husk fly (*Rhagoletis completa*).
Some European private organic labels are stricter than the EU regulation and do not allow the use of synthetic pyrethroids at all.

Agronomic use, technological or physiological functionality for the intended use
Walnuts (as well as other nuts) are getting a growing interest in several EU countries as healthy food. Therefore, also the organic production of walnuts is facing chances of development, but its professional cultivation is not simple. Among the problems affecting the crop, the walnut husk fly (*Rhagoletis completa*) is quite a challenge in certain areas, where climate favours it, and on susceptible varieties. The use of deltamethrin in traps, with feed attractant, is intended for the control of the fly.

Necessity for intended use, known alternatives
The walnut husk fly (*Rhagoletis completa*) is an emerging pest which has gained importance only recently. For its control in organic management, the following alternatives can be considered (see also Coates 2005; Van Steenwyk et al. 2018):

- Spinosad: not authorised against the walnut husk fly so far;
- kaolin: its effect is only partial and its use (spraying) is difficult due to tree size;
- traps with attractants and physical (liquid or sticky) killing-agent: such traps are commercially available and have been used against the Mediterranean and other fruit flies, but there is little experience with the walnut husk fly to date;
- soil coverage under trees: this is possible only under isolated trees or in small areas.

Overall, trapping contributes significantly to reducing the problem, but should best be combined with other techniques. For professional use, it does not sufficiently solve the problem.

Origin of raw materials, methods of manufacture
Pyrethroids are of fully synthetic origin.

Environmental issues, use of resources, recycling
The use of synthetic pyrethroids within traps is not of environmental concern, if used according to Good Agricultural Practices, following the use instructions, appropriate risk mitigation and waste disposal measures assigned for the products, including their correct disposal after use.

Animal welfare issues
no issue

Human health issues
As long as deltamethrin is used within traps and appropriate precautions are taken when handling the traps, the Group considers that the risks for operators, workers, bystanders and consumers are at an acceptable level and there is no specific concern with regard to organic production.

Food quality and authenticity
It does not hamper food authenticity or quality. Residues on the product are not a concern as the application is only in traps.

Traditional use and precedents in organic production
Synthetic pyrethroids are allowed, with restrictions, namely within traps and with attractants, in EU organic production since the early 1990s.

Authorised use in organic farming outside the EU / international harmonization of organic farming standards
Under the NOP standard, deltamethrin is considered as a synthetic material and is therefore prohibited.

Other relevant issues
In the 1990s, when deltamethrin and lambda-cyhalothrin were authorised for EU organic production, it was clear that their use is not in line with organic principles (due to their synthetic origin and the fact that they do not exist in nature). They were only allowed because there were no better alternatives sufficiently effective against the pests

and their authorisation was only considered acceptable because the use in traps precludes any direct contact with the organic crops.
In 2011, EGTOP stated that there are good indications that the synthetic pyrethroids deltamethrin and lambda-cyhalothrin are no longer essential in the organic production of olives and citrus in Mediterranean countries. Concerning tropical crops, it was not clear to the Group whether deltamethrin and lambda-cyhalothrin are still essential or not (see EGTOP Report on Plant Protection I, chapter 3.7). In 2016, the Group emphasized once more that deltamethrin and lambda-cyhalothrin should be re-evaluated (see EGTOP Report on Plant Protection III, chapter 4.7.1).

Reflections and conclusions
Regarding the *use of synthetic pyrethroids in general*, the Group highlights the following:

- At present, there are no generally applicable alternatives for the control of olive fruit fly (*Bactrocera oleae*), and walnut husk fly (*Rhagoletis completa*) in organic production. The Mediterranean fruit fly (*Ceratitis capitata*) can be controlled by the Sterile Insect Technique, even if it is not applicable in all farm types.
- The Group has no environmental concern, as no unacceptable ecotoxicological risk is associated with the use within traps and assuming that these are disposed correctly.
- The Group has a reputation concern as deltamethrin is a synthetic pesticide not in line with the principles of organic production. This concern applies for all uses of synthetic pyrethroids (deltamethrin and lambda-cyhalothrin), also against the olive fruit fly and the Mediterranean fruit fly.
- Prolongation of the allowance for use of synthetic pyrethroids in traps may hamper (slow down, demotivate) the search for alternatives and their introduction into practise.
- Overall, the Group considers that synthetic pyrethroids should not be authorised permanently, but only for a transitional period, during which the sector should develop more acceptable alternatives such as traps with specific attractants that kill the flies mechanically.
- For the transitional period, the Group thinks that it would be adequate to set a deadline in 2026. In case that the approval of deltamethrin or lambda-cyhalothrin should expire earlier, their use in organic production would also expire earlier.

Regarding the use of deltamethrin *in walnuts*, the Group highlights the following:

- To be fair, the Group considers that the use of deltamethrin *in traps* should be assessed in the same way for all the combinations of pest/crops where no documented alternative methods of control are available for practitioners.

Therefore, the Group recommends authorizing deltamethrin now also for the control of *Rhagoletis completa* for a limited time period. At the same time, the Group also recommends setting an expiry date for the authorization of deltamethrin and lambda-cyhalothrin in Annex I for all uses.

Recommendations
The group recommends to modify the existing entry in Annex I, part 4 as follows (new parts underlined):

Number and part of Annex	CAS	Name	Specific conditions and limits
40A	52918-63-5	Deltamethrin	only in traps with specific attractants against *Bactrocera oleae*, *Ceratitis capitata* <u>and *Rhagoletis completa*</u> <u>provisionally authorised until 2026</u>
5E	91465-08-6	Lambda-cyhalothrin	only in traps with specific attractants against *Bactrocera oleae* and *Ceratitis capitata* <u>provisionally authorised until 2026</u>

3.2 Fertilisers, soil conditioners and nutrients (Annex II of Reg. 2021/1165)

3.2.1 Extension of the entry 'household waste' to 'bio-waste'

Introduction, scope of this chapter
'Composted or fermented mixture of household waste' is currently authorised with various restrictions. The Group was asked to evaluate whether this entry should be re-named to include raw materials from additional sources (request made by Sweden). The requested new entry reads 'Composted or fermented mix of food and kitchen waste, from households, offices, restaurants, wholesale, canteens, caterers, and retail premises.

Authorization in general production
The present horizontal 'fertilizer regulation' Reg. (EU) 2019/1009 now also includes products from waste. All product function categories (PFC's) are defined: organic, organo-mineral and inorganic fertilizer, liming material, soil improver, growing medium, inhibitor, plant biostimulant and fertilizing product blend. Specifications include requirements on amounts of minerals and carbon, as well as maximum amounts of inorganic contaminants and pathogens. For the component material categories (CMC's) nr. 3 (compost) and nr. 5 (digestate other than fresh crop digestate); biowaste is defined within the meaning of Directive 2008/98/EC (waste), resulting from separate bio-waste collection at source.
In the Directive 2008/98/EC on waste, the term 'bio-waste' is defined as '*biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises and comparable waste from food processing plants*', and 'separate collection' is defined as 'the collection where a waste stream is kept separately by type and nature so as to facilitate a specific treatment'.
The required processes for composting and fermentation are defined in detail to avoid spreading of contagious diseases and/or bacteria, as also thresholds for contaminants, chemical and macroscopic impurities. It is mentioned that the produced digestate shall contain (a) no more than 3 g/kg dry matter of macroscopic impurities above 2 mm in any of the following forms: glass, metal or plastics; and (b) no more than 5 g/kg dry matter (= 0.5 %) of the sum of the macroscopic impurities referred to in point (a).
From 16 July 2026, the presence of plastics above 2 mm within the maximum limit value referred to in point (a) shall be no more than 2.5 g/kg dry matter. By 16 July 2029 the limit-value of 2.5 g/kg dry matter for plastics above 2 mm shall be re-assessed in order to take into account the progress made with regards to separate collection of bio-waste.

Authorization in organic production
'Composted or fermented mixture of household waste' is authorised in the current Reg. (EU) 2021/1165, Annex II. The specific conditions and limits stated for this material are: (i) product obtained from source separated household waste, which has been submitted to composting or to anaerobic fermentation for biogas production; (ii) only vegetable and animal household waste; (iii) only when produced in a closed and monitored collection system, accepted by the Member State; (iv) Maximum concentrations in mg/kg of dry matter: cadmium: 0.7; copper: 70; nickel: 25; lead: 45; zinc: 200; mercury: 0.4; chromium (total): 70; chromium (VI): not detectable

Agronomic use, technological or physiological functionality for the intended use
Composted or fermented mixture of household waste is a valuable source of nutrients and organic matter and may improve soil structure and fertility. Composted or fermented mix of food and kitchen waste, from households, offices, restaurants, wholesale, canteens, caterers, and retail premise has a very similar agronomic value.
The use of compost and digestate (from production of biogas) is an important way of nutrient recycling. It can be a valuable fertilizer for organic farms, providing particularly organic matter, N and P. The Group highlights that in organic farming, there is a lack of sources for organic matter, phosphorus and nitrogen especially in the regions of Europe where only few organic livestock exist or in horticultural crops such as fruit and vegetables. Even though nitrogen from the air can be fixed by the symbiosis of legumes and nitrogen fixing bacteria, it is not easy to maintain a rotation, where legumes are grown frequently enough to achieve a significant effect. Compost or digestate from recycled food and kitchen waste is thus welcomed as supplement for nutrients and as a source of organic carbon.

Necessity for intended use, known alternatives
Phosphorous and nitrogen, as well as organic matter, are essential for plant growth and the maintenance of soil fertility. Phosphorous as well as nitrogen from recycled food and kitchen waste complies with the organic principle of circularity. Phosphorous can be obtained from other sources, but some of them are or will become limited. Nitrogen can also be obtained from other sources.

Origin of raw materials, methods of manufacture

The request is to allow food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers, and retail premises. All of these raw materials are included in the definition of 'bio-waste' in the Dir. 2008/98/EC. However, 'bio-waste' also includes waste from food processing plants.

Waste from food processing plants comprises raw materials such as damaged, rotten, misshapen, over or undersized fruit and vegetables (e.g. outer leaves of lettuce or cabbage heads and inedible crop parts such as foliage of carrots). These materials are sorted out at the beginning of food processing. They undergo hardly any processing steps (except for washing), no food additives are added, and they are not packaged. The Group is less concerned about these materials than about household waste or waste from retailers. In conclusion, the Group recommends allowing the use of all bio-waste as defined in the waste Dir. 2008/98/EC.

Bio-waste derives entirely from the recycling of organic waste material from various sources. Reg. (EU) 2019/1009 describes the procedures of the collection of the raw materials and methods for bio-waste manufacturing.

Environmental issues, use of resources, recycling

Composted or fermented mixture of household waste is already authorised. With respect to contaminants, the Group is not more concerned about other kinds of bio-waste. For macroscopic impurities (glass, metal, plastics), the EU fertiliser regulation sets maximum values. For heavy metals, the EU organic regulation sets maximum values which are stricter than those of the EU fertiliser regulation.

The potential environmental impact is similar to other permitted N and P fertilizers in digestate or compost, e.g. from composted or fermented mixtures of vegetable origin.

Animal welfare issues

Of no concern

Human health issues

There are no human health risks with the production or the application process.

Food quality and authenticity

The Group recommends that there should be no application to edible crop parts, neither for food nor for feed.

Traditional use and precedents in organic production

Compost, also from food and kitchen waste, has always been used as a fertilizer in agriculture and horticulture, including organic production. Digestate from fermented organic matter is of more recent date (since the 1970s), and is also considered as a valuable fertiliser in addition to animal manure.

Authorised use in organic farming outside the EU / international harmonization of organic farming standards

Under the NOP standard, such materials are allowed.

Other relevant issues

To date, very little is known about the presence of microplastic and its impact on soil biology (Machado et al., 2017). However, several scientific research programs are ongoing (e.g. H2020-Organic Plus, EOM4Soil) also to assess their presence in organic fertilisers and define suitable analytical methods. Depending on the outcomes of these studies, the use of bio-waste might have to be re-considered in the future. The Group recommends that this topic should be cautiously monitored.

Bio waste from conventional origin can contain pesticide residues which may contaminate soils and which may result in measurable residues in organic crops. This may limit the applicability of composted bio waste in organic production. The Group recommends that suppliers of composts systematically monitor their composts for pesticide residues, before they are used in organic production.

Reflections and conclusions

The Group is concerned about the presence of plastic and microplastics in composts and digestates from bio-waste which can derive from packaged food, roadside cuttings, etc. Plastic packaging of overlaid or spoiled food, not unpacked before composting, is an essential input path. Once plastic particles have entered the bio-waste they can hardly, if at all, be removed technically. The Group outlines that the input of plastic into composting and digestion plants should be minimized. The Group is also concerned about the presence of pesticides, pesticide metabolites and other contaminants. Basically, the Group underlines the importance of keeping all kinds of contaminations as low as technically possible. As the EU fertiliser regulation and the organic regulation set maximum values for heavy metals and for macroscopic impurities, the Group considers that these risks are at least partly managed.

Nevertheless, the recycling of organic wastes is an important step towards a more sustainable agri-food chain. In the Group's opinion, organic farming should be part of this nutrient cycle. Therefore, the Group recommends authorizing all bio-wastes which have undergone composting or anaerobic fermentation as fertilisers in organic farming.

Recommendations
The Group recommends to modify the existing entry in Annex II as follows (new parts underlined):

Name Compound products or products containing only materials listed hereunder	Description, specific conditions and limits
Composted or fermented <u>bio-waste</u>	Product obtained from source separated <u>bio-waste</u>, which has been submitted to composting or to anaerobic fermentation for biogas production. Only vegetable and animal <u>bio-waste</u>. Only when produced in a closed and monitored collection system, accepted by the Member State. Maximum concentrations in mg/kg of dry matter: cadmium: 0.7; copper: 70; nickel: 25; lead: 45; zinc: 200; mercury: 0.4; chromium (total): 70; chromium (VI): not detectable

3.2.2 Precipitated phosphate salts and derivatives (struvite)

Introduction, scope of this chapter
The Group has previously evaluated struvite (EGTOP report on Fertilisers (II), chapter 4.2). At that time, struvite was not authorised under the fertiliser regulation Reg. (EC) 2003/2003. Therefore, the Group recommended to wait for its authorization under the EU fertiliser legislation and then to authorise it for organic production, provided that the method of production ensures hygienic and pollutant safety.
Meanwhile, it has been decided (Reg. (EU) 2021/2068) that 'precipitated phosphate salts and derivates' will be added to Annex II to of the new fertiliser regulation Reg. (EU) 2019/1009, as a new Component Material Category (CMC) 12. Therefore, the Group was asked to advise whether this material should now be authorised for EU organic farming (request made by Germany), but no new dossier was provided.

Authorization in general production
Struvite (CAS nr. 7785-21-9, a crystalized product consisting of magnesium ammonium phosphate hexahydrate ($NH_4MgPO_4{\cdot}6H_2O$) is listed in the fertilizer Reg. (EU) 2019/1009 which will enter into force in July 2022 (see Reg. 2021/2086).

Authorization in organic production
Struvite is currently not listed in Annex II of Reg. (EU) 2021/1165.

Agronomic use, technological or physiological functionality for the intended use
Struvite, as one of the precipitated phosphates, is a slow release P fertilizer with a higher solubility in the root zone than rock phosphate. This product can be used for fertilizing soils with phosphorus. Recommended soil application rates are based on expected crop yields and on soil availability of P (not only total P content).

Necessity for intended use, known alternatives
Need for P: Phosphorus (P) is an essential mineral for plant growth. As soils can store large quantities of phosphorus for long periods, fields may not need P fertilisation in the short term. P availability is to be considered, as low level of soil organic matter or high pH of soil cause a reduced availability also in cases where P presence is high. In such cases it is preferred to work on the existing P availability improvement and not to add further P.

Alternatives: (i) It is possible to increase soil P availability through an increase of soil organic matter and soil biological activity, to stimulate P solubilization and thus ensure the phosphorus supply. In addition, the mycorrhizal network of arbuscular mycorrhizae fungi (AMF) helps some crops to obtain P from a higher volume of soil compared to that explored by roots. Thus, promotion of root colonisation by AMF helps to improve the P supply for some crops. The application of biostimulants containing AMF in the field soil may reduce the supply of phosphate fertilizers by 80 % (Jacobsen, 1995). (ii) Fertilisers from plant or animal origin (green waste or bio-waste compost, manure, animal by-products) contain significant quantities of P. Although they might be applied primarily for other purposes (e.g. as a soil conditioner, N fertiliser), they also provide P to the soil. (iii) Soft ground rock phosphate is the main dedicated P fertiliser authorised for organic farming at the moment. Forecasts show that the world's reserves of exploitable phosphate deposits will be depleted in about 100 years.

Comparison of different P sources: animal excrements supply not only phosphorus, but also maintain and enhance soil life, soil fertility and soil stability. However, their use is sometimes limited by the requirement to maintain a balance between N and P fertilisation. Struvite and other precipitated phosphates obtained from waste are a way to recycle phosphorus (and possibly other minerals). This is a renewable source of P. By contrast, soft ground rock phosphate is not from renewable sources. In addition, the levels of cadmium and other contaminants in soft ground rock phosphate can be high for certain origins, even though its content limit is defined by the EU Regulation on fertilising products. Aluminium-calcium phosphate is not available on the market. Some biochar types (currently listed in Annex II) are sources for phosphorous (however, the Group advises to re-evaluate the risks of using biochar as fertiliser/ soil conditioner or nutrient, see chapter 3.2.3 on bone charcoal). The application of AMF-based or other biostimulants is not yet widely known by farmers and only documented in few cases. Bone charcoal would be another theoretical alternative, but the Group does not recommend its authorisation (see separate chapter).

Origin of raw materials, methods of manufacture
Struvite and other precipitated phosphates are mainly obtained as a precipitation product at wastewater treatment plants. This material was already evaluated by EGTOP (see EGTOP report on fertilisers II) and recommended for authorization in organic production.
According to the Reg. (EU) 2021/2086, it may also be recovered from other materials than wastewater from sewer sludge, such as wastewater from the food and pet food industry, bio-waste, processing residues from the production of bioethanol and biodiesel and animal by-products. The use of these raw materials has not yet been evaluated by EGTOP.
There are different processes for obtaining struvite (Wollmann and Möller 2015). Depending on the origin of the wastewater and of the processes, the quality and purity of the final product may be different. It is generally accepted now that when deriving struvite, also traces of phosphate minerals such as $MgNH_4PO_4 \cdot H_2O$ (dittmarite), $MgHPO_4 \cdot 3H_2O$ (newberyite), $MgKPO_4 \cdot 6H_2O$ (K-struvite) and a wide variety of calcium phosphates (e.g. $CaNH_4PO_4 \cdot 7H_20$ (calcium ammonium phosphate), amorphous calcium phosphates, brushite ($CaHPO_4 \cdot 2H_2O$)) will be precipitated. This is not negative, as they also contribute to P fertilization. To purify struvite would be very costly and would require use of extra chemicals.
Struvite forms naturally at wastewater treatment plants, as a precipitate and forms crystals which can create restrictions in pipework carrying waste materials. Struvite can also be produced under controlled conditions. For this purpose, the pH of wastewater from the separation of bio-solids at waste water treatment plants is increased and a small quantity of magnesium salt is added to start crystal growth/nucleation.

Environmental issues, use of resources, recycling
The production of struvite from wastewater treatment plants through precipitation reduces the possibility of pollution from phosphate and nitrogen entering surface waters. Since struvite is derived from a continuously produced waste, P, N and some Mg and Ca are recycled and reused. There is no risk of P, N and Mg leaching to *groundwater* from struvite after application to soil but leaching to *surface water* by run-off of soil-bound microparticles is possible under certain conditions, especially when overdosed (Mc Dowell et al, 2019). In neutral-to-basic soils when the application rate is matched to crop demands and soil analysis, the risk is minimized.
The use of a recycled source of phosphorus such as struvite could partially replace the application of soft rock phosphate, which is considered to be a non-renewable source of P. Data on emissions during the production process of struvite are very scarce.

Animal welfare issues
No animal welfare issues

Human health issues
Some organic contaminants, viruses and microorganisms of human origin might be trapped during the processes of precipitation and/or nucleation used to produce struvite. To manage this risk, the fertilizer regulation Reg. (EU) 2019/1009 sets limits for contaminants and pathogens in the SMC 12 and PFC 1. Especially the limit of carbon content in Product Function Category (PFC) 1 (fertilizers) is important, as the pathogens which might cause human health issues, are directly correlated to the C content. If these limits are maintained, the Group is not concerned about potential risks.

Food quality and authenticity
Precipitated phosphate salts with a low organic C content generally show low levels of contamination (Delgado Sancho et al., 2019), which is an argument for setting a limit to organic C content. The product should not be spread on growing plants, but should be applied to the soil.

Traditional use and precedents in organic production
Struvite and other precipitated phosphate salts are new products and therefore no traditional use exists.

Authorised use in organic farming outside the EU / international harmonization of organic farming standards
Under the NOP standard, struvite is considered as a synthetic material. As it is not on the list of allowed synthetic materials, it is currently prohibited.

Other relevant issues
None identified

Reflections and conclusions
As stated also for household waste, the recycling of organic wastes is an important step towards a more sustainable agri-food chain. In the Group's opinion, organic farming should be part of this nutrient recycling. The recovery of phosphates from wastes is a new technology which is still under development. A range of technological processes exist today, new processes are likely to be developed in the future and the Group cannot predict which ones will be more adopted in practice.
The Group has previously recommended authorizing struvite made from waste water (see EGTOP report on fertilizers II). In the Group's opinion, most of the other raw materials now authorised by the fertiliser regulation are at least equally acceptable as waste water, with the following exception:

- Manure must not be from factory farming origin.

Recommendations
The Group recommends to add a new entry in Annex II as follows:

Name Compound products or products containing only materials listed hereunder	Description, specific conditions and limits
Recovered struvite and precipitated phosphate salts	Products must meet the requirements defined by the Regulation (EU) 2019/1009, for products derived from waste materials. Animal manure as source material shall not have factory farming origin.

3.2.3 Bone charcoal

Introduction, scope of this chapter
The Group was asked whether bone charcoal (=biochar made from bone meal) should be authorised for EU organic farming (request made by Hungary). The original request was to mention it together with other animal by-products as 'bone meal, degelatinised bone meal <u>or bone charcoal</u>'. However, animal by-products are N-rich materials, while bone charcoal is a P-rich material. Therefore, the Group prefers to consider it as a separate item which might potentially be included elsewhere in Annex II.
The original request is based on a commercial product which consists of bone charcoal and micro-organisms that enhance P solubility. Here, the Group evaluates bone charcoal as a raw material. In case that bone charcoal should be authorised, manufacturers are free to combine it with such micro-organisms or other allowed substances, as long as the requirements of general legislation are respected.
When the Group evaluated biochar (EGTOP report on Fertilizers (III)), it has only considered raw materials of plant origin, and has explicitly excluded products and by-products of animal origin.

Authorization in general production
The new EU fertiliser regulation Reg. (EU) 2019/1009 will apply from 07/2022. It will cover 'pyrolysis products' in Annex II, without distinguishing between charcoal made from plant or animal materials. This regulation also sets maximum levels for contaminants such as PAH, PCDD/F and PCB.

The product mentioned in the application is authorised in Hungary as a fertiliser for conventional agriculture until 12, 2029. Regulatory status: 6300/2402-2/2020 NÉBIH Hungary (PROTECTOR). Authorisations in other European Member States are not known to the Group.

Authorization in organic production
Currently, only biochar made from untreated plant material is authorised for organic production. Until 15 July 2022, the maximum PAH content is set at 4 mg per kg DM; from 16 July 2022 on, the maximum specified in Reg. (EU) 2019/1009 will apply.
The raw material bone meal is authorised as a fertiliser for organic farming.

Agronomic use, technological or physiological functionality for the intended use
The material is proposed as a source of P to improve the availability of nutrients and the overall condition of the soil. The dossier mentions a dosage of 100 – 1000 kg/ha, with an average dose of 200 kg/ha.

Necessity for intended use, known alternatives
For a discussion of necessity and known alternatives for P fertilisers, see the chapter on precipitated phosphate salts and derivatives (struvite).

Origin of raw materials, methods of manufacture
Input material is animal bone meal, which is authorised as a fertiliser for organic farming. There are different processes and installations for pyrolysis of organic materials and the Group assumes that many of the processes and installations currently used for the pyrolysis process with plant materials could potentially also be used for bones.

Environmental issues, use of resources, recycling
The JRC's assessment report (Delgado Sancho et al., 2019) concludes, that the use of pyrolysis and gasification materials produced according to the recycling rules proposed in the assessment report does not have any general adverse effects on the environment or human health. However, there are also critical views. Some authors state that pyrolysis processes may result in high amounts of organic contaminants, in particular PAH. Because these compounds strongly bind to charcoal, standard analytical methods might underestimate the amounts of PAH present in some biochar materials (Bucheli et al., 2015).

Animal welfare issues
For bones, factory farming origin cannot be excluded, but bone meal is currently authorised for organic production. Bone *charcoal* raises no additional issues of animal welfare.

Human health issues
see food quality and authenticity

Food quality and authenticity
Since soil contamination with PAHs cannot be ruled out, an accumulation of PAHs in the soil could take place in the long term, which might be taken up by plants and transferred to the harvested products and food.

Traditional use and precedents in organic production
No traditional use of bone charcoal is known to the Group. The use of biochar can be seen as a precedent.

Authorised use in organic farming outside the EU / international harmonization of organic farming standards
Under the NOP standard, bone charcoal is considered as a non-synthetic material and is therefore allowed.

Other relevant issues: reflections on pyrolysed materials in general
Since the Group's initial assessment of biochar in 2018 (see EGTOP report on Fertilizers III), a lot of new scientific evidence has become available. These raise some concerns about the benefits and risks of the pyrolysed materials.

- During the process of pyrolysis, a large number of aromatic organic substances are formed, independently of the raw materials (Dutta et al., 2017). The Group is especially concerned about polycyclic aromatic hydrocarbons (PAHs), because of their carcinogenicity and mutagenicity, but also because of their persistence and possible impact on the soil microbiome. Thus, charcoal from pyrolysis has a permanent pollutant potential. The fertiliser regulation sets maximum values for PAHs. However, the Group has some doubts whether the current analytical methods measure PAHs reliably, because they can be strongly

bound to the carbon matrix. The Group recommends that PAH contamination and other pollutants as PCDDs/PCDFs in biochar should be studied in more detail, in order to verify whether their use is safe.
- Biochar is sometimes advertised as being similar to 'Terra Preta'. The Group underlines that this is misleading. Biochar is produced with a technological process that is not comparable to the natural humification process that leads to Terra Preta (HPFA, 2015). In terms of formation of PAHs, the two processes are very different.
- Positive effects on soil condition such as water retention and soil structure are very dependent on the soil clay content in the mid-latitudes in field trials.
- Biochar can be synthesised in many ways and the process greatly influences the climate impact, as well as the half-life time can vary between 2 and 1500 years. The benefit for climate protection is therefore questionable (Kambo and Dutta, 2015)).

In the light of this new information now available for pyrolysed products, the Group recommends that the authorization of biochar for use in organic agriculture should be re-evaluated by EGTOP in a future meeting.

The Group noted that on July 16, 2022 the maximum value for PAHs in biochar from plant material will be aligned with the limits of the horizontal fertiliser regulation.
The Group is concerned about the presence of PAHs in bone charcoal as well as in biochar. Until the Group has made a new evaluation of biochar, it recommends keeping the maximum of 4 mg/kg (dry matter), as it was originally recommended by EGTOP.

Reflections and conclusions
The Group acknowledges that phosphorus fertilisers are important for crop production. Bone meal is one of the materials currently authorised for P fertilisation. In the Group's opinion, bone meal is an important, renewable source of P. The question raised by this request is whether bone meal should be used as such, or after pyrolysis. The total amount of P available from bones remains unchanged, regardless in which form bones are used. However, using bone in the form of charcoal has the following differences:
- Part of the nitrogen which is also present in bone meal is lost in bone charcoal.
- The request argues with the presence of human or animal pathogens in non-pyrolized bone meal, such as salmonella, anthrax, TBC and mouth and foot disease. Moreover, there is some evidence that antibiotic resistant bacteria are present in some animal by-products. However, the Group underlines that it has no major concerns over the use of bone meal, provided that it is used correctly.
- PAH are formed as undesired by-products. The amounts of PAH vary greatly with the process used. In addition, the Group has some doubts whether the current analytical methods quantify PAH adequately. The Group is not in a position to verify the true PAH contents of different biochar materials. Considering their carcinogenicity, the Group recommends taking a precautionary approach.

In conclusion, the Group sees no clear advantage of using bone charcoal, but a certain (not precisely quantifiable) risk and believes that non-pyrolyzed bone meal and other permitted alternatives as P fertilisers should be used in preference. Therefore, the Group recommends not to authorise bone charcoal.

Recommendations
In the Group's opinion, the use of bone charcoal should not be authorised for organic farming.

3.2.4 Potassium chloride (muriate of potash)

Introduction, scope of this chapter
The Group was asked whether muriate of potash should be authorised for EU organic farming (request made by The Netherlands). 'Muriate of potash' is a term commonly used in the fertiliser industry and is synonymous for potassium chloride. The term 'muriate of potash' was used in the old EU fertiliser regulation (Reg. 2003/2003), but is not used in the new EU fertiliser regulation (Reg. (EU) 2019/1009).

Authorization in general production
'Muriate of potash' is an EC fertiliser type defined in the old EU fertiliser regulation Reg. 2003/2003 as 'product obtained from crude potassium salts and containing potassium chloride as its essential ingredient'. Muriate of potash is also covered by the new Reg. EU 2019/1009 on fertilising products.

Authorization in organic production
Two potassium fertilisers are currently included among the authorised fertilisers, soil conditioners and nutrients in Annex II of Reg. (EU) 2021/1165: crude potassium salt and potassium sulphate, while potassium chloride is currently not authorised.

Agronomic use, technological or physiological functionality for the intended use
Potassium is one of the three basic plant nutrients along with nitrogen and phosphorus. About 95 % of potash produced worldwide is used in agriculture. The rest is used for industrial purposes, including glass manufacturing, soaps, plastics and pharmaceuticals.
There are two different kinds of potassium chloride fertilisers, differing in the K_2O contents (60 – 62 % or 48 – 50 %), depending on the production process. The current minimum limit is 37 % K_2O expressed as water soluble. Potassium chloride can be used for fertigation, because of its good solubility.

Necessity for intended use, known alternatives
There is no substitute for potassium compounds in agriculture; they are essential to maintain crop production. Products and by-products of plant and animal origin contain also potassium. Where additional potassium is needed, crude potassium salt and potassium sulphate are used until now.

Origin of raw materials, methods of manufacture
There are two sources of potassium: mined minerals and by-products from cement production.
Mining: Potash is extracted from buried ancient evaporites (mainly sylvite ores) by underground or solution mining. This accounts for most of the potassium produced. Another important source is brine from landlocked water bodies, such as the Dead Sea, Salar de Atacama or Great Salt Lake. The major producers are located in Canada (Saskatchewan) where more than 40 % of the world's known reserves are present, and USA. The extracted materials are purified by physical methods (flotation, crystallization). The extraction process is similar to that of kainit, which is authorised for organic production. The Group considers this as a 'natural source'.
By-product from cement production: potassium chloride can also be obtained from by-products of cement production. The Group considers this as a 'synthetic source' and does not recommend its authorization in organic farming.

Environmental issues, use of resources, recycling
In general, there are no drawback environmental effects from the use of potassium salts. However, chloride salts may contribute to the salinization of soils and are therefore less recommended from the agronomical point of view compared to sulphate salts.
Potassium ores are still available world-wide without known danger of reduced future availability.

Animal welfare issues
Not relevant

Human health issues
Not relevant

Food quality and authenticity
Not relevant

Traditional use and precedents in organic production
In the dossier it is stated that 'In the past, it has been a common practice in organic production since there were no other alternatives with this concentration of K2O and salt solubility'.
The use of potassium chloride has never been allowed in EU organic production. The use of other K_2O salts has been, nevertheless, allowed due to the major need for this element in any kind of crops.

Authorised use in organic farming outside the EU / international harmonization of organic farming standards
Under the NOP standard, the use of potassium chloride in crop production is prohibited unless derived from a mined source and is applied in a manner that minimizes chloride accumulation in the soil.

Other relevant issues
The request derives from the need of having a product with a solubility that is suitable (also) for use in modern irrigation systems (e.g. drip irrigation). As potassium chloride has a solubility of 300 g/l, it is suitable for this purpose.

Reflections and conclusions
The request is based on the needs of greenhouse production, where a highly soluble potassium source could be used for fertigation. The Group can foresee also uses in other cropping systems with modern irrigation techniques aiming at reducing the water use.
The high solubility of potassium chloride in water could be seen as conflicting with organic principles (similar to sodium nitrate from natural mining). Unlike sodium nitrate, however, there is no risk of leaching with potassium chloride, and the Group has no evidence of detrimental effects on plants or plant diseases.
In the Group's opinion, the use of potassium chloride from natural sources is acceptable and should be authorised for organic production. In contrast, potassium chloride from industrial sources such as the cement industry is not acceptable and should therefore not be authorised for organic production. The Group recommends that potassium chloride is applied in a manner that minimizes chloride accumulation in the soil.

Recommendations
The Group recommends adding a new entry in Annex II as follows:

Name Compound products or products containing only materials listed hereunder	Description, specific conditions and limits
Potassium chloride (muriate of potash)	Only of natural origin

3.2.5 Calcium sulphate / phosphogypsum

Introduction, scope of this chapter
The term 'phosphogypsum' denominates gypsum which has been obtained as a by-product from the production of phosphoric acid. Chemically, it is calcium sulphate. Calcium sulphate is already authorised, but it is currently restricted to products of natural origin (which excludes phosphogypsum). The Group was asked whether calcium sulphate obtained as a by-product of phosphoric acid production should also be authorised for EU organic farming (request made by Finland).

Authorization in general production
The use of calcium sulphate is allowed in general agriculture in the EU, included in Reg. (EC) 2003/2003 under the section 'Inorganic secondary nutrient fertilisers'. In this regulation, calcium sulphate is characterised as: 'Product of natural or industrial origin, containing calcium sulphate at various degrees of hydration'. Phosphogypsum is covered also in the new fertiliser regulation Reg. (EU) 2019/1009, in Component Material Category 11 (CMC 11).

Authorization in organic production
Utilization of phosphogypsum on organically managed agricultural soils is currently not possible, because Annex II of Reg. (EU) 2021/1165 limits calcium sulphate to 'natural origin'.

Agronomic use, technological or physiological functionality for the intended use
Calcium sulphate is used for liming, i.e. the application of calcium- and magnesium-rich materials to soil. There is clearly a need for liming in soils with low pH. It can also improve aggregate stability on clay soils. Liming has proven to have positive environmental impacts e.g. reducing leaching of phosphorus into watercourses and redeeming micronutrient imbalances in agricultural soils allowing for more efficient nutrient uptake, better growth and higher yields resulting in more sustainable use of natural resources.

Necessity for intended use, known alternatives
There are substances authorised for liming in organic agriculture, for instance chalk, marl, ground limestone, Breton ameliorant ('maërl'), phosphate chalk and mussel waste.
The request to allow the use of phosphogypsum arises from specific conditions in Finland, where gypsum (calcium sulphate) from natural origin is not available and has to be imported from countries like Latvia or Spain. Since it concerns a bulk product with a high-volume dosage (3-5 tonnes per ha), transport is costly and needs a considerable amount of energy. On the other hand, phosphogypsum is readily available in high volumes, next to the Siilinjärvi mine, where it is a by-product of phosphoric acid production.

Origin of raw materials, methods of manufacture
Phosphogypsum is a by-product of phosphorus production and originates from rocks which contain phosphate and calcium. To solubilize the phosphorus, the rock is treated with sulphuric acid. In this process, phosphoric acid and calcium sulphate (gypsum) are formed. The phosphoric acid is used for industrial purposes, e.g., to produce fertiliser ammonium phosphate, while the gypsum remains as a by-product. It is stored outside, in specified gypsum storage area for minimum 2 years for rinsing out water soluble phosphorus and impurities. Before delivery as a fertiliser, it is grinded and sieved.

Environmental issues, use of resources, recycling
Phosphogypsum may contain different contaminants, due to the presence of impurities in the rocks that are used as raw materials, such as toxic heavy metals and various radioactive isotopes. The precise environmental impact varies from site to site. At a world-wide scale, phosphogypsum is sometimes recorded to have high levels of radioactivity. The material from Finland such as Siilinjärvi phosphogypsum, however, typically shows low levels of radioactive elements. Phosphogypsum may also contain heavy metals, but these are managed by maximum levels given in the fertiliser regulation Reg. (EU) 2019/1009. JRC has studied properties of phosphogypsum (Huygens and Savegn, 2022) and concluded that (i) the material has a good agronomic efficiency and (ii) if the conditions specified in Directive 200/98/EC are followed, its use does not present a risk to human, animal, or plant health, to safety or to the environment.
As a recycled by-product, phosphogypsum provides an alternative to the mining virgin natural gypsum.

Animal welfare issues
If this material is used according to the conditions specified in Directive 200/98/EC, its use does not present a risk to animal health (Huygens and Savegn, 2022).

Human health issues
If this material is used according to the conditions specified in Directive 200/98/EC, its use does not present a risk to human health (Huygens and Savegn, 2022).

Food quality and authenticity
If the limits for contaminants set in the fertilizer regulation Reg. (EU) 2019/1009 are respected, the Group foresees no negative effects on food quality and on the soil from the utilization of phosphogypsum.

Traditional use and precedents in organic production
There is no traditional use of phosphogypsum in organic farming. Calcium sulphate of natural origin is permitted in annex II of Reg. (EU) 2021/1165 and has traditionally been used on large scale.

Authorised use in organic farming outside the EU / international harmonization of organic farming standards
Under the NOP standard, phosphogypsum is considered as a synthetic material and therefore prohibited.

Other relevant issues
none

Reflections and conclusions
The Group considers that liming is important. Phosphogypsum might offer an additional solution in places where natural gypsum is not available. However, since sulphuric acid is used in the production process, phosphogypsum does not strictly meet the definition of being ‘of plant, animal, microbial or mineral origin’.
In general, use of industrial by-products and recycled gypsum can support circular economy. However, in this case, the evaluated substance is a by-product of the mass production of fertilisers that are not allowed in organic agriculture. Therefore, the use of phosphogypsum in organic agriculture might undermine the credibility of the organic sector.
There are other solutions for liming with materials of natural origin.

Recommendations
In the Group’s opinion, phosphogypsum should not be allowed for use in organic agriculture.

3.2.7 Comment on widespread environmental contamination

Several substances discussed in this report (bio-waste, struvite, bone charcoal) raise the issue of contamination risk in organic farming. Due to the general relevance of contaminations for organic production, the Group agreed on the following statement.

In recent years, organic farming has done pioneering work in keeping agricultural ecosystems as free of polluting substances as possible, and in making production processes in primary production and processing as close to nature as possible and with as little negative impact on nature as possible, relating to the state of knowledge. The idea of circular economy has played a major role in organic production principles from the very beginning and is embedded in the organic concept. In the meantime, organic agriculture has grown considerably and is increasingly confronted with environmental pollution and pollutant loads in different cycles organic farming is a part of. This poses a great challenge with respect to its principles, the consumer expectations / quality demands of organic agriculture and its products and to control for contamination. Meeting the quality demands/expectations and compliance to the organic regulation is made more difficult by the presence of pollutants in many eco-systems and food cycles, as well as by the contamination from conventional cycles with substances banned in organic agriculture, e.g. by the possibility of drifting pesticides.

In the Group's opinion, circular economy is important and should be widely adopted also in organic production. However, it is clear that recycled materials may be contaminated with undesirable substances such as microplastic, heavy metals, veterinary drugs or pesticides. In the examples of bio-waste and struvite, the Group has decided that the beneficial aspects of circular economy outweigh the risks of potential contamination.

Nevertheless, the Group underlines that such contaminations are undesirable and should be kept as low as possible and welcomes all initiatives that reduce the output and contamination risk of such substances. It is therefore important to assess, for each recycled substance, what the risks may be, if thresholds for application and accumulation (taking the yearly doses into consideration) are within compliance of regulations, and if necessary, clarify and specify which products should be discarded. As long as organic farming is implemented in an environment where contamination is frequent, however, a part of this contamination may end up also in the organic production chain.

One of the Green Deal targets of the EU is to significantly increase the cultivation area under organic production. That means increasing issues with the co-existence with conventional farming. The burden of proofing the environmentally friendly practices should not be solely on organic farmers. Therefore, the applicants submitting their dossiers for the evaluation of the EGTOP should put all effort in demonstrating that the inputs intended in organic production are ecologically sustainable.

The Group does not recommend any changes in the organic legislation at the moment. However, the Group highlights these risks and recommends that the European Commission and Member States take them into consideration within the framework of policies and regulations concerning organic farming development, circular economy and environmental protection. Moreover, these risks should be continuously monitored and preventively managed in:

- the use of pesticides, veterinary drugs, plastic or any other potentially polluting materials and in
- the production of organic fertilizers from recycled materials.

Finally, the organic sector should be aware that the proposed measures can reduce contaminations (in frequency and in amounts), but may not always completely eliminate them from the organic production chain. Under these circumstances, a certain level of contamination can be difficult to avoid in organic products. The issue of how to handle such residues is hotly debated at the moment. The Group would welcome harmonization, among EU member states, of control practises and on actions taken in case of detections of residues of non allowed products on organic products and in organic farms.

4. MINORITY OPINIONS

None.

5. LIST OF ABBREVIATIONS / GLOSSARY

None.

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