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DIRECTORATE-GENERAL FOR AGRICULTURE AND RURAL DEVELOPMENT

Directorate B. Multilateral relations, quality policy
B.4. Organics

Expert Group for Technical Advice on Organic Production

EGTOP

FINAL REPORT ON PLANT PROTECTION (III)

The EGTOP adopted this technical advice at the 13th plenary meeting of 9 – 10 June 2016
and submitted the final version on 26 October 2016

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

With the Communication from the Commission to the Council and to the European Parliament on a European action plan for organic food and farming adopted in June 2004, the Commission intended to assess the situation and to lay down the basis for policy development, thereby providing an overall strategic vision for the contribution of organic farming to the common agricultural policy. In particular, the European action plan for organic food and farming recommends, in action 11, establishing an independent expert panel for technical advice. The Commission may need technical advice to decide on the authorisation of the use of products, substances and techniques in organic farming and processing, to develop or improve organic production rules and, more in general, for any other matter relating to the area of organic production. By Commission Decision 2009/427/EC of 3 June 2009, the Commission set up the Expert Group for Technical Advice on Organic Production.

EGTOP

The Group shall provide technical advice on any matter relating to the area of organic production and in particular it must assist the Commission in evaluating products, substances and techniques which can be used in organic production, improving existing rules and developing new production rules and in bringing about an exchange of experience and good practices in the field of organic production.

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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.

http://ec.europa.eu/agriculture/organic/home_en

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• Bernhard Speiser (calcium hydroxide).

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All declarations of interest of permanent Group members are available at the following webpage: www.organic-farming.europa.eu

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Expert Group for Technical Advice on Organic Production (EGTOP; thereafter called 'the Group') has evaluated a number of topics relevant for the use of plant protection products in organic production in accordance to the request set out in the third EGTOP plant protection product mandate. The Group concluded the following:

The use of sodium hydrogen carbonate is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It should therefore be included in Annex II, together with potassium hydrogen carbonate. Proposed listing: 'Potassium and sodium hydrogen carbonate (aka potassium/sodium bicarbonate)'.

The use of Salix spp. cortex (willow bark extract) is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It should therefore be included in Annex II. Proposed listing: 'Salix spp. cortex' (aka willow bark extract)'.

The use of chitosan hydrochloride is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It is already authorised under the listing of 'basic substances'. The Group recommends a limitation to raw materials obtained from sustainable fisheries or organic aquaculture.

The use of COS-OGA is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It should be included in Annex II without restrictions.

The use of garlic extract is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It should therefore be included in Annex II without restriction.

The use of diammonium phosphate as an attractant in traps is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It should therefore be re-included in Annex II.

In addition, the Group has prepared an overview of all plant protection products that have not been evaluated by EGTOP before. For the following substances, the Group sees no need for a dossier and/or re-evaluation, and recommends that they should remain on Annex II:

- spinosad
- calcium hydroxide
- ferric phosphate
- potassium hydrogen carbonate

For calcium hydroxide, the Group recommends deleting the current restriction.

For the following substances, the Group sees the need for a dossier and re-evaluation, but recommends that they should remain on Annex II in the meantime:

- azadirachtin
- pyrethrins
- deltamethrin and lambdacyhalothrin
- lime sulphur

If the use of traps containing deltamethrin and lambdacyhalothrin is re-evaluated, it might be necessary to evaluate also some of the substances, which are used as attractants in these traps.

For ethylene, the Group recommends that the uses should be restricted to those cases where it is essential. The Group accepts those uses which are authorised under EU pesticide legislation (i.e.

indoor use by professionals in bananas, potatoes), because it considers them to be essential. Uses on other crops should be evaluated separately, and specific restrictions included in Annex II, if needed.

Finally, the Group has prepared an overview of all substances which are currently authorised as basic substances, explaining in which way they need to be mentioned in Annex II. Lecithins, sucrose, fructose, vinegar, whey, chitosan hydrochloride and Equisetum arvense L. are already authorised for organic production under the listing of 'basic substances', while calcium hydroxide and quassia are authorised by a separate listing. Sodium hydrogen carbonate, Salix spp. cortex, and diammonium phosphate are not yet authorised and would need to be listed separately in Annex II.

1. BACKGROUND

In recent time, several Member States have submitted dossiers under Article 16(3)(b) of Council Regulation (EC) No 834/20072 concerning the possible inclusion of a number of substances in Annex II to Commission Regulation (EC) No 889/20083 or, more in general, on their compliance with the above mentioned legislation.

France (in 2015) and Germany (in 2014) introduced a request for evaluation of chitosan hydrochloride. Italy (in 2014) and UK (in 2015) both requested the evaluation of garlic extract. France presented a dossier on the use of Salix spp. Cortex and diammonium phosphate. Belgium submitted a request on COS-OGA and Denmark on sodium hydrogen carbonate.

Therefore, the Group is requested to prepare report with technical advice on the matters included in the terms of reference.

2. TERMS OF REFERENCE

In the 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 Council Regulation (EC) No 834/2007 and, hence, can be authorised to be used in organic production under the EU organic farming legislation.

Substances:

- BE dossier (2015): COS-OGA
- DE and FR dossiers (2014/2015): Chitosan
- FR dossier (2015): Salix spp. Cortex and Diammonium Phosphate
- IT and UK dossiers (2015): Garlic extract
- DK (2015): Sodium hydrogen carbonate

The Commission would also like to get the advice from the group as regards the following:

- Norway and Sweden requested a general evaluation of plant protection products that have not been evaluated before by EGTOP in order to ensure that the whole Annex II has been assessed.

For the preparation of its report the group is invited to examine technical dossiers provided to the Commission by the Member States and suggest amendments to the current list in Annex II of the Regulation 889/2008.

3. CONSIDERATIONS AND CONCLUSIONS

4.1 Sodium hydrogen carbonate

Introduction, scope of this chapter

Sodium hydrogen carbonate ($NaHCO_3$) is also known as sodium bicarbonate. It is chemically very similar to potassium hydrogen carbonate ($KHCO_3$). The two substances are therefore frequently compared in this chapter.
Sodium hydrogen carbonate is mainly used for purposes other than plant protection. It is the major ingredient of baking powder and is frequently found in soda powder, toothpastes and

medicaments against gastric reflux disease. It has numerous other applications such as pH buffer for feeds, use in cheese making, pyrotechnics, smell absorber, removal of paint and corrosion and many others.

Authorisation in general production and in organic production

Sodium hydrogen carbonate is approved as a basic substance for use in plant protection, while potassium hydrogen carbonate is approved as an active substance.

Agronomic use, technological or physiological functionality for the intended use

On wet leaf surfaces, sodium hydrogen carbonate dissociates into the sodium and the hydrogen carbonate ion. The hydrogen carbonate ion is responsible for the effect on pathogens. This is identical to potassium hydrogen carbonate, which also dissociates into the hydrogen carbonate ion. The difference is only that sodium ions are released in the first case and potassium ions in the second case. Potassium is a major plant nutrient, while sodium is not a plant nutrient (see section on environment for details).
According to the Commission's review document, 1 – 8 applications are recommended per year, and the recommended rate per application is 2 – 5 kg/ha.

Necessity for intended use, known alternatives

The representative uses (see glossary) for sodium hydrogen carbonate are control of: mildews on vegetables, soft fruit and ornamentals; powdery mildew on grapevine; apple scab; storage diseases like blue and green mould on different fruits. For potassium hydrogen carbonate, the representative uses are control of powdery mildew on grapevine; apple scab; suckers on pear.
Authorisations for commercial products may cover also other crops. They vary between member states and are subject to frequent changes. In summary, there are pathogen-crop-country combinations where none of the two, only one or both substances are authorised. Therefore, the Group sees a necessity for both sodium and potassium hydrogen carbonate.

Origin of raw materials, methods of manufacture

Sodium and hydrogen carbonate are ubiquitous in nature. The commercial substance is manufactured by chemical processes, but is identical to the naturally occurring form.

Environmental issues, use of resources, recycling

As hydrogen carbonate is ubiquitous in nature, the Group has no concerns over this substance.
The Group concluded that the application of sodium hydrogen carbonate would not lead to soil salinization with the currently authorised application rates.

Animal welfare issues

The Group has no concerns (see EGTOP report on plant protection II, chapter 4.5).

Human health issue
s
The Group has no concerns (see EGTOP report on plant protection II, chapter 4.5).

Food quality and authenticity

The Group has no concerns (see EGTOP report on plant protection II, chapter 4.5).

Traditional use and precedents in organic production

Sodium hydrogen carbonate has traditionally been used for plant protection in organic production. It was included in the first version of Reg. 2092/91 under the name 'sodium bicarbonate'. It is also authorised as a feed material (Annex V) under the name sodium bicarbonate.

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

Sodium bicarbonate may be used for plant protection according to the Codex Alimentarius guidelines for the production, processing, labelling and marketing of organically produced foods, in US organic production and according to the IFOAM norms.

Other relevant issues

none

Reflections of the Group / Balancing of arguments in the light of organic production principles

Sodium hydrogen carbonate has traditionally been used for plant protection in organic production. Potassium hydrogen carbonate, which is very similar, is also authorised. Therefore, the Group has no concerns over the use of sodium hydrogen carbonate.

Conclusions

The Group concluded that the use of sodium hydrogen carbonate is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It should therefore be included in Annex II, together with potassium hydrogen carbonate, without additional restriction.
Proposed listing: 'Potassium and sodium hydrogen carbonate (aka potassium/sodium bicarbonate)'.

4.2 Salix spp. cortex

Introduction, scope of this chapter

Willow bark extract has been traditionally used in organic farming. In this document, it is referred to as 'Salix spp. cortex', which is the official denomination under which this substance is approved. Salix spp. cortex is a homogenate containing various compounds, particularly polyphenols and salicylic acid. It can be produced on organic farms.

Authorisation in general production and in organic production

Salix spp. cortex is approved as a basic substance for use in plant protection.

Agronomic use, technological or physiological functionality for the intended use

The representative uses are: control of foliar fungi like *Taphrina deformans* in fruit trees and particularly in peach; control of foliar fungi like scab and powdery mildew in apple; control of downy mildew and powdery mildew in grapevine. The dossier mentions also a use in tomato.
The mode of action is not fully understood. According to the Commission's review, Salix spp. cortex is classified as a fungicide. According to the dossier, it acts via the stimulation of natural defense mechanisms.

According to the review report, Salix spp. cortex has to be used within 24 hours after its preparation. It is therefore a concoction which will normally be prepared on the farm which wants to use it. Typically, the final Salix spp cortex concentration in the final preparation applied on plant is about 2.2 g/L, and between 0.44 - 13.3 kg/ha is usually applied annually (depending on plant species).

Necessity for intended use, known alternatives

Depending on the crop and pest to be controlled, there are several alternatives (e.g. copper, sulphur), besides the preventative agronomic measures. According to the dossier, Salix cortex could be an alternative, to reduce the use of copper fungicides. The Group could not verify to what extent such a reduction would be possible.

Origin of raw materials, methods of manufacture

Willow bark is simmered in water at 80 °C for 2 hours. After cooling, the solution is filtered and diluted with water. It has to be applied within 24 hours, to prevent microbial contamination.

Environmental issues, use of resources, recycling

The Group has no concerns.

Animal welfare issues

The Group has no concerns.

Human health issues

The Group has no concerns.

Food quality and authenticity

The Group has no concerns.

Traditional use and precedents in organic production

Concoctions of various plants, including willow bark, have been traditionally used on organic farming. In Germany, there were plant strengtheners containing willow bark on the market, and could be used in organic farming.

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

Willow bark extract is not explicitly mentioned in the Codex Alimentarius guidelines for the production, processing, labelling and marketing of organically produced foods, in the NOP rules for US organic production or in the IFOAM norms. However, natural plant preparations are authorised according to all three standards.

Other relevant issues
None.

Reflections of the Group / Balancing of arguments in the light of organic production principles

The Group sees this substance as a natural, harmless, often farm-made with some limited effect on plants, probably as a stimulator of natural defence mechanisms. The use of such methods and substances is well in line with the principles of organic production. Furthermore, the use of substances produced on-farm is in line with the principle of restricting the use of external inputs (Reg. 834/2007, Art. 4(a)(b)).
Salix spp. cortex may help to maintain plant health and might thereby contribute to reduce the use of less desirable substances such as copper or sulphur, but it is unlikely to replace them. Considering that Salix spp. cortex has to be prepared on-farm and can be stored only for 24 hours, the Group assumes that it will find only a very limited use by organic farmers. However, if an organic farmer wishes to use this method, the Group is not opposed to it.
Salix spp. cortex is a basic substance, but it is not a food. Therefore, it is not covered by the present listing of 'basic substances' in Annex II, and needs to be listed separately (see also chapter 4.8).

Conclusions

The Group concluded that the use of Salix spp. cortex is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It should therefore be included in Annex II without additional restrictions.
Proposed listing: 'Salix spp. cortex' (aka willow bark extract)'

4.3 Chitosan hydrochloride

Introduction, scope of this chapter

Chitosan hydrochloride is also known as chitosan. It is a linear polysaccharide composed of randomly distributed D-glucosamine N-acetyl-D-glucosamine (acetylated unit). The present request is for use as a stimulator of plants' natural defences.
Chitosan has a range of uses other than plant protection, such as water filtration, winemaking (fining agent), medicine (hemostatic agent) and others.

Authorisation in general production and in organic production

Chitosan hydrochloride is authorised as a basic substance for use in plant protection. Because it was classified as a foodstuff, it is also authorized for organic production under the listing of 'basic substances'. It was also positively assessed by the Group as organic wine-making coadjuvant (see EGTOP report on Wine). There are also fertilizers on the market, which contain chitin, and sometimes make claims similar to the effects of chitosan described here.

Agronomic use, technological or physiological functionality for the intended use

According to the Commission's review, chitosan hydrochloride acts as an elicitor of plant resistance against pathogenic fungi and bacteria. The representative uses which were authorised are the control of pathogenic fungi and bacteria on fruits, small fruits and berries; vegetables; cereals; spices; crops for animal feed; cereals (seed treatment); potatoes (seed treatment); sugar beet (seed treatment). In addition to these effects, the dossier mentions that foliar treatment reduces water consumption and that seed treatment increases stress tolerance. The dossier states a dose of 200 mg/m^2, which is equivalent to 2 kg/ha.

Necessity for intended use, known alternatives

Depending on the crop and pest to be controlled, there are several alternatives (e.g. copper, sulphur and some PPP based on micro-organisms), besides the preventive agronomic measures (see also COS-OGA, chapter 4.4). It might be a tool to improve the health of organic crops, and possibly to contribute to the reduction of copper fungicides.

Origin of raw materials, methods of manufacture

Chitosan naturally occurs in the shells / carapax of crabs or shrimps etc., exoskeletons of insects and cell walls of fungi. The material used for plant protection is derived from crab shells, which are by-products of the shrimp industry.
The crab shells are decalcified with hydrochloric acid and purified with water. The polysaccharide chitin is precipitated and then deacetylated with sodium hydroxide. The solution is neutralized with hydrochloric acid, purified with water and then dried.

Environmental issues, use of resources, recycling, sustainability

The Group has no concerns over the environmental impacts of manufacture and use of chitosan. Hydrochloric acid and sodium hydroxide, in the process water, form sodium chloride (=salt), and this is cleared according to environmental rules.
The raw material is a by-product from the food industry. The recycling of wastes and by-products of plant and animal origin as input in plant and livestock production is an explicit principle of organic farming (see Reg. 834/2007, Art. 5 (c)).
If chitosan is derived as a by-product from wild catches obtained by sustainable fishery or from organic aquaculture or insect rearing, the Group has no concerns.

Animal welfare issues

No issues identified.

Human health issues

The Group has no concerns.

Food quality and authenticity

The Group has no concerns.

Traditional use and precedents in organic production

Plant strengtheners based on chitosan have been used in the past in organic farming in Germany. Fertilizers and soil amendments containing chitosan are in use also in other EU countries.

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

In the Codex Alimentarius guidelines for the production, processing, labelling and marketing of organically produced foods, chitosan is not mentioned, but 'chitin nematicides' are authorised. In US organic production, chitosan may not be used, because it is considered to be synthetic. According to the IFOAM norms, 'animal preparations and oils' may be used for plant protection.

Other relevant issues

None.

Reflections of the Group / Balancing of arguments in the light of organic production principle s

Chitosan hydrochloride can be useful as part of a broader strategy including agronomic measures and the use of other plant protection products. It could be a tool to reduce (but not replace) the use of products, which have more negative impacts on the environment.

Stimulators of plants' natural defences such as chitosan hydrochloride trigger metabolic processes in crops which also occur during infections by pathogens. This is therefore a natural mode of action.

The recycling of wastes and by-products of plant and animal origin as input in plant and livestock production is an explicit principle of organic farming (see Reg. 834/2007, Art. 5 (c)). However, raw material originating from sustainable fisheries or organic aquaculture should be used, consistent with the recommendation for chitin in the EGTOP report on fertilizers I, chapter 3.3.

The Group has no other concerns over the use of chitosan hydrochloride, and prefers it to several other currently authorised substances such as copper or sulphur.

Chitosan hydrochloride is a basic substance, and it is classified as a foodstuff. It is therefore authorized for use by the present listing of 'basic substances' in Annex II, and does not need to be listed separately (see also chapter 4.8).

Conclusions

The Group concluded that the use of chitosan hydrochloride is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It is already authorized by the listing in 'basic substances'.

The Group recommends that this listing is amended with the following restriction 'Chitosan: only if obtained from sustainable fisheries or organic aquaculture (as currently defined by EU regulations)', as it is now in Annex I for chitin.

4.4 COS-OGA

Introduction, scope of this chapter

The denomination COS-OGA is an acronym for a complex of COS and OGA. COS stands for 'chitooligosaccharides', while OGA stands for 'oligogalacturonans' (for details, see section on

origin below). 'COS-OGA' is the official terminology under which this active substance is registered at EU level.
COS is a depolymerisation product obtained from chitosan, which is discussed separately in chapter 4.3.
COS and OGA are both oligosaccharides, that is short-chained carbohydrates. COS-OGA has therefore a similar chemical structure to laminarin, which is a polysaccharide (i.e. a carbohydrate with longer chain length). COS-OGA also has a similar mode of action to laminarin (i.e. stimulation of natural defences).

Authorisation in general production and in organic production

COS-OGA is approved as an active substance in the EU, and has been assigned the status of a low-risk active substance. There are also fertilizers on the market, which contain COS-OGA.

Agronomic use, technological or physiological functionality for the intended use

COS-OGA is an elicitor of the plants' natural defences, and has no fungicidal action on pathogens. The representative use evaluated by EFSA is foliar spraying against foliar fungi, to control powdery mildew (*Sphaerotheca fuliginea*) on Cucurbitaceae grown in glasshouses. However, it is also effective on a range of other crops. For example, the use on Solanaceae is registered in the Netherlands, and it was also shown to be effective in grapevines (van_Aube*l et al*., 2014). According to that study, effectivity was in the range of 70 % for cucumber crops and 75 – 80 % for grapevines. Like in laminarin, the dose is very low (lower than 0.1 kg/ha).

Necessity for intended use, known alternatives

Depending on the crop and pest to be controlled, there are several alternatives (e.g. copper, sulphur and some plant protection products based on micro-organisms), besides the preventative agronomic measures (see evaluation of laminarin in the EGTOP report on plant protection I).

Origin of raw materials, methods of manufacture

COS is a by-product of the shrimp industry, and it is thus of animal origin. The dossier does not mention whether the raw materials are obtained from sustainable fisheries or organic aquaculture. It is extracted from shrimp exoskeletons. OGA is a by-product of the fruit juice industry, and is thus of plant origin. It is obtained from pectin, which is extracted from citrus and apple peels. Both chitosan and pectin are ubiquitous in nature.
To manufacture COS-OGA, shrimp extract and pectin are both hydrolysed to produce COS and OGA. Then a physical separation is carried out to select those oligosaccharides with the desired chain length (degree of polymerization). No GMO enzymes are used in the manufacture.

Environmental issues, use of resources, recycling

The Group has no concerns over the environmental impacts of manufacture and use of COS-OGA.
The raw materials are by-products from the food industry. The recycling of wastes and by-products of plant and animal origin as input in plant and livestock production is an explicit principle of organic farming (see Reg. 834/2007, Art. 5 (c)). However, for origin of raw materials of COS, see discussion of chitosan (chapter 4.3).

Animal welfare issues

No issues identified.

Human health issues

EFSA expressed no toxicological concern on the components of COS-OGA. COS-OGA is classified as a low-risk active substance.

Food quality and authenticity

Due to the very low toxicity and the very low application dose, and due to the ubiquitous occurrence of both components in nature, the Group has no concerns over residues on crops.

Traditional use and precedents in organic production

COS-OGA is a new substance, and has therefore no traditional use. However, chitosan (COS), has traditionally been used as a plant strengthener in organic farming in Germany and Italy (see above). The use of laminarin, which is chemically similar and has a similar mode of action, is a precedent.

Authorised use in organic farming outside the EU / international harmonization of organic farming standard
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COS-OGA is not explicitly mentioned in the Codex Alimentarius guidelines for the production, processing, labelling and marketing of organically produced foods, in the NOP rules for US organic production or in the IFOAM norms.

Other relevant issues

None.

Reflections of the Group / Balancing of arguments in the light of organic production principles

In regions and in situations where powdery mildew is a threat, COS-OGA can be useful as part of a broader strategy including agronomic measures and the use of other plant protection products. It could be a tool to reduce (but not replace) the use of products, which have more negative impact on the environment.
Stimulators of plants' natural defences such as COS-OGA trigger metabolic processes in crops, which also occur during infections by pathogens. This is therefore a natural mode of action.
The Group appreciates that COS-OGA is derived from by-products of the food industry, is used in very small doses (less than 0.1 kg/ha) and is a low-risk active substance. In the Group's opinion, these advantages outweigh any potential negative impacts regarding the origin of chitosan.
The Group has no concerns over the use of COS-OGA.

Conclusions

The Group concluded that the use of COS-OGA is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It should be included in Annex II without additional restrictions.

4.5 Garlic extract

Introduction, scope of this chapter

The Group was asked to evaluate garlic extract. This is currently on the market in the form of a commercial product containing granules of dried, pure garlic extract. The dossier requests the use as a nematicide, but it is approved as a repellent.
Garlic is mainly used in cooking, but it has also been used traditionally for medical purposes.

Authorisation in general production and in organic production

Garlic extract is authorised as an active substance (repellent) at EU level, and commercial products containing garlic extract are authorised in several member states.

Agronomic use, technological or physiological functionality for the intended use

The representative uses are: control of cabbage and turnip root fly in various vegetables; repellent against birds, mammals and insects in various vegetables and potatoes; control of various nematodes in potatoes, parsnip berries and root vegetables. It can be applied at various life stages of crops, both in protected and outdoor crops. It is applied to the soil at the time of seed drilling or transplantation (often placed next to seeds in band applications). The registered rate in the UK and Italy is 20 – 25 kg/ha at seed drilling or transplanting, in any season of the year.
Garlic extract is a complex mixture of compounds, and therefore has several modes of action on pests. According to the Annex II of the dossier, in 8 out of the 22 trials the commercial product based on garlic extract was significantly better in controlling nematodes than the untreated control. In potatoes it has been described that the commercial product was effective on some free living nematodes, cyst nematodes and root-knot nematodes.

Necessity for intended use, known alternatives

Nematodes are pests of global importance and cause significant yield losses on a large range of crops. There are a number of cultural practices, which help to limit nematode populations and/or damage, such as sufficiently wide crop rotations, resistant cultivars and the use of nematode-free (certified) seeds. In many cases, these practices may be sufficient. However, in heavily infested soils such methods are not often sufficient to enable economically viable production.
For direct control of nematodes, two micro-organisms (*Paecilomyces lilacinus* and *Bacillus firmus*) have been developed. The dossier suggests that garlic extract is superior to these two micro-organisms, but gives no precise evidence on this. In any case, the two micro-organisms are at the moment not registered in many member states, and are therefore not available for many organic farmers.
Other pests and diseases controlled by garlic extract can also be of importance for organic farmers, depending on local and regional conditions.

Origin of raw materials, methods of manufacture

The substance is pure, food-grade garlic extract. This is obtained by pressing heat-shocked garlic bulbs. The raw extract is separated and then the fractions are remixed according to the manufactures specification. No chemical solvents are used in the manufacturing. Most of the

components of the garlic extract are expected to be unspecific plant material. However, up to 3.5 % of the substance is expected to be composed of a number of organopolysulfides, to which the biological activity as a plant protection product and a repellent is attributed.

Environmental issues, use of resources, recycling

The Group has no concerns. Garlic extract is fully natural and will degrade completely. When garlic or onions are grown in a field, the soil will be exposed to much higher levels of polysulfides than from an application of garlic extract.

Animal welfare issues

The Group has no concerns.

Human health issues

The Group has no concerns, and it can be reasonably assumed that the dietary exposure of humans due to the culinary use of garlic is significantly higher than the potential exposure from the use of garlic extract as a plant protection product.

Food quality and authenticity

Because garlic extract is only applied to the soil and does not have a systemic effect, the Group has no concerns.

Traditional use and precedents in organic production

Garlic extract has traditionally been used in organic farming. The main traditional use of garlic extract was as fungicide. In Germany, there were plant strengtheners containing garlic extract on the market, and could be used in organic farming.

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

Garlic extract is not explicitly mentioned in the Codex Alimentarius guidelines for the production, processing, labelling and marketing of organically produced foods, in the NOP rules for US organic production or in the IFOAM norms. However, natural plant preparations are authorised according to all three standards.

Other relevant issues

None.

Reflections of the Group / Balancing of arguments in the light of organic production principles

Basic substances of plant or animal origin which are food are automatically authorised in organic production. This clause is not valid for garlic extract, because it is not authorised as a basic substance, but as an active substance. In the Group's opinion, however, garlic extract can be judged in analogy to basic substances of plant origin which are food.
The dossier requested the use as a nematicide, but it is approved as a repellent under plant protection products legislation (EU Reg. 1107/2009). Considering the traditional use of garlic,

the Group sees no need to restrict the uses of garlic extract in Annex II. However, it can only be used as a repellent at the moment, due to general plant protection products legislation (EU Reg. 1107/2009).

Conclusions

The Group concluded that the use of garlic extract (consistent with current pesticide regulation) is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It should therefore be included in Annex II without additional restriction.

4.6 Diammonium phosphate

Introduction, scope of this chapter

The Group was asked to evaluate the use of diammonium phosphate. This substance is also called diammonium hydrogen phosphate. The request concerns its use in traps, as an attractant for certain insect pests mainly on orchard crops. As this substance has been authorised earlier, the Group considers this as a request for re-introduction into Annex II.
Diammonium phosphate is mainly used for purposes other than plant protection. These include fertilisation (only in conventional agriculture), yeast nutrient in winemaking, purification of sugar, cigarette additive, fire retardant, as a flux for soldering, in wool dying and in the manufacture of special glasses.

Authorisation in general production and in organic production

Attractants used as baits in physical traps are considered as active substances. This use is in the scope of the organic regulation and thus only permitted when listed in Annex II. Diammonium phosphate is authorised as a basic substance for use in plant protection. This authorisation concerns the use in physical traps.

Agronomic use, technological or physiological functionality for the intended use

Diammonium phosphate has an odour which is attractive to flies. It can be used for the control of the Mediterranean fruit fly (*Ceratitis capitata*), the cherry fly (*Rhagoletis cerasi*) and the olive fly (*Bactrocera olea*). The Group suspects that it could be useful also for other pests belonging to the group of diptera (flies). It attracts both males and females. It is usually applied as an aqueous solution of 30 – 40 g/l diammonium phosphate. This solution is filled into physical traps. The smell attracts flies to the traps, where they are killed by physical action (drowning in water). Diammonium phosphate has no lethal effects on the flies.
The attractant solution can be filled either in PET bottles with holes or in commercial traps. The shape and colour of the traps affect the attractivity to pests and to non-target insects. The method can be used for monitoring and mass trapping. For monitoring, 1 – 5 traps/ha are required, whereas for mass trapping, up to 100 traps/ha are used. The amount of diammonium phosphate used is 0.04 – 0.2 kg/ha for monitoring, and maximum 4 kg/ha for mass trapping.
The method can be used in fruit orchards including cherry, olives, citrus and other crops where the Mediterranean fruit fly causes damage.

Necessity for intended use, known alternatives

The Mediterranean fruit fly, the cherry fly and the olive fly are key pests in several horticultural crops, particularly in the Mediterranean region. Hydrolysed proteins would be an alternative attractant. Pheromones are another alternative, but they attract only males. Ammonium carbonate and ammonium hydrogen carbonate would also be effective, but they are not authorised for

organic farming. Hydrolysed proteins seem to be more effective than pheromones, but only for a short period, because they degrade quickly. Diammonium phosphate in traps was preferred in the past by olive growers also because of economic reasons.
Direct spraying of permitted insecticides (e.g. spinosad) onto crops would be an alternative, but this is clearly less desirable in the Group's opinion. Under low levels of pests, traps can give sufficient protection, and they can be used simultaneously for monitoring of pest populations. When pest populations rise, the number of traps can be increased and/or insecticides (e.g. spinosad) can be sprayed (depending on the crops).

Origin of raw materials, methods of manufacture

Both ammonia and phosphate are ubiquitous in nature. However, the material used for plant protection is synthetically manufactured (reaction of ammonia with phosphoric acid) but identical to the naturally occurring substance.

Environmental issues, use of resources, recycling

Diammonium phosphate is not a specific attractant, and therefore has the potential to also attract non-target insects.
The size and shape of the entry to the traps greatly influences which insect species will be caught by the traps. Long-term experience has taught producers the optimal size of holes (depending on the pest species). In addition, the period when the traps are exposed also determines the abundance and species caught. Thus, if such traps are used according to good agricultural practice, the catches of non-target insects are limited. For instance, after application of a set of good agricultural practices, the 'olipe' traps with diammonimum phosphate in olive crops showed a high specifity (up to 90 % of insect specimens in the trap belonged to the target species) (Luque-López and Pereda-Cruz, 2003). Therefore, the Group has no concerns.

Animal welfare issues

The Group has no concerns.

Human health issues

The Group has no concerns.

Food quality and authenticity

Because it is only used in traps and has no contact with the crop, the Group has no concerns.

Traditional use and precedents in organic production

Diammonium phosphate is traditionally used in traps in organic production. It was authorised according to later versions of Reg. 2092/91 and also in early versions of Reg. 889/2008. It was probably removed from Reg. 889/2008 for legal considerations, because the Group is not aware of any discussions within the organic sector about this substance. The use for monitoring purposes is not affected and has thus always been allowed.
Diammonium phosphate is authorised for the production of organic wine as a yeast nutrient (Annex VIIIa).

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

Diammonium phosphate is not explicitly mentioned in the Codex Alimentarius guidelines for the production, processing, labelling and marketing of organically produced foods, in the NOP rules for US organic production or in the IFOAM norms.

Other relevant issues

None.

Reflections of the Group / Balancing of arguments in the light of organic production principles

The use of physical traps is explicitly mentioned as a principle of organic farming (Reg. 834/2007, Art. 5(f). In the Group's opinion, this is clearly more desirable than the spraying of permitted insecticides, because it has less side-effects on non-target organisms and does not lead to residues.
Diammonium phosphate is a basic substance, but it is not of plant or animal origin. Therefore, it is not covered by the present listing of 'basic substances' in Annex II, and needs to be listed separately (see also chapter 4.8).

Conclusions

The Group concluded that the use of diammonium phosphate as an attractant in traps is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It should therefore be included in Annex II. It should only be used as an attractant in traps. Because this is already specified under pesticide legislation, no additional restriction is needed in Annex II.

4.7 Overview over plant protection products not yet evaluated by EGTOP

The Group was asked to provide a general evaluation of plant protection products that have not been evaluated before by EGTOP, in order to ensure that the whole Annex II has been assessed. It is not always possible to draw a clear line between products which were evaluated and products which were not yet evaluated. For example, in certain products one use may have been evaluated, while other uses were not evaluated. In addition, some substances were not evaluated by EGTOP, but by an ad-hoc expert panel. To handle all situations adequately, each substance of Annex II is mentioned in this chapter, with a short description of the evaluations at EU level which it has undergone. The substances are presented in the same order and under the same headings as they appear in Annex II.

In the case of substances which have not been evaluated before, the Group gives a preliminary opinion whether or not it sees a need to evaluate these substances. Because no dossiers were available, it was not possible for the Group to carry out full evaluations in all cases. However, the Group indicates whether it sees a need for a more thorough evaluation or not.

4.7.1 Substances of plant or animal origin

Azadirachtin extracted from Azadirachta indica (Neem tree)

Azadirachtin has not been evaluated by EGTOP. However, it has been traditionally used in organic farming worldwide. It is important or even essential for the control of a number of pests. It is rapidly broken down in the environment. It acts only on the insects which feed on treated crops, and therefore has very limited side-effects on non-target insects. There is some controversy over the use of azadirachtin mainly due to its effects on bumblebees and honey bees. Some studies have shown a potential increase in the rate of mortality of bumblebees (Naumann and Isman, 1996; Barbosa *et al.*, 2015; Xavier *et al.*, 2015) whereas others (Akca *et al.*, 2009) did not find acute toxicity to bees after application of azadirachtin. Also, residues of azadirachtin can sometimes be found in treated crops.
In the Group's opinion, a more careful evaluation of the risks and of strategies to minimize the exposure of non-target organisms seems necessary, including a distinction between neem oil and pure azadirachtin. The Group recommends submission of a dossier and re-evaluation of azadirachtin. However, the Group recommends that azadirachtin remains in Annex II in the meantime.

Basic substances

Basic substances are discussed in chapter 4.8 below and in the EGTOP report on plant protection II, chapter 4.7.

Beeswax

Beeswax was discussed in the EGTOP report on plant protection I, chapter 3.6.4. The Group has no objections against its use for pruning and grafting.

Hydrolysed proteins excluding gelatine

Hydrolysed proteins are used as attractants in traps. They were briefly discussed in the EGTOP report on plant protection II, chapter 4.8. The Group sees no need for a dossier and/or re-evaluation, and recommends that hydrolyzed proteins should remain in Annex II.

Laminarin

Laminarin is an elicitor of natural plant defences. It was discussed in the EGTOP report on plant protection I, chapter 3.1. The Group sees no need for a dossier and/or re-evaluation, and recommends that laminarin should remain in Annex II.

Pheromones

Pheromones were briefly discussed in the EGTOP report on plant protection II, chapter 4.8. Every insect species has its own pheromone. Therefore, the Group sees no need to approve and list each pheromone separately in Annex II. As long as they are used in traps or dispensers, the Group sees no need for a dossier and/or re-evaluation, and recommends that pheromones should remain in Annex II. For pheromones sprayed directly onto crops, however, the Group recommends a full evaluation case by case.

Plant oils

Plant oils were briefly discussed in the EGTOP report on plant protection II, chapter 4.8. The Group confirms that all uses except as herbicides are acceptable.
The Group sees no need for a dossier and/or re-evaluation, and recommends that plant oils should remain in Annex II.

Pyrethrins extracted from Chrysanthemum cinerariaefolium

Pyrethrins have not been evaluated by EGTOP. They have been traditionally used in organic farming worldwide, and have been used for insect control for more than one century.
Pyrethrins are found within the pyrethrum extract from the flowerhead of the *Chrysanthemum* plants. Pyrethrum induces a toxic effect in a broad spectrum of insects (including beneficials) when it penetrates the cuticle and reaches the nervous system. Pyrethrum does not persist for a long time in the environment, because it is degraded by high temperature and UV light.
The effect of pyrethrins is enhanced by other oil substances such as sesame or rapeseed oil. The main issue concerning pyrethrin is the widespread use of pyperonil butoxide (PBO) as a synergist. The Group has previously concluded that the use of PBO is not in line with objectives, criteria and principles of Organic Farming, and so tolerance of its use should be phased out (see EGTOP report on plant protection II).
In the Group's opinion, a more careful evaluation of the risks and of strategies to minimize the exposure of non-target organisms seems necessary, including a distinction between plant extract and pure active substance. The Group recommends submission of a dossier and re-evaluation of pyrethrins. However, the Group recommends that pyrethrins remain in Annex II in the meantime.

Pyrethroids (only deltamethrin or lambdacyhalothrin)

Deltamethrin and lambdacyhalothrin are only allowed in traps, and only against two pest species. They were briefly discussed in the EGTOP report on plant protection I, chapter 3.7. They are controversial, because they are synthetic and do not occur naturally. However, they are of great economic importance in some regions of the Mediterranean.
The Group finds that a full evaluation of these two substances is necessary now. The Group recommends submission of a dossier and re-evaluation of these two pyrethroids. However, the Group recommends that pyrethroids remain in Annex II in the meantime.
Comment: Deltamethrin and lambdacyhalothrin are only allowed in traps, which always contain also attractants. The Group noted that some commercial traps use attractants which are currently not authorised for organic production. If the use of traps containing deltamethrin and lambdacyhalothrin is re-evaluated, it might therefore be necessary to evaluate also some of the substances which are used in these traps as attractants.

Quassia extracted from Quassia amara

Quassia can be used for the control of the apple sawfly, but is currently not approved under EU pesticide legislation. It has been re-submitted and is currently under evaluation for approval, and because of that, a derogation has been implemented to keep it in Annex II. The Group has never fully evaluated quassia, but it has stated earlier (EGTOP report on Plant Protection II, chapter 4.7) that it has no objections to its continued use.

Quassia extract is on the draft list of substances which have been identified as possible candidates for basic substances. Quassia is a flavouring agent and can therefore be considered as a foodstuff (Art. 2 of Reg. 178/2002), and it is of plant origin. If quassia should be approved as basic substance, it will automatically be approved for organic farming.

Quassia is essential for the control of the apple sawfly in some countries. The Group sees no need for a dossier and/or re-evaluation, and recommends that quassia remains in Annex II with the current restriction, pending the final decision of pesticide approval.

Repellents by smell of animal or plant origin/sheep fat

Repellents by smell of animal or plant origin are briefly discussed in the EGTOP report on plant protection II, chapter 4.8. Sheep fat is discussed in the EGTOP report on plant protection I, chapter 3.3. The Group sees no need for a dossier and/or re-evaluation, and recommends that these repellents should remain in Annex II.

4.7.2 Micro-organisms and substances produced by micro-organisms

Micro-organisms

Micro-organisms were briefly discussed in the EGTOP report on plant protection II, chapter 4.8. Micro-organisms have been traditionally used in organic farming worldwide. They are one of the most environmentally friendly tools for plant protection. The Group sees no need for a dossier and/or re-evaluation, and recommends that micro-organisms should remain in Annex II.

Spinosad

Spinosad is an insecticide. It was evaluated in the report of the ad-hoc expert group on pesticides in organic food production, chapter 1. Spinosad is now widely used in organic farming worldwide. It is useful and in some cases essential. It must be used carefully (good agricultural practice), in order to avoid negative impacts on non-target organisms. If this is done, the advantages of spinosad outweigh the disadvantages. Therefore, the Group sees no need for a dossier and/or re-evaluation, and recommends that spinosad remains in Annex II.

4.7.3 Substances other than those mentioned in Sections 1 and 2, except ethylene

Aluminium silicate (Kaolin)

Aluminium silicate is an insecticide. It was discussed in the EGTOP report on plant protection I, chapter 3.2. The Group sees no need for a dossier and/or re-evaluation, and recommends that aluminum silicate should remain in Annex II.

Calcium hydroxide

Calcium hydroxide was not evaluated by EGTOP. Calcium hydroxide is now approved as a basic substance for use in plant protection as a fungicide. Because it is of mineral origin, it is not automatically approved for organic production and is listed separately. It is traditionally used in organic plant protection, and was already authorised under the old organic regulation 2092/91. In addition, it is authorised for disinfection in livestock production and in aquaculture (Annex VII) and as a processing aid for organic food (Annex VIII). Calcium hydroxide is also used as a trunk paint as a repellent against various insects and also for frost protection. It is also a component of Bordeaux mixture, which is included in Annex II. The mode of action seems to be a change of pH on the plant surface (calcium hydroxide is alkaline). This is such a basic mechanism that the

Group anticipates effects on other diseases or pests. For example, recent experiments suggest that calcium hydroxide is effective against *Drosophila suzukii,* an invasive species which was recently introduced into Europe and which is rapidly spreading and can heavily threaten fruit production in some areas (Cini et al., 2012). Calcium hydroxide is also active against *Botrytis cinerea* in greenhouses vegetables, or as repellent of ants in fruit trees.
The Group sees no need for a dossier and/or re-evaluation, and recommends that calcium hydroxide should remain in Annex II. Following its approval as a basic substance in 2015, it is permitted under EU pesticide regulations for use in plant protection as a fungicide against *Neonectria galligena* and other diseases in pome and stone fruit, and therefore there is no need for keeping the restriction in Annex II to *Neonectria galligena* only. Should there be a proposal to extend the uses of calcium hydroxide as a basic substance (e.g. as a repellent/insecticide), then this would need to be reviewed in the context of Annex II. The Group recommends that the use of calcium hydroxide as a repellent/insecticide to control *Drosophila suzukii* should be reviewed as a matter of urgency, both in terms of EU pesticide regulation and Annex II, because of the damage that this new pest is causing.

Carbon dioxide

Carbon dioxide is used as an insecticide. It was evaluated in the EGTOP report on plant protection II, chapter 4.3. The Group sees no need for a dossier and/or re-evaluation, and recommends that carbon dioxide should remain on Annex II.

Copper compounds

The use of copper fungicides has been extensively discussed in the organic sector during the last decade or longer. The discussion resulted in a quantitative limitation of the amounts of copper applied per ha and year, established by Reg. 473/2002. The reasons are given in recitals (7) and (8) to that regulation.
Until now, EGTOP has not evaluated copper compounds. Currently, the re-evaluation of copper under pesticide legislation is still pending, and various research projects looking into copper reduction and alternatives to copper are still ongoing. The Group recognizes that a careful evaluation of copper fungicides and of the restrictions for their use is important. However, the Group recommends to postpone this discussion until the re-evaluation as a pesticide is completed.

Fatty acids

Fatty acid potassium salts were briefly discussed in the EGTOP report on plant protection II, chapter 4.8. Their use for disease control was evaluated in more detail in the EGTOP report on plant protection II, chapter 4.6. The Group sees no need for a dossier and/or re-evaluation, and recommends that fatty acid potassium salts should remain in Annex II with the existing restrictions.

Ferric phosphate (iron (III) orthophosphate)

Ferric phosphate is a molluscicide. It has not been evaluated by EGTOP. Ferric phosphate is effective against slugs and snails when eaten. Ferric phosphate is considered harmless to all other organisms including carabid beetles, earthworms, bees, birds, mammals and humans and no undesirable ecological side effects have been identified until now. However, there are some indications that there may be risks for earthworms from certain chelating agents (EDTA, EDDS) which are present in some commercial products (Edwards *et al.*, 2009).

Iron and phosphate ions are ubiquitous in nature and found in many foods naturally. Iron phosphate is used to fortify foods such as bread. Other foods, such as pasta, milk, and beverages, are also fortified with forms of iron. No other substances with clear molluscicidal effects are included in Annex II.
The Group sees no need for a dossier and/or re-evaluation, and recommends that ferric phosphate remains in Annex II.

Kieselgur (diatomaceous earth)

Kieselgur is an insecticide. It was evaluated in the EGTOP report on plant protection II, chapter 4.2. The Group sees no need for a dossier and/or re-evaluation, and recommends that kieselgur remains in Annex II.

Lime sulphur (calcium polysulphide)

Lime sulphur is a fungicide. It has not been evaluated by EGTOP. Lime sulphur is hazardous for users and has some side-effects on non-target organisms. Nevertheless, it is important for the control of a number of diseases, particularly apple scab, and can substantially reduce copper. In some Mediterranean countries, it is essential for the control of insects inside the bark, mainly in grapevine and in some fruit trees. Experts consulted by the Group argued that the advantages of lime sulphur outweigh the disadvantages.
In the Group's opinion, a more careful evaluation of the risks and of strategies to minimize the exposure of workers/users and non-target organisms seems necessary. The Group recommends submission of a dossier and re-evaluation of lime sulphur. However, the Group recommends that lime sulphur remains in Annex II in the meantime.

Paraffin oil

Paraffin oils are insecticides. They were briefly discussed in the EGTOP report on plant protection II, chapter 4.8. The Group sees no need for a dossier and/or re-evaluation, and recommends that paraffin oil remains in Annex II.

Potassium hydrogen carbonate (aka potassium bicarbonate)

Potassium hydrogen carbonate (use as a fungicide) was evaluated by the ad-hoc expert group on pesticides in organic food production, chapter 2. Its use as an insecticide was evaluated in the EGTOP report on plant protection II, chapter 4.5.
The Group sees no need for a dossier and/or re-evaluation, and recommends that potassium hydrogen carbonate remains in Annex II.

Quartz sand

Quartz sand is a repellent. It has not been evaluated by EGTOP. The Group has no concerns and sees no need for a dossier and/or evaluation, and recommends that quartz sand remains in Annex II.

Sulphur

Sulphur is a fungicide and acaricide. It was briefly discussed in the EGTOP report on plant protection I, chapter 3.6.3. Sulphur is important for the control of many diseases, e.g. apple scab,

powdery mildew. It has some side-effects on certain beneficial organisms. Experts consulted by the Group argued that the advantages of sulphur outweigh the disadvantages.
In the Group's opinion, a more careful evaluation of the risks and of strategies to minimize the exposure of non-target organisms seems desirable. The Group recommends submission of a dossier and re-evaluation of sulphur. However, the Group recommends that sulphur remains in Annex II in the meantime.

4.7.4 Ethylene

Ethylene is produced by all higher plants and acts as a plant growth regulator. For agricultural purposes, it is obtained through chemical processes. It can be applied either as pressurized gas in bottles, or with generators producing ethylene from ethanol in situ. Ethylene is subject to pesticide legislation. It can be applied only indoors in many crops for various purposes (see below).

Until April 2016, ethylene was authorised in organic production for the following uses: (1) degreening bananas, kiwis and kakis; (2) degreening of citrus fruit only as part of a strategy for the prevention of fruit fly damage in citrus; (3) flower induction of pineapple; (4) sprouting inhibition in potatoes and onions.
Since April 2016, there are no more restrictions on the use of ethylene in the organic regulation. It was not possible for the Group to compile an exclusive list of crops in which ethylene is currently used. The Group found national authorisations for potato (AT, DE, FR, IE, NL, UK), onion (AT, NL), shallot (AT, NL), garlic (AT, NL), tomato (AT, NL), citrus (ES), banana (ES) and cut flowers (DE). The Group suspects that a number of other crops are also regularly treated with ethylene. For example, bananas must be ripened in all European countries. In the following, some crops are briefly discussed.

Pineapple

In pineapple, ethylene is applied to synchronize the onset of flowering (field use). This is necessary if the fruit are transported to Europe, because for economic reasons, large quantities of pineapples have to be shipped together. By contrast, if the pineapples are sold on the local market, synchronization of flowering is not necessary.
Comment: In the EU, field uses of ethylene are not authorised at the moment, so this can only be done in third countries. However, long transportation distances occur mainly in these countries.
This use has not been evaluated by EGTOP.

Potatoes and onions

In potato and onion, ethylene is used indoors to suppress sprouting during storage for crops stored until the next season starts. This use of ethylene was evaluated by the ad-hoc expert group on pesticides in organic food production (chapter 5). In conventional production, ethylene can also be used in shallot and garlic for the same purpose.

Citrus

Ethylene can be used to induce colour change (de-greening) in citrus. This use was evaluated in the report of the ad-hoc expert group on pesticides in organic food production (chapter 4). That group made clear that ethylene should not be authorised for citrus in general, but that the use should be limited to situations where degreening is part of a strategy for the prevention of fruit fly damage.

Bananas, kiwi, kaki

In many fruits, ethylene induces or speeds up processes related to ripening, such as colour change, softening and development of flavour and taste.
For bananas which are produced overseas and transported over long distances, the use of ethylene is essential. Nevertheless, it is possible to sell bananas on local markets without ethylene treatment.
Kaki is a very delicate fruit and cannot be transported when ripe. Therefore, the same argument applies as for bananas.
These uses have not been evaluated by EGTOP.

Other fruits

In many fruits, ethylene induces or speeds up processes related to ripening, such as colour change, softening and development of flavour and taste. Such effects have been observed not only in banana, kiwi and kaki (see above), but also in a range of other crops including, avocado, apple, pear, papaya and certain varieties of melons and peppers (a fruit vegetable).
These uses have not been evaluated by EGTOP.

Tomatoes

In tomatoes, ethylene is applied to the greenhouse atmosphere, to induce colour change of tomatoes late in the season, when these fruits would otherwise not turn red any more. This use is authorised at least in two member states.
This use was not authorised in organic production until April 2016 and was not evaluated by EGTOP.

Reflections

The use of ethylene for ripening has great economic advantages: (1) the fruit can be picked when they are still unripe and hard. Thus, they suffer little damage during transport. (2) The ripening of fruits can be timed precisely to the moment when the fruit are being marketed. (3) Large quantities of fruit can be ripened synchronously, thus matching the needs of large retailers. (4) Its use can prevent sprouting, and thus reduces food waste. The use of ethylene is particularly important for trade of tropical fruits, since overseas transportation of ripe fruit such as bananas is not possible.

On the other hand, the Group has also some concerns: (1) Under natural situations, fruits grow and mature on plants, and are then picked and consumed. The use of ethylene allows to influence the crops' developmental cycle, to pick fruit at an earlier stage of maturation, and to mature them later in a 'ripening chamber' or to suppress sprouting during storage. In the Group's opinion, such practices represent a significant step away from the ideal of 'natural production'. (2) There is also a potential conflict with Art. 4(c)(i) (strict limitation of the use of chemically synthesised inputs to exceptional cases these being: where the appropriate management practices do not exist). (3) Finally, there could be a potential conflict with Art. 6(c) (misleading regarding the true nature of the product). The Group is therefore concerned that such practices could undermine consumer trust.
Therefore, the use of ethylene should be restricted to those cases where it is essential.

Conclusions

The Group accepts those uses which are authorised under EU pesticide legislation (i.e. indoor use by professionals in bananas, potatoes), because it considers them to be essential. Uses on other crops should be evaluated separately, and specific restrictions included in Annex II, if needed.

4.8 Overview over basic substances authorised for use in plant protection to date

The listing of 'basic substances' in Annex II is new, and was not evaluated by EGTOP with the present restrictions. The Group sees a risk that this listing could be interpreted in different ways, leading to different conclusions about why some substances are authorised. In particular, the definition of 'foodstuff' is critical (see below).
There are also basic substances of mineral origin which are acceptable for organic farming (e.g. calcium hydroxide). These are not automatically authorised, but need to be listed individually.
To achieve a uniform interpretation, the Group briefly discusses the definition of 'foodstuff', and gives an overview over all substances which are currently authorised as basic substances, plus those which are mentioned in this report and might be confused with basic substances.

4.8.1 Definition of 'foodstuff'

The restriction refers to Art. 2 of Reg. 178/2002. According to this article, 'food' (or 'foodstuff') means any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans. 'Food' includes drink, chewing gum and any substance, including water, intentionally incorporated into the food during its manufacture, preparation or treatment. It is clear that food ingredients, flavourings and food additives are foodstuff. Regarding food processing aids, there is no community law and they are not considered as foodstuff in this context.
In many cases, the implementing regulation which authorises a basic substance contains a clear statement in the recitals (usually recital 3) that the substance fulfils the criteria of a foodstuff. Where such a statement is available, the Group has based its judgement on this statement.

4.8.2 Overview table

The overview table below summarizes the main aspects; each substance is then briefly discussed in the following two sub-chapters. Substances which have a 'yes' in the 2nd, 3rd and 4th column are automatically authorised under the listing of basic substances (see last column).

Substance	Authorised as basic substance?	Food?	Plant or animal origin?	Authorised for organic production?
lecithins	yes	yes	yes (plant)	yes (under basic substances)
sucrose	yes	yes	yes (plant)	yes (under basic substances)
fructose	yes	yes	yes (plant)	yes (under basic substances)
vinegar	yes	yes	yes (plant)	yes (under basic substances)
whey	yes	yes	yes (animal)	yes (under basic substances)
Equisetum arvense L.	yes	yes	yes (plant)	yes (under basic substances)
chitosan hydrochloride	yes	yes	yes (animal)	yes (under basic substances) (see also 4.3)

Substance	Authorised as basic substance?	Food?	Plant or animal origin?	Authorised for organic production?
calcium hydroxide	yes	yes (E 526)	no	yes (separate listing)
quassia	no (but in progress)	yes (flavouring of drinks)	yes (plant)	yes (separate listing) (see also 4.7.1)
sodium hydrogen carbonate	yes	yes (E 500)	no	no (recommendation: see 4.1)
Salix spp. cortex	yes	no	yes (plant)	no (recommendation: see 4.2)
diammonium phosphate	yes	yes (E 342)	no	no (recommendation: see 4.6)
Garlic extract	No	yes	yes (plant)	no (recommendation: see 4.5)

4.8.3 Brief discussion of basic substances of plant or animal origin which are food

Lecithins

Lecithins are authorised as basic substance, they are of plant origin and they are food. They may therefore be used in organic plant protection without explicit listing and their mention in Annex II has been removed.
Lecithins can be used to control a range of fungal diseases such as powdery mildews on fruit, grapes, berries, vegetables and ornamentals, tomato late blight and grapevine downy mildew. Lecithins are discussed in the report Plant Protection II, chapter 4.7.

Sucrose

Sucrose is authorised as basic substance, it is of plant origin and it is food. It may therefore be used in organic plant protection without explicit listing.
Sucrose can be used to control fruit borers like the codling moth in apples and the corn borer in maize. Until now, the use of sucrose has not been widely discussed in the European organic sector, but the Group has no concerns over its use.

Fructose

Fructose is authorised as basic substance, it is of plant origin and it is food. It may therefore be used in organic plant protection without explicit listing.
Fructose can be used to control fruit borers like the codling moth in apples. Until now, the use of fructose has not been widely discussed in the European organic sector, but the Group has no concerns over its use.

Vinegar

Vinegar is authorised as basic substance, it is of plant origin and it is food. It may therefore be used in organic plant protection without explicit listing.
Vinegar can be used as a seed treatment against fungal and bacterial diseases on cereals and vegetables. It can also be used for disinfection of cutting tools used for pruning of trees and shrubs. Until now, the use of vinegar has not been widely discussed in the European organic sector, but the Group has no concerns over its use.

Whey

Whey is authorised as a basic substance, it is of animal origin and it is food. It may therefore be used in organic plant protection without explicit listing.
Whey can be used to control powdery mildews in grapevine, cucumber and zucchini squash, and tomato yellow leaf curl virus. Until now, the use of whey has not been widely discussed in the European organic sector, but the Group has no concerns over its use. It is also used as a fertiliser.

Equisetum arvense L.

Equisetum arvense L. (=horsetail) is authorised as basic substance and is of plant origin. It is a foodstuff (herbal infusion). *Equisetum arvense L.* is discussed in the EGTOP report on Plant Protection II, but the Group did not make a recommendation at that time. Horsetail decoctions (see glossary) have traditionally been used in organic farming, and this use is now authorised as

a basic substance. The review report lists a number of fruit trees, grapevines and vegetables, where it can be used against various diseases.
The Group concluded that the use of horsetail is in line with the objectives, criteria, and principles of organic farming as laid down in Council Regulation (EC) No 834/2007. It may therefore be used in organic plant protection under basic substance listing.

Chitosan hydrochloride

Chitosan hydrochloride is authorised as a basic substance, it is of animal origin and it is classified as a foodstuff. It may therefore be used in organic plant protection without explicit listing. It is discussed in detail above (see section 4.3).

Quassia

A request for authorisation of quassia as a basic substance is pending. If this is approved, quassia will be authorised automatically (see chapter 4.7.1). At the moment, it is authorised by a separate listing. In case it is authorised as a basic substance, it may be used in organic plant protection under basic substance listing.

4.8.4 Brief discussion of other basic substances

Sodium hydrogen carbonate

Sodium hydrogen carbonate is authorised as basic substance and it meets the definition of foodstuff (acidity regulator, E 500), but it is not of plant or animal origin.
It is discussed in detail above (see section 4.1), and separate listing in Annex II is recommended.

Salix spp. Cortex

Salix spp. Cortex is authorised as basic substance and is of plant origin. However, it does not meet the definition of foodstuff.
It is discussed in detail above (see section 4.2), and separate listing in Annex II is recommended.

Diammonium phosphate

Diammonium phosphate is authorised as basic substance, but is not of plant or animal origin. It meets the definition of foodstuff (food additive E 342).
It is discussed in detail above (see section 4.6), and separate listing in Annex II is recommended.

Calcium hydroxide

Calcium hydroxide is authorised as basic substance and it meets the definition of foodstuff (acidity regulator, E 526), but it is not of plant or animal origin. However, it is mentioned separately in Annex II and may therefore be used in organic plant protection. For details, see section 4.7.3.

4. MINORITY OPINIONS

None.

5. LIST OF ABBREVIATIONS / GLOSSARY

aka	also known as
active substance	The constituent of a plant protection product that kills or otherwise controls a pest or a weed. For the legal definition, see Reg. EC No 1107/2009, Art. 2.
basic substance	A substance which is not predominantly used for plant protection purposes, but nevertheless is useful in plant protection. The full criteria are given in Reg. EC No 1107/2009, Art. 23.
decoction	A concentrated liquor resulting from heating or boiling a substance, especially a preparation made from woody plant material such as roots and bark.
low risk active substance	A substance which poses only a low risk to human and animal health and the environment. For details, see Reg. EC No 1107/2009, Art. 22.
representative use	use for which the substance is approved under pesticide legislation at EU level. For details, see Reg. EC No 1107/2009, Art. 8(1)(a).

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