

Use of potassium bicarbonate as a fungicide in organic farming

This document discusses whether potassium bicarbonate could be allowed for use as a fungicide in organic crops. The argumentation follows the criteria proposed by the ORGANIC INPUTS EVALUATION project.

- **Use and necessity:** potassium bicarbonate can be used as a contact fungicide in a variety of crops, e.g. grapevine, pome and stone fruit, berries and soft fruit, vegetables and cereals. In Europe, efficacy trials are still underway at present. It is applied with standard spray equipment at a rate of 2 to 8 kg/ha, with a maximum of 8 applications per year. It mainly inhibits fungus mycelium development. Its mode of action is linked with osmotic pressure, pH and specific bicarbonate/carbonate ion effects. In some crops, potassium bicarbonate has the potential to replace copper or sulfur fungicides.
- **Origin:** Potassium bicarbonate is made industrially from carbon dioxide (CO₂) gas and potassium hydroxide (KOH).
- **Environment:** Potassium bicarbonate is naturally present in humans, animals, plants and virtually all living organisms. Under environmental conditions, potassium bicarbonate dissociates completely to potassium and bicarbonate ions and it is impossible to differentiate between ions naturally present and those of external origin. Bicarbonate is present in soil pore waters as a result of carbon dioxide liberated from the respiration of soil organism. Potassium (K) is an essential plant and microbial nutrient that has a natural cycle in soil of uptake and utilisation by plants and microbes, followed by release resulting from the decomposition of rotting organisms. Potassium input resulting from use as a fungicide is considerably smaller than the crops' potassium needs. Further, potassium bicarbonate has an extremely low toxicity to mammals and is not hazardous to the environment.
- **Human health:** Because of its extremely low toxicity, potassium bicarbonate presents no health risks to operators and bystanders, and its residues present no risks to consumers. It is a recognized food additive (E 501).
- **Public perception:** Potassium bicarbonate has been used for decades in medicine and everyday products (as a food ingredient and as a leavening agent in baking). Thus, it is perceived as a safe substance by consumers. In the farming community, the partial replacement of copper fungicides by potassium bicarbonate will be perceived favourably.
- **Consistency with organic farming traditions:** Baking powder (sodium bicarbonate) has been used by organic farmers for decades, and is still used as plant strengthener in Germany. Potassium bicarbonate is allowed for use in organic farming in the USA, and also by the IFOAM standards.

Summary and Conclusions

Potassium bicarbonate occurs in nature, is an effective fungicide, and is safe for humans and the environment. As a fungicide, it has the potential to replace copper and sulphur in some crops. However, for commercial use it has to be synthesized. In conclusion, its advantages clearly outweigh the disadvantage of synthetic manufacture and it will be favourably perceived by consumers. We therefore recommend the use of potassium bicarbonate as a fungicide in organic farming.

Bernhard Speiser and Lucius Tamm

This document is based on a criteria matrix developed by the ORGANIC INPUTS EVALUATION project (see www.organicinputs.org) and is intended as a basis for discussion by standard setting institutions. The conclusions are based on the present knowledge and may be modified if new information becomes available.