Section A5 Effectiveness against target organisms and intended uses

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			Official use only
5.1	**Function (IIA5.1)**	Wood preservative, fungistatic agent PT 08	X
5.2	**Organism(s) to be controlled and products, organisms or objects to be protected (IIA5.2)**		
5.2.1	Organism(s) to be controlled (IIA5.2)	Primarily fungi causing blue stain, but also mould infesting wood superficially.	
5.2.2	Products, organisms or objects to be protected (IIA5.2)	Freshly cut wood. Protection against infestation by blue stain and other wood disfiguring fungi for a limited time – between sawmill and further processing (up to 6 weeks).	X
5.3	**Effects on target organisms, and likely concentration at which the active substance will be used (IIA5.3)**		
5.3.1	Effects on target organisms (IIA5.3)	The effects on target organisms are presented by means of Sorbic acid, for being a well documented compound. However, the stated effects apply similarly to the acid's salts, in the present case Potassium sorbate, since the sorbate anion is the biochemically relevant moiety (A5.4/01, 02). The aqueous solution merely represents a more viable application medium for the envisaged biocidal use as wood preservative. Sorbates exhibit antimicrobial effects against a wide spectrum of micro-organisms, primarily fungi (including yeasts). The effect can be characterised as predominantly fungistatic. The most sensitive stadia are spores and conidia, which are prevented from germination by relatively low concentrations of the active, followed by germinating spores and fully developed mycelia, which require higher concentrations to inhibit growth. Sorbates are most effective against fungi at acidic pH. This is also discussed as the reason for the lower efficacy of Potassium sorbate in relation to the free acid (A5.4/02). With respect to wood preservation it should be noted that, since most wood species provide a slightly acidic environment, the dissociation equilibrium will be shifted towards the free acid even when Potassium sorbate is applied, thus resulting in satisfactory efficacy (also see Section B5.10.2).	

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5.3.2	Likely concentrations at which the a.s. will be used (IIA5.3)	The final concentration of the treatment solution will probably range between 3 and 10 % w/w. Treated wood is not foreseen to be exposed to outdoor weathering (rain, snow).
5.4	**Mode of action (including time delay) (IIA5.4)**	References: **A5.4.1/01:** Lück E, Jager M (1995) Sorbic acid. In: Antimicrobial Food Additives, 2nd Ed., Springer Verlag, Chapter 19 (published). **A5.4.1/02:** Lück E, Jager M, Raczek N (1998) Sorbic acid. Ullmann's Encyclopedia of Industrial Chemistry, 6th Ed., 10pp (published).
5.4.1	Mode of action	The antimicrobial effect of sorbates rests on a wide spectrum of different and relatively unspecific mechanisms: 1) Inhibition of enzymes of the carbohydrate metabolism, e.g., enolase or lactate dehydrogenase; furthermore, the sorbate interferes with several enzymes of the citrate cycle (A5.4.1/01, 02). 2) More generally, due to its double bonds, the sorbate forms covalent bonds with SH groups, thereby inactivating a broad range of enzymes. 3) Catalase and peroxidase are impaired. 4) The cell membrane is a further target: Sorbic acid inhibits absorption of amino acids and may partially destruct the cell membrane, thus leading to osmotic disturbance. The antimicrobial action of sorbates probably is a consequence of a combination of the above factors which may differ among various types of microorganisms, with some details remaining unexplained (A5.4/02). To cause its biocidal effect, the sorbate must penetrate the cell wall, which is only possible in undissociated form. This explains the higher effectiveness of Sorbic acid in relation to its salts. With respect to wood protection, the slightly acidic matrix that wood represents ensures the presence of free acid in sufficient amounts, independent of nature of the compound applied (in the present case Potassium sorbate). Due to the primary use of sorbates as food preservatives, the effects in question have predominantly been studied in food-spoiling microorganisms. Effectiveness against wood-disfiguring fungi (a) is likely on the basis of the broad spectrum of action and (b) has been demonstrated by the efficacy studies conducted in the context of this dossier (Section B5.10.2). Since information on the mode of action is textbook knowledge (A5.4.1/01, 02), more detailed studies are not provided.
5.4.2	Time delay	No information available.

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5.5 Field of use envisaged (IIA5.5)

MG02: Preservatives

PT 08: Wood preservatives

References:

A5.5/01:

[redacted] Statement concerning the use of potassium sorbate as biocidal product. [redacted]

A5.5/02:

[redacted] Statement of the UIC on use of TC 3 at the production of EUR-pallets. [redacted]

Potassium sorbate is intended for the temporary protection of freshly cut wood for the time between sawing (preparation of boards) and further processing or drying and should therefore not be considered as a conventional wood preservative. As, however, wood is treated, PT 08 is the appropriate product type under Directive 98/8/EC.

Potassium sorbate and Sorbic acid are mainly used as food preservatives and are approved for direct addition to food, thus for ingestion by humans. This excludes a strong antimicrobial effect. Potent antimicrobial action would, when a substance is quickly absorbed in the human body, most likely result in deleterious effects on somatic cells, or if absorbed only slowly, impair the intestinal flora. Both such effects would necessarily exclude authorisations for food use.

Potassium sorbate/ Sorbic acid will therefore only be used when protection of the sawed wood for a limited period of time is necessary but special safety considerations apply as for wood pallets used in the food industry. No other application in wood is currently intended.

As regards the application for which authorisation of Potassium sorbate/ Sorbic acid is sought, the wood is cut to measure and afterwards treated with Potassium sorbate solution by dipping or bathing. The sawmills normally use dipping or bathing processes, and other applications may only be used in rare cases. Instructions for use will limit the applications to dipping or bathing as the appropriate way of use.

The intended protection against mould growth, especially growth of blue stain originating from spontaneous infection is thereby achieved for several weeks. It is crucial to treat the wood immediately after sawing, since under warm and humid conditions as not uncommon in summer, mould growth can be so fast that visible discolouration establishes within hours after sawing. Heavily infested wood can only be sold, if at all, at substantially reduced prices. Only marginal to very limited stain is tolerated in practice.

Assembled pallets are usually dried in a drying chamber, not at least to reduce weight, as the water content in fresh-sawed pine may be

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well above 50 % in summer. As a consequence of the lower water content, the risk of mould growth is very limited.

Potassium sorbate/ Sorbic acid are characterised by their structural similarity to fatty acids. The Sorbate is therefore metabolised like fatty acids when the cell count is sufficiently high or the concentration is below the inhibitory level. Spiking tests can be performed reasonably only with cell counts equivalent to the spontaneous contamination to be controlled. Therefore, Potassium sorbate/ Sorbic acid is likely to fail standard tests for wood preservatives utilising inoculation with high cell numbers *a priori*. Therefore, Potassium sorbate/ Sorbic acid does not fulfil the requirements for allocation to one of the standard classes for wood preservatives and is not intended for such listing.

For special cases like the application described above, adequate performance criteria should be customised according to the particular and limited requirements of the specified application. Users of wood pallets often ban use of the normal wood preservatives and are interested in a treatment using an active of low concern. Application studies of "Holzforschung Austria", an internationally respected institute in this area, demonstrated efficacy of Potassium sorbate/ Sorbic acid for limited periods (cross-reference to B5.10.2/01). It should be noted that the applied laboratory test method uses constantly high humidity which favours growth of blue stain. In contrast, the water content of boards decreases during practical storage which favours the action of Potassium sorbate/ Sorbic acid compared to laboratory studies.

Practical experience in comparison to an agent used hitherto show acceptable performance of Potassium sorbate/ Sorbic acid under conditions as stated.

Storage of sawed wood (boards for pallets) until further use is generally below 3–4 weeks with the first few days being critical for mould infestation. Storage does normally not exceed 6 weeks.

Producers of pallets confirmed that protection of the sawed wood for 4 weeks is more than sufficient. In this application, treatment with conventional wood preservatives was widely banned by users. Therefore, pallet producers were forced to minimise the time between sawing and further processing and drying, and to limit it to very few days in summer. It has nevertheless not been possible to exclude mould growth completely which resulted in high rejection rates. It was confirmed that producers and users of wood-based packaging welcome the possibility of wood preservation with food preservative in the critical time, i.e. within the first few weeks after sawing. Drying of pallets has become standard practice by these companies for a long time.

Environmental exposure:

In view of the particular use, significant environmental emissions from wood in service are not expected. The pallets will not be continuously exposed to conditions that could induce leaching. Environmental releases during service life, if occurring at all, are expected to be diffuse and low.

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5.6	**User (IIA5.6)**	Professional/ industrial
5.7	**Information on the occurrence or possible occurrence of the development of resistance and appropriate management strategies (IIA5.7)**	
5.7.1	Development of resistance	Attempts to select various species of bacteria and fungi for resistance towards Sorbic acid were unsuccessful (A5.4/01, 02). Furthermore, a literature search conducted in order to retrieve corresponding information on resistance gave no evidence for resistance. Due to the wide spectrum of biochemical mechanisms making up the mode of action (5.4.1 oben), development of resistance seems generally very unlikely.
5.7.2	Management strategies	Since the development of resistance to date has not been reported, management strategies are not proposed.
5.8	**Likely tonnage to be placed on the market per year (IIA5.8)**	Data on produced/ imported tonnages are considered to be commercially sensitive and are therefore to be treated as confidential. These company-specific data are provided separately in Appendices 1–3 to Document III-A (confidential information, company-specific).

Evaluation by Competent Authorities	
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	
Materials and Methods	
Results and discussion	
Conclusion	
Reliability	
Acceptability	
Remarks	[redacted]
	COMMENTS FROM

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Subsection (Annex Point)

Date	
Materials and Methods	
Results and discussion	
Conclusion	
Reliability	
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