Biocidal Products Committee (BPC)

Opinion on a request according to Article 75(1)(g) of Regulation (EU) No 528/2012 on

The evaluation of the availability and suitability of alternatives to boric acid and disodium tetraborate pentahydrate

ECHA/BPC/271/2020

Adopted

2 December 2020

Opinion of the Biocidal Products Committee

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In accordance with Article 75(1)(g) of Regulation (EU) No 528/2012 of the European Parliament and of the Council 22 May 2012 concerning the making available on the market and use of biocidal products, the Biocidal Products Committee (BPC) has adopted this opinion on the evaluation of the availability and suitability of alternatives boric acid and disodium tetraborate pentahydrate.

This document presents the opinion adopted by the BPC, having regard to the conclusions of the rapporteur.

Process for the adoption of opinions

A request by Commission was received by ECHA on 21 July 2020. The request was confirmed by ECHA to be passed to the BPC by 27 July 2020. The BPC appointed the rapporteur at its meeting of 6 October 2020. The rapporteur presented the draft opinion to the BPC at its 37th meeting of 1-4 December 2020. Following the adoption of the opinion at the BPC-37 meeting of 2 December 2020 the opinion was amended accordingly and delivered by ECHA to the Commission on 18 December 2020.

Adoption of the opinion

Rapporteur: The Netherlands

The BPC opinion on the evaluation of the availability and suitability of alternatives to boric acid and disodium tetraborate pentahydrate was adopted on 2 December 2020.

The BPC opinion was adopted by consensus. The opinion is published on the ECHA webpage at: https://echa.europa.eu/regulations/biocidal-products-regulation/approval-of-active-substances/opinions-on-article-75-1-g

Further details of the opinion and background

1. Request for the opinion and background

On 28 February 2020, EBA AISBL submitted to ECHA applications for the renewal of approval of boric acid and disodium tetraborate pentahydrate for PT08 “wood preservatives” in accordance with Article 13 of the Biocidal Product Regulation (EU) No 528/2012 (the BPR). These applications are currently under examination by the competent authority of the Netherlands.

Boric acid and disodium tetraborate pentahydrate are classified as Reprotoxic category 1B in accordance with Regulation (EC) No 1272/2008 on classification, labelling and packaging (CLP), and therefore meet the exclusion criteria set out in Article 5(1)(c) of the BPR.

The approval of active substances meeting the exclusion criteria should not be renewed unless it is shown that at least one of the criteria set out in Article 5(2) of the BPR is met.

During the last meetings of the Standing Committee on Biocidal Products and the Member States’ Competent Authorities, discussions took place in order to find possible ways to streamline the renewal process of active substances meeting the exclusion criteria. Proposals were made to find ways to give early indications to the evaluating competent authority (eCA) whether the conditions for derogations from exclusion would be met or not. If there are indications that suitable and sufficient alternatives are available, the eCA could decide to speed up its work (for instance by renouncing to request additional data) with the objective to limit to the minimum the time necessary to be able to conclude the examination of the application. This would help to conclude the renewal process as soon as possible and, assuming that the active substance would not be renewed, the relevant procedures could be initiated to remove biocidal products containing the substance from the market.

Among others, it was agreed during the 68th Standing Committee on Biocidal Products of 15 May 2020 that an opinion should be specifically requested from ECHA’s Biocidal Product Committee at the beginning of the renewal examination of the concerned active substances on whether there are suitable and sufficient alternative substances and technologies for the use(s) referred to by the applicant.

The Commission requested the BPC via the ECHA Secretariat to provide an opinion. on whether suitable and sufficient alternative substances and technologies exist to substitute the use of boric acid and disodium tetraborate for PT08 (wood preservatives) for the use(s) presented in the application for renewal. The uses applied or include: preventive wood preservation of wood in Use Classes 1, 2, 3 and 4, curative wood preservation, preservation of freshly cut timber (anti-sapstain), preventive barrier treatment against the dry rot fungus *Serpula lacrymans* and treatment of piles and grillages that support buildings.

Since disodium tetraborate is converted into boric acid/borate upon dissolution in water, these active substances are not considered to be competing active substances and therefore both active substances are included in one opinion. Futhermore it is noted that the current inclusion of disodium tetraborate covers three substance forms; disodium tetraborate pentahydrate (CAS no: 12179-04-3), disodium tetraborate anhydrous (CAS no: 1330-43-4) and disodium tetraborate decahydrate (CAS no: 1303-96-4). The renewal application is for disodium tetraborate pentahydrate only.

2. Summary of information supporting the request for the opinion

In order to determine whether the approval of boric acid and disodium tetraborate pentahydrate complies with at least one of the criteria set out in Article 5(2) of the BPR information from the following sources have been used:

a) Impact assessments for both boric acid and disodium tetraborate pentahydrate provided by the applicant in order to demonstrate that non-approval as active substances for continued use in biocidal products would have a disproportionate negative impact on society (Article 5(2)(c) (see paragraph 2.2);

b) The list of active substances included into the Union list or Annex I, or under examination (under the review programme set up in Article 89 of the BPR or outside the review programme applied for as a new active substance) for the same product-type, and similar uses (pattern of use, target organism, etc.) (see parapgraph 2.2.1);

c) The list of biocidal products authorised in R4BP for the same product-type, and similar uses (pattern of use, target organism, etc.) (see paragraph 2.2.4);

d) Any information available to Member State's Competent Authorities, including on biocidal products still placed on the market under the transitional period set up under Article 89 of the BPR (see paragraph 2.2.6);

e) Public consultation in accordance with Article 10(3) of the BPR (28 August untill 27 October 2020) (see paragraph 2.2.7);

f) An additional stakeholder survey carried out on alternatives (11 September untill 7 October 2020) (see paragraph 2.2.8);

g) Literature search, covering both chemical and non-chemical alternatives (see paragraph 2.2.9).

Evaluation of the information was done by eCA the Netherlands in collaboration with the Dutch Certification Body for Wood and Wood Products (SKH) and by the Dutch National Institute for Public Health and the Environment (RIVM).

2.1 Impact Assessment

An impact assessment was performed by the applicant. The applicant gathered evidence by means of an impact assessment in order to demonstrate that non-approval as active substances for continued use in biocidal products would have a disproportionate negative impact on society (Article 5(2)(c)).

As part of the impact assessment (RPA, 2020) a questionnaire was sent out to respectively 12 listed boric acid and 6 listed disodium tetraborate pentahydrate biocidal product manufacturers, followed by key stakeholder interviews in order to identify the presented case studies and downstream users. With respect to downstream users, a selection was made of those downstream users expected to have the most knowledge of the active substances, their functionality and biocidal products. Furthermore 5 Industry Associations with expertise in wood preservation or timber production were contacted.

Information from the applicant's impact assessment has been used as the startingpoint for the analysis on alternatives, combined with the information gathered from point a to g mentioned above. Below several key elements are discussed:

2.2 Potential alternatives (active substances)

Use of borates

Borate-based wood preservation products cover a wide area of use. The currently authorized borate-based biocidal products for PT08 cover:

- Preservation of (soft and hard) wood in Use Classes 1, 2, 3 and 4 (CEN, 2013);
- Preventive and curative preservation, treatment of freshly cut timber;
- Protection against wood attacking insects (including termites) and fungi (including *Serpula lacrymans*);
- Application by penetrative and superficial methods.

Criteria for alternatives

No guidance is currently available that establishes criteria for what is considered a “suitable and available alternative” for an active substance that meets the BPR exclusion criteria. The following criteria (taken from ECHA’s article 10 public consultation website) were identified as being critical for the assessment of alternatives:

- Technical feasibility: can the alternative offer the same level of protection and functionality?
- Financial aspects of feasibility: can the alternative offer the same level of protection and functionality at the same price point? Considering the scope of this assessment mostly qualitative statements will be used as very little quantitative information is available;
- Hazards and risks of the alternative: do the alternatives reduce the hazard and risk to man and the environment compared to the use of borates? An alternative active substance should not meet the BPR exclusion criteria as this would not contribute to a lower hazard/risk;
- Availability: is the alternative widely and readily available or is capacity a problem?

It should be noted that combinations of alternatives may be needed to cover all uses identified for borate-based wood preservation products. Considering the scope of this report, it should not be considered a validation of the alternatives identified, but rather as a means to identify uses for which no suitable alternatives to borates are available, as identifying such uses is critical for deciding on the renewal of the borates.

2.2.1 Mode of action

In the applicant’s impact assessment it is stated that the non-renewal of the borates would result in the loss of both “a unique mode of action against fungi and a unique mode of action against insects” (RPA, 2020). To determine the potential impact of the no derogation scenario for the borates, the potential impact on the number of available modes of action against fungi and insects was investigated by the eCA.

According to the ECHA website (ECHA, 2020) 46 active substances are known for use in wood preservation (PT08). Several of these substances can not be considered alternatives for borates, for one or more of the following reasons (between brackets the number of excluded active substances is mentioned):

- Approval of the active substance has expired (6 substances): thiabendazole, dichlofluanid, flufenoxuron, thiamethoxam, clothianidin and thiacloprid;
- Initial approval of the active substance is in progress (3 substances): diamine, polymeric betaine and *Trichoderma harzianum* strain T-720;

- Substances are gasses and are used only for curative wood fumigation instead of preventive wood treatment: sulfuryl fluoride and hydrogen cyanide (2 substances);
- Active substances will not be renewed or are only considered to be relevant for niche applications (not relevant for borates) as indicated in the impact assessment provided by the applicant (RPA, 2020): tolylfluanid, K-HDO (only for use in wood composites), OIT, DCOIT and potassium sorbate (5 substances).

Substances that have a similar hazard/risk profile to the borates were excluded from the selection of potential alternatives. These substances include (between brackets the number of excluded active substances is mentioned):

- Active substances meeting the BPR exclusion criteria (excluding active substances for which approval has expired): propiconazole, cyproconazole, creosote, boric oxide, boric acid, disodium octaborate tetrahydrate, disodium tetraborate, disodium tetraborate decahydrate and disodium tetraborate pentahydrate (9 substances);
- Active substances that are candidates for substitution (excluding active substances that also meet the BPR exclusion criteria and active substances for which approval has expired): bifenthrin, etofenprox, fenpropimorph, and tebuconazole d (4 substances).

For the remaining 17 active substances the mode of action (MoA) was determined for fungicidal and insecticidal activity. For grouping purposes the information was preferably retrieved from the websites of the Fungicide Resistance Action Committee (FRAC, 2020) and the Insecticide Resistance Action Committee (IRAC, 2020). Where no data was available from these websites, information on mode of action was obtained from the active substance evaluations disseminated on the ECHA website (ECHA, 2020). The results are summarized in Table 1 below.

Table 1. Borates and active substance alternatives for borates and their fungicidal and insecticidal mode of action. Identical modes of action have been marked with identical colors. For borates and Cu-HDO the information on mode of action against fungi was obtained from Reinplecht, 2010 (in Carisse, 2010), the insecticidal mode of action was considered to be equivalent to the mode of action of other copper-based active substances. An overview of all known PT08 active substances and their status with regard to approval, candidate for substitution status and meeting BPR exclusion criteria is included in the non-confidential Annex (Table 1).

Active Substance	**MoA against fungi**	**MoA against insects**
Borates	Inactivation of enzymes / inhibition of metabolic activity	IRAC Class 8D (miscellaneous non-specific (multi-site) inhibitors
Cu-HDO	Inhibition of respiration (for Cu^{2+}), considered equivalent to FRAC Class M (inorganic)	Stomach poison (Cu^{2+})
ADBAC/BKC (C12-16)	Cell wall destruction	Stomach poison
DDACarbonate	Cell wall destruction	Stomach poison
DDAC	Cell wall destruction	Stomach poison
Chlorfenapyr	No fungicidal activity	IRAC Class 13 (uncouplers of oxidative phosphorylation of the proton gradient)
Cypermethrin	No fungicidal activity	IRAC Class 3A (sodium channel modulators)
Permethrin	No fungicidal activity	IRAC Class 3A (sodium channel modulators)
Fenoxycarb	No fungicidal activity	IRAC Class 7B (juvenile hormone mimics)
ATMAC/TMAC	Cell wall destruction	No insecticidal activity
Dazomet	Methyl isothiocyanate generator	IRAC Class 8F (Methyl isothiocyanate generators)
IPBC	FRAC Class F4 (carbamates)	No insecticidal activity
Penflufen	FRAC Class FC2 (succinate dehydrogenase)	No insecticidal activity
Bardap 26	Cell wall destruction	Stomach poison
Basic Copper carbonate	FRAC Class M (inorganic)	Stomach poison
Copper (II) oxide	FRAC Class M (inorganic)	Stomach poison
Copper hydroxide	FRAC Class M (inorganic)	Stomach poison
Granulated copper	FRAC Class M (inorganic)	Stomach poison

Based on the criteria defined above, 17 active substances remain as alternatives to boric acid and disodium tetraborate pentahydrate. For fungicidal activity at least 5 different modes of action remain. For insecticidal activity at least 4 different modes of action remain in this worst-case scenario (Table 1).

This number is considered sufficient by the Technical Guidance Note on comparative assessment of biocidal products (Euroepan Commission, 2015) which requires at least three different and independent modes of action. As it is unlikely that all currently authorized active substances meeting the BPR exclusion criteria and/or candidates for substitution will not be renewed, the most likely scenario is that more modes of action will be available than estimated under the worst-case no derogation scenario. Please note that the availability of active substances for the control of the dry rot fungus *Serpula lacrymans* is discussed separately in section 2.2.4.2.1.

2.2.2 Resistance

Borates are presented as active substances against which no resistance occurs in target organisms (RPA, 2020). Resistance may be defined as 'a heritable change in the sensitivity of a pest population that is reflected in the repeated failure of a product to achieve the expected level of control when used according to the label recommendation for that pest species' (IRAC, 2020).

For insecticidal alternatives such as bifenthrin and cypermethrin it should be noted that although resistance in insects has been observed (RPA, 2020), none of the insect species in which resistance has been observed are wood-attacking insects (Arthropod Pesticide Resistance Database, 2020).

At the product level, resistance of target organisms is not a major issue for the products and uses currently authorized for wood preservation. For example, for none of the 95 products currently authorized for preventive and curative wood protection (PT08) in the Netherlands (Ctgb, 2020) resistance management measures are included in the use instructions in the Summary of Product Characteristics (SPC).

Based on the information available the occurrence of resistance is not considered a critical factor when deciding on the renewal of the borates. The formulation of products based on multiple active substances (preferably with different modes of action) has proven to be sufficient in dealing with issues such as tolerance of target organisms (copper) or limited spectrum fungicidal activity (tebuconazole). The use of multiple active substances in a single product is a long-standing, common and accepted practice in wood preservation. As indicated above, even under a worst-case no derogation scenario, a sufficient number of active substances with different modes of action will remain on the market to formulate efficacious products. Please note that the availability of active substnaces for the control of the dry rot fungus *Serpula lacrymans* is discussed separately in section 2.2.4.2.1.

2.2.3 Physical and technical properties

A number of physical and technical properties of borates are highlighted in the impact assessment (RPA,2020) to stress the unique characteristics of these substances:

- Low vapour pressure: this is preferred in Use Class 1 and 2 as it means evaporation and thus exposure of inhabitants to harmful chemicals is minimized;
- Flame retardant properties: wood treated with borates becomes flame retardant, thus offering protection in case of fire;
- Corrosion inhibiting properties: borate-treated wood will not affect any metal parts (construction) it comes into contact with negatively;
- High diffusion capability: borates are able to penetrate deeper into wood and less-durable section, thus offering more protection against wood-attacking organisms.

A comparison with alternative active substances is provided in Table 2. The active substances listed below were selected by the applicant as the most likely alternatives to borates based on the comparison of uses in SPCs (Summary of Product Characteristics) of currently authorized products (RPA, 2020). Data on vapour pressure was obtained from the active substance dossiers on the ECHA website (ECHA, 2020). Information on costs of the alternatives was obtained from the impact assessment provided by the applicant (RPA, 2020, table 4-12). For the other properties, the characteristics of alternatives were discussed with the Dutch Certification Body for Wood and Wood Products (SKH, 2020, personal communication).

Table 2. Active substance alternatives for boric acid and disodium tetraborate pentahydrate and their physical and technical properties. Bifenthrin and tebuconazole are included here as they were identified as alternatives in the impact assessment (RPA, 2020). It should be noted that both these substances are candidates for substitution.

Property	Boric acid	Cypermethrin	Bifenthrin	ADBAC/BKC (C12-16)	DDAC	Tebuconazole	Basic copper carbonate
Low vapour pressure?	Yes < 1.0 x 10^{-5} Pa at ambient temperature	Yes 6 x 10^{-7} Pa at 25°C	Yes 2.4 x 10^{-5} Pa at 25°C	Yes 8.57 x 10^{-4} Pa at 25°C	Yes 3.11 x 10^{-9} Pa at 25°C	Yes 1.7 x 10^{-6} Pa at 20°C	Yes < 1.0 x 10^{-5} Pa at ambient temperature
Flame retardant properties?	Yes	No	No	No	No	No	No
Corrosion inhibiting properties?	Yes	No	No	No	No	No	No
High diffusion capability?	Yes	No	No	No	No	No	No

All alternative active substances have low vapour pressures and can be considered suitable replacements for borates with regard to this property. However, when considering the flame retardant and corrosion inhibiting properties and the high diffusion capability it becomes clear that alternatives for borates are lacking in these areas. With regard to the high diffusion capability it should be noted that the disadvantage of this property is the fact that borates can leach easily from treated wood. To counter the leaching of borates from wood that is exposed to weathering and leaching (Use Class 3 and 4), these active substances are often co-formulated with chromate-free fixating wood preservatives such as quaternary ammonium compounds, propiconazole and fenoxycarb (Mai and Militz, 2007, in: Kües, 2007).

2.2.4 Alternative biocidal products

A comparison of the Summary of Product Characteristics (SPC) for borate-based products and products based on alternative active substances has proven difficult as:

- wood preservation products (PT08) were among the first products to be authorized under the BPR. Due to inexperience of both applicants and competent authorities with the SPC-format, target organisms, intended uses and application methods have been documented inconsistently.
- SPCs contain a considerable amount of data which is hard to analyze systematically due to the issue raised above. As a result, only a high-level comparison can be made in the time available. This high-level comparison may overlook important niche applications.

In general, taking only target organisms, application methods and use classes into account, it can be concluded that for each authorized use of borate-based products, products based on alternative active substances are available that cover the same use. Sometimes the uses of borate-based products can be covered by a single product based on alternative active substances, sometimes multiple products are needed. However, this general comparison fails to uncover some of the more specific or niche uses of borate-based products. These specific applications, highlighted in chapters 6, 7 and 8 of the impact assessment (RPA, 2020) will be discussed in more detail below. The information provided by the applicant was verified by the Dutch Certification Body for Wood and Wood Products (SKH, 2020).

2.2.4.1 Anti-sapstain

Use against sapstain has been identified as one of the key uses of borates. The advantages and disadvantages of the alternatives identified in the impact assessment (RPA, 2020) are displayed in Table 3. Special attention is given to the use against sapstain in pallets.

Table 3. Advantages (+) and disadvantages (-) of identified alternatives for the use of borates (RPA, 2020, chapter 6).

1. Alternative identity and properties	Biocidal products based on other active substance(s)	Kiln drying	Plastic pallets
2. Technical feasibility	(-) Copper based products cannot be used as they affect wood colour. (-) IPBC degrades too quickly to be useful for this application.[1] (-) Non-borate based products lack anti-corrosion properties that protect treatment vessels. (-) Different wood species require specific product products, borate based product offer distinct advantages for certain wood types and under certain conditions. Products and active substances are not interchangeable.	(+) Freshly cut timber can be kiln dried to prevent sapstain. (-) Kiln drying does not offer protection against fungi beyond the initial treatment in case of rewetting. To achieve such protection a wood preservative (either borate or non-borate based) is needed.	(+) No treatment with biocides required. (+) Longer lifespan than wooden pallets. (+) Better suited for food and beverage, chemicals and pharma. (+) Certain plastic types have a higher fire safety rating than wooden pallets. (-) Not easily repaired. (-) Not biodegradable. (-) Can hold less weight than wooden pallets).
3. Financial aspects of feasibility	(-) Non-borate based products are available at a higher price level.	(-) Kiln drying is expensive, approximately 10% of the value of the wood.	(-) Plastic pallets are 3 times more expensive than wooden pallets. (-) Lifecycle impact (Global Warming Potential, expressed as kg CO_2 eq) is higher for plastic pallets than for wooden pallets.
4. Hazard and risks of the alternative	(+/-) All active substances authorized for PT8 are classified as dangerous for man and/or the environment. Hazard and risk can only be assessed at product level.	(+) Kiln drying is achieved without the use of chemicals and free of the risks and hazards associated with the use of dangerous chemicals (such as wood preservatives).	(+) The use of plastic pallets is achieved without the use of chemicals and free of the risks and hazards associated with the use of dangerous chemicals (such as wood preservatives).
5. Availability	(+) Non-borate based products are readily available.	(-) Capacity is an issue both due to the availability of kilns and the drying time (days) required.	(-) Only 5% of pallets are currently made of plastic, insufficient production capacity is currently available to significantly increase the percentage of plastic pallets.
6. Conclusion on suitability and availability of the alternative	Considering the specificity of anti-sapstain products (depending on wood type), the limitations of non-borate active substances and the increased costs of non-borate active substances, the alternative active substances are not in all cases a suitable alternative to the use of borates.	Considering the higher costs, limited availability/capacity and lack of protection against fungi beyond the initial treatment, kiln drying is not considered an suitable alternative to the use of borates.	Considering the higher costs, limited availability and significant scale-up issues for plastic pallets production, plastic pallets are not considered a suitable alternative to the use of borate-based wood preservatives.

1) Please note that this point was raised in both the impact assessment and in response to the public consultation. It could not be verified by external sources within the scope and timeframe of this assessment. It should be noted that IPBC-based products authorized for use against wood discolouring fungi (blue stain) on wood in Use Class 2 and 3 are available, indicating that this active substance has proven efficacy against wood discolouring fungi on wood exposed to weathering.

2.2.4.2 Internal building structures

Use in internal building structures has been identified as one of the mainstream uses of borates. The advantages and disadvantages of the alternatives identified in the impact assessment (RPA, 2020) are displayed in Table 4.

Table 4. Advantages (+) and disadvantages (-) of identified alternatives for the use of borates in internal building structures (RPA, 2020, chapter 7). This use concerns treatment of wood in Use Classes 1 and 2 (CEN, 2013).

1. Alternative identity and properties	Biocidal products based on other active substance(s)	Steel
2. Technical feasibility	(-) For organic active substances long service life may be an issue. (-) Non-borates do not possess flame retardant and anti-corrosion properties (-) Optimal pH is an issue with non-borate based products.	(+) Can handle a wider span than wood. (+) No risk of insect or fungal infestations. (+) Easily recycled. (-) Can rust where cut, drilled, welded or scratched. (-) Allows more heat to escape. (-) Lower structural integrity at higher temperatures).
3. Financial aspects of feasibility	(-) Non-borate based products are available at a higher price level.	(-) Steel is more expensive than wood. (-) Steel has a higher carbon footprint than wood.
4. Hazard and risks of the alternative	(+/-) All active substances authorized for PT8 are classified as dangerous for man and/or the environment. Hazard and risk can only be assessed at product level.	(+/-) Some methods to protect steel, such as the use of zinc, have an environmental impact.
5. Availability	(+) Non-borate based products are readily available. (-) Several non-borate alternatives meet the BPR exclusion criteria or are candidates for substitution. Future availability of these alternatives is uncertain.	(-) A wholesale move towards steel seems unlikely due to the technical and economic advantages of wood highlighted above.
6. Conclusion on suitability and availability of the alternative	Considering the need for a long service life and several beneficial properties of borate based products (flame retardant, anti-corrosion) products based on alternative active substances may not be suitable in all cases. It should be noted that the treatment of wood for internal structures is not common practice in all member states. In Northern countries were termites are not endemic, use in Use Classes 1 and 2 (under roof) is usually not treated as the wood is too dry to be affected by fungi. Wood-attacking beetles are mainly found in inaccessible areas of older buildings.	Considering the higher costs and technical disadvantages the use of steel instead of wood is not a suitable alternative for borate-treated wood in all cases.

2.2.4.2.1 Use against Serpula lacrymans

A specific fungus that occurs in buildings is the true dry rot fungus (*Serpula lacrymans*). This fungus causes brown rot in timber and can penetrate damp masonry, causing infections over long distances (CEN, 2020).

For control of *Serpula lacrymans* 36 products are currently authorized under the BPR (ECHA, 2020). Of these 36 products, 31 are based on propiconazole + IPBC, 3 products are based on borates (boric oxide, disodium octaborate tetrahydrate, disodium tetraborate) and 2 products are based on a combination of borates + quats (boric acid + disodium tetraborate + DDAC; boric acid + ADBAC).

In case the authorization fo the borates is not renewed, and considering propiconazole meets the exclusion criteria and will be evaluated for renewal in the near future, the number of active substances and modes of action available for control of *Serpula lacrymans* will be very limited in the future (note that quats by themselves will not be sufficiently efficacious, hence the current addition of borates as co-biocides).

2.2.4.3 Piles and grillages

In-situ treatment of piles (long slender wooden columns) and grillages (wooden frameworks) in foundations under buildings from the 19th and early 20th century has been identified as one of the niche uses of borates. The advantages and disadvantages of the alternatives identified in the impact assessment (RPA, 2020) are displayed in Table 5.

Table 5. Advantages (+) and disadvantages (-) of identified alternatives for the use of borates in conservation of piles and grillages (RPA, 2020, chapter 8). This use concerns curative and preventive treatment of wood in Use Class 4 (CEN, 2013).

1. Alternative identity and properties	Biocidal products based on other active substance(s)	Hydrological manipulation	Underpinning
2. Technical feasibility	(-) There are no products based on other active substances authorized for this use. (-) Phage-based products have been in development, but no commercially viable product is available at this moment.	(+) Best option for long-time protection of wooden piles and grillages. (-) Impossible to implement at a small scale (building) level. (-) May conflict with other interests (subway systems, etc.). (-) Re-infiltration with water often brings in additional oxygen, accelerating decay.	(+) Provides a long-term solution. (-) Requires access to the site at ground level, very disruptive (evacuation of inhabitants required).
3. Financial aspects of feasibility	(-) As no products based on other active substances are currently authorized for this use, economic feasibility cannot be assessed.	(-) Hydrological manipulation is complex and requires constant monitoring due to changes in weather conditions and groundwater flow. (-) Large scale process, and therefore expensive.	(-) 15-20 times more expensive than treatment with borates. (-) Evacuation of inhabitants is required.
4. Hazard and risks of the alternative	(+/-) All active substances authorized for PT8 are classified as dangerous for man and/or the environment. Hazard and risk can only be assessed at product level. For this particular application leaching to soil is a very relevant environmental exposure route.	(+) Hydrological manipulation is achieved without the use of chemicals and free of the risks and hazards associated with the use of dangerous chemicals (such as wood preservatives).	(+) Underpinning is achieved without the use of chemicals and free of the risks and hazards associated with the use of dangerous chemicals (such as wood preservatives).
5. Availability	(-) No products based on other active substance(s) are available for this application at the moment.	(+) Hydrological manipulation is an available technique and often already applied in sites where decay occurs (due to lowering of the groundwater level).	(+) Technology and materials are readily available.
6. Conclusion on suitability and availability of the alternative	Considering no products based on other active substance(s) are currently available for this application, such products are not an alternative to the use of borates.	Considering the higher costs and the fact that hydrological manipulation may conflict with other interests, it cannot be considered a one-size-fits-all alternative for the use of borates.	Considering the higher costs and disruptiveness of underpinning, it cannot be considered a suitable alternative to the use of borates in all cases.

2.2.5 Non-chemical alternatives

As non-chemical alternatives to the use of wood preservatives chemical modification of wood, thermal modification of wood and wood polymer composites were identified in the impact assessment provided by the applicant (RPA, 2020). It should be noted that these alternatives in general are expensive and not suited as an alternative for wood in construction applications (SKH, 2020).

Chemical modification methods for wood include acetylation, furfurylation and treatment with DMDHEU (1,3-dimethylol-4,5-dihydroxyethyleneurea). Acetylated wood can be used in building applications (Use classes 1 and 2) such as window and door frames and façade panels, while furfurylated wood is suited for automotive and nautical applications. Although chemical modification may replace borate treatment for some uses and use classes (depending on the type of treatment), borates remain vital for certain applications (e.g. in-situ curative treatment). Acetylation of wood does not offer protection against termites (SKH, 2020). Sales volumes of chemically modified wood are very low compared to the size of the EU timber market, which means availability is an issue.

Thermal modification may replace borate treatment for some uses in use class 1 and 2 (garden furniture, building products), but this method is not suited for treatment of wood

for ground contact applications, load bearing structures and wood in heavy duty applications. Furthermore, thermal modification does not provide protection against termites (see 2.2.8).

Wood-polymer composites may be used as a replacement for borate treatment for a broad range of applications. However, at this moment this method is expensive (compared to use of wood preservatives) and not cost effective. Wood polymer composites are not considered a genuine alternative to wood (SKH, 2020). From a technical point of view these are considered synthetic materials (and are covered by e.g. CEN norms for synthetic materials) rather than wood.

2.2.6 Biocidal products on the market under the Transitional period

No suitable alternative products on the market under the transitional period were identified in The Netherlands. During the public consultation only one possible alternative product on the market under the transitional period was identified in Finland. For more information on this product, please refer to section 2.2.7).

2.2.7 Public consultation

From 28 August until 27 October 2020 a public consultation was held concerning the renewal of the borates. Any party in possession of additional information or insights was encouraged to provide these to ECHA. For boric acid 21 replies were received (19 unique replies, as two respondents submitted the same input twice). For disodium tetraborate pentahydrate 14 replies were received.

For both substances three identical replies were received in favour of not renewing the approval of the borates. One respondent (biocidal product company) stated that sufficient non-borate products are authorized for use classes 1 through 4. Specifically named active substances include: copper (compounds), azoles and quaternary ammonium compounds. The information provided was insufficient to evaluate the potential for substituting the borates for e.g. the case studies provided in the impact assessment (RPA, 2020). Another biocidal product company mentioned an alternative product authorized in Finland under transitional law (SYKE no 346, an ADBAC/BKC (C12-C16)-based product) for protection of structures and exterior paint against bacteria, viruses and moulds. The information provided was insufficient for the eCA to assess the suitability of this alternative. As no protection against insects is claimed, the product cannot be considered a full alternative for the use of borates (note that efficacy against woodboring beetles is mandatory for preventive treatment of wood in Use class 1). The third reply (member state) stated borate-based products contributed only to 0.1% of wood preservation product sales in one particular member state and that no difficulty was expected in replacing the borate-based products for this national market. No non-chemical alternatives were identified in the responses.

For boric acid and disdodium tetraborate pentahydrate respectively 16 and 11 replies were received in favour of renewing the approval of these substances. For both substances almost identical argumentations from the same respondents were received. The responses stressed the importance of borates with regard to: technical properties (low vapour pressure, high diffusion capability, metal corrosion inhibiting properties, flame retardant properties, buffering actions), efficacy spectrum, lack of resistance in target organisms, low cost compared to alternatives, use against *Serpula lacrymans*, use against sapstain in freshly cut timber and use for preservation of piles and grillages.

Except for alternative active substances no additional alternatives for the use of borates were identified in the public consultation. The majority of respondents is in favour of renewing the approval of borates as active substances.

2.2.8 Stakeholder Survey

A stakeholder survey on alternatives was launched by ECHA from 11 September untill 7 Octobre 2020. The survey was sent out to 239 companies and 9 associations/federations (covered by 218 e-mail addresses). A total of 14 comments were received, 13 of which were unique as one respondent replied twice.

Out of 13 respondents, 4 indicated other active substances that are currently on the market that could replace borates. One respondent mistakenly answered “yes” to to this question, based on the information provided under other questions if becomes clear this respondent is of the opinion borates cannot be replaced by other active substances. The response of this one respondent to the question (“Are you aware of other substances currently available on the market as wood preservative with a different or same use that could be used to replace boric acid and disodium tetraborate pentahydrate?”) was therefore considered to be “no”.

Substances that were specifically named as alternatives by 3 respondents are: cypermethrin, permethrin, bifenthrin, quats (ADBAC, DDAC), IPBC, DCOIT, Bardap 26, azoles (tebuconazole, propiconazole), diamine (initial approval in progress) and copper (compounds).

With regard to the uses for which these active substances could replace borates, the information is very generic:

- One respondent indicated they have been producing wood preservation products for 35 years for preventive use in Use classes 1, 2 and 3.1 and curative use without the need to use borates as active substances;
- One respondent remarks borate-based products are mostly authorized for Use classes 1 and 2, less hazardous alternatives to borates are available for Use classes 3 and 4.

Out of 13 respondents 9 indicated other active substances that are currently on the market cannot be considered alternatives for the use of borates. One respondent provided extensive feedback on the background of this opinion: all alternatives have technical limitations in comparison to borates. These limitations include the unique mode of action, lack of potential of development of resistance in target organisms, penetration properties, corrosion inhibiting properties, flame retardant properties, buffering actions and stabilization properties. Another replicant confirmed the flame retardant properties are their main reason for not considering other active substances as alternatives to borates.

Two respondents indicated research and development has been undertaken to identify possible alternatives for the use of borates. One respondent stated such research and development was not undertaken by their company as in their opinion there is no suitable alternative for borates.

Only one company indicated non-chemical alternatives are available for the use of borates, in this case thermal modification of wood. However, the respondent went on to state that this method is unsuited for long-lasting protection in applications where the wood will become wet (e.g. Use classes 4 and 5). Furthermore thermal treatment influences the mechanical properties of the wood, making it less suited for load-bearing constructions or heavy duty use. Also, thermal modification does not offer protection against termites.

The stakeholder survey identified currently authorized active substances and thermal treatment of wood as alternatives for the use of borates. The additional information provided for these alternatives was lacking the level of detail required by the CA to fully assess the suitability of these alternatives. The majority of respondents was of the opinion that no suitable chemical or non-chemical alternatives for the use of borates are currently

available. Considering the low response rate of less than 6% (13 responses out of 218 surveys sent out) caution should be applied with regard to the representivity of the survey results.

2.2.9 Literature search

In order to identify alternatives for the use of borates a scientific literature search was performed (RIVM, 2020) using SCOPUS (SCOPUS, 2020). Only relevant post-1990 references were considered. Chemical, physical and biological alternatives were all considered. The following alternatives were identified in scientific literature:

- Thermal modification of wood, this alternative is not suited to replace all uses of borates, see impact assessment provided by the applicant (RPA, 2020);
- Chemical modification of wood, this alternative is not suited to replace all uses of borates, see impact assessment provided by the applicant (RPA, 2020);
- Treatment with alternative currently authorized active substances such as quaternary ammonium compounds, azoles and copper. As these substances are already authorized and included in the impact assessment provided by the applicant, these substances were not considered new or additional alternatives;
- Treatment with active substances that are not currently authorized such as essential oils (not included in Annex A of the BPR), pheromones (not included in Annex A of the BPR, use of pheromones by themselves to attract or repel wood-attacking organisms would fall under PT19, not PT8), fluorine compounds and extracts of thermally treated wood. In one or more scientific publications the fungicidal and/or insecticidal potential of these substances was investigated. For most of these substances research is in a very early stage and no complete dataset on efficacy and human and/or environmental safety is available. As none of these substances are currently authorized or undergoing evaluation as part of the BPR review program they cannot be considered current alternatives taking into account the deadline for renewal of the borates;
- Microwave treatment of wood, this method is only effective against wood-attacking insects and does not provide residual efficacy. As a result, it is not considered an alternative to the use of borates. This method is mostly used as a curative method followed by a preventive biocidal treatment. The method is also used for non-residual treatment of pallet wood (SKH, 2020).

The literature search identified a number of non-authorized (potential) active substances and microwave treatment as additional alternatives to the use of borates. For non-authorized (potential) active substnaces the lack of availability was considered to make them unsuitable as alternatives. For microwave treatment, the limited scope of application (no residual efficacy) was considered to make it unsuitable. Furthermore, the information from these references is insufficient to fully assess the suitability of the alternatives.

3. Overall conclusions

Taking into account information from the impact assessment, ECHA database of approved active substances, R4BP3 database of authorized biocidal products, public consultation, stakeholder survey and literature search on alternatives the BPC concludes that borates:

- Have some unique technical properties not found in other active substances. These properties include: flame retardant properties, metal corrosion inhibiting properties and high diffusion capability;
- Are crucial for control of the true dry rot fungus *Serpula lacrymans*. Non-renawal of borates results in an extremely limited number of active substances available for the control of this target organism;

- Are crucial for the control of sapstain in freshly cut timber. Alternative active substances are unsuited due to technical shortcomings (non-colourless, efficacious period to short) and/or higher costs. Non-chemical alternatives (e.g. kiln drying) do not offer residual protection, are more exepensive and insufficient capacity is available to treat all freshly cut timber;
- Are crucial for the curative and (subsequent) preservative treatment of piles and grillages. Although non-chemical alternatives are available, these are more expensive, invasive, and in case of hydrological manipulation, are difficult to implement at building level.

The BPC therefore concludes that for some uses of boric acid and disodium tetraborate pentahydrate no suitable alternatives are available.

Annexes

Reference list

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- RIVM, 2020. Literature search on boric acid alternatives. VSP rapportnummer 14969A00.

Non-confidential Annex

Table 1: Status of PT08 active substances

Substance	CAS-nummer	Status	Meets exclusion criteria?	Candidate for substitution?
Cu-HDO	312600-89-8	Approved	No	No
K-HDO	66603-10-9	Approved	No	No
Diamine	2372-82-9	Initial application for approval in progress	No	No
Polymeric betaine	214710-34-6	Initial application for approval in progress	No	No
ADBAC/BKC (C12-16)	68424-85-1	Approved	No	No
DDACarbonate	894406-76-9	Approved	No	No
DDAC	7173-51-5	Approved	No	No
Chlorfenapyr	122453-73-0	Approved	No	No
Hydrogen cyanide	74-90-8	Approved	No	No
Cypermethrin	52315-07-8	Approved	No	No
Etofenprox	80844-07-1	Approved	No	Yes
Permethrin	52645-53-1	Approved	No	No
Bifenthrin	82657-04-3	Approved	No	Yes
Fenoxycarb	72490-01-8	Approved	No	No
Disodium octaborate tetrahydrate	12280-03-4	Approved	Yes	Yes
Disodium tetraborate	1330-43-4	Approved	Yes	Yes
Disodium tetraborate decahydrate	1303-96-4	Approved	Yes	Yes
Disodium tetraborate pentahydrate	12179-04-3	Approved	Yes	Yes
Boric acid	10043-35-3	Approved	Yes	Yes
Boric oxide	1303-86-2	Approved	Yes	Yes
ATMAC/TMAC	61789-18-2	Approved	No	No
Dazomet	533-74-4	Approved	No	No
IPBC	55406-53-6	Approved	No	No
Penflufen	494793-67-8	Approved	No	No
Propiconazole	60207-90-1	Approved	Yes	No
Cyproconazole	94361-06-5	Approved	Yes	Yes
Tebuconazole	107534-96-3	Approved	No	Yes
Fenpropimorph	67564-91-4	Approved	No	Yes
Tolylfluanid	731-27-1	Approved	No	No
Dichlofluanid	1085-98-9	Expired	No	No
OIT	26530-20-1	Approved	No	No
DCOIT	64359-81-5	Approved	No	No
Trichoderma harzianum strain T-720	67892-31-3	Initial application for approval in progress	No	No
Creosote	8001-58-9	Approved	Yes	Yes
Potassium Sorbate	24634-61-5	Approved	No	No
Flufenoxuron	101463-69-8	Expired	No	No
Clothianidin	210880-92-5	Expired	No	Yes
Thiabendazole	148-79-8	Expired	No	No
Thiacloprid	111988-49-9	Expired	Yes	No
Thiamethoxam	153719-23-4	Expired	No	Yes
Bardap 26	94667-33-1	Approved	No	No
Basic Copper carbonate	12069-69-1	Approved	No	No

Copper (II) oxide	1317-38-0	Approved	No	No
Copper hydroxide	20427-59-2	Approved	No	No
Granulated copper	-	Approved	No	No

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