

Basic Substances, a Sustainable Tool to Complement and Eventually Replace Synthetic Pesticides in the Management of Pre and Postharvest Diseases: Reviewed Instructions for Users

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Concerns about synthetic pesticide residues on fresh produce and promoting sustainable agriculture, viable alternatives are needed to maintain productivity, ensure food quality, and meet retailer demands for lower pesticide levels. Basic substances are relatively novel compounds that can be used in plant protection without neurotoxic or immune-toxic effects and are still poorly known by phytosanitary consultants (plant doctors), researchers, growers, consumers, and decision makers. The focus of this review is to provide updated information about 24 basic substances currently approved in the EU and to summarize in a single document their properties and instructions for users. Most of these substances have a fungicidal activity (calcium hydroxide, chitosan, chitosan hydrochloride, *Equisetum arvense* L., hydrogen peroxide, lecithins, cow milk, mustard seed powder, *Salix* spp., sunflower oil, sodium chloride, sodium hydrogen carbonate, *Urtica* spp., vinegar, and whey). Basic substances can meet consumer demand for produce with minimal pesticide residues, potentially replacing synthetic pesticides. Large-scale trials are crucial to determine optimal dosage and application strategies for basic substances in diverse agricultural settings.

Approved basic substances

Allium cepa bulb extract¹ Beer¹ Calcium hydroxide

Chitosan Chitosan hydrochloride² Clayed charcoal³ Cow milk⁴

Diammonium phosphate⁵ *Equisetum arvense* L. Fructose² Hydrogen peroxide

L-cysteine⁶ Lecithins Mustard seed powder Onion oil⁷ *Salix* spp. cortex

Sodium chloride² Sodium hydrogen carbonate⁸ Sucrose²

Sunflower oil Talc E553B⁹ *Urtica* spp.¹⁰

Vinegar⁸ Whey⁴

Fungicide

Fungicide and bactericide

Fungicide and insecticide

¹Molluscicide; ²Elicitor; ³Protectant;

⁴Virucide; ⁵Attractant; ⁶Insecticide;

⁷Repellent; ⁸Herbicide;

⁹Insectifuge, fungifuge; scent

masking; ¹⁰Acaricide

Examples of requests from the retailer of the amount of the Maximum Residue Level (MRL) and Acute reference doses (ARfD).

| Retailer | Max. %MRL/Active Substance | Max. Sum %MRL/Sample | Max. %ARfD/Active Substance | Max. Sum %ARfD/Sample | Max. Number of Active Substances/Samples |
|------------------|----------------------------|----------------------|-----------------------------|-----------------------|--|
| ALDI/HOFER | 70% | 80% | 70% | 80% | 3-5 |
| ALBERT HEIJN | 50% | - | 50% | - | - |
| ASDA | 80% | - | - | - | - |
| BILLA | 100% | - | 100% | - | - |
| DOHLA | - | 70% | - | 70% | 3-5 |
| EDEKA | 70% | - | 100% | - | 5 |
| EDEKA OWN BRANDS | 50% | - | 70% | - | 5 |
| GLOBUS | 70% | - | 70% | 100% | 5 |
| LIDL | 33.3% | 80% | 100% | - | 5 |
| KAUFLAND | 33.3% | 80% | 50% | 50% | 5 |
| NORMA | - | 70% | - | 70% | 5 |
| METRO | 50% | 80% | 70% | 100% | 5 |
| MIGROS | - | - | - | - | 6 |
| NETTO | 70% | - | 100% | - | 5 |
| REWE | 50% | 100% | 70% | 100% | 5 |
| REWE OWN BRANDS | 50% | 100% | 50% | - | 5 |
| TEGUT | 70% | - | 70% | - | Max. 4 (>0.01 mg/kg) |
| TENGEL MANN | 70% | 150% | 70% | 100% | - |

CONCLUSIONS

The use of basic substances is in line with the restriction on applying chemical PPPs and the principles of the European Green Deal and SDGs, mostly renewables and with no MRL. There is relatively poor information about the effectiveness of basic substances compared to synthetic pesticides and biological PPPs.

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REFERENCE

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