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Biofungicides for the control of diseases and pests in vegetable crops

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New bioproducts that have repellent and toxic effects against pests, due to the natural compounds they contain, are already being introduced into plant protection technologies. The presented botanical and bioproducts are registered and authorized for use in organic vegetable production.

Treatment with chemical plant protection products (PPPs) is an easily applicable and effective method for pest control.

Pests, however, are highly variable and easily develop resistance to pesticides. The global chemical industry continuously enriches the market with new PPPs based on new active substances. The majority of them are highly effective, with a broad spectrum of activity. A key

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requirement, in addition to their good biological activity, is their selectivity towards beneficial species.

Today, an important condition in modern vegetable production is obtaining produce free from pesticide residues and protecting the environment. This necessitates reducing the use of pesticides and including alternative means in plant protection systems. New pesticides based on plant extracts (phytopesticides) are already being introduced into plant protection technologies; they have repellent and toxic effects against pests due to the natural compounds they contain – alkaloids, esters, glycosides, etc. Biopreparations are microorganisms or products of their vital activity. They may be: bacterial, fungal and viral preparations. They are characterized by a number of positive aspects: they do not pollute the environment; they have a narrow specialization and do not induce resistance.

Mineral and vegetable oils (mint, pine, cumin) have insecticidal, acaricidal and fungicidal effects. High insecticidal activity against Myzus persicae Sulz. has been established when using crude soybean oil, and refined rapeseed oil significantly reduces the number of plants infected with Cucumber mosaic virus (CMV).

Essential oils from anise, dill and basil have a toxic effect and reduce the population density of M. persicae. This is an alternative option for reducing chemical treatments.

Biofungicides

TIMOREX 66 EC (66% oil from Melaleuca alternifolia) Manufacturer: Biomor Timorex 66 EC is a natural product. It is an oil extract from leaves and shoot tips of the Australian tea tree Melaleuca alternifolia. A biological foliar fungicide with contact and protective action against fungal and bacterial pathogens. Active substance: Aqueous emulsion, tea tree oil, vegetable oil, sodium bicarbonate, water. Mode of action: it has excellent protective and eradicative activity, inhibits spore germination, stops mycelial growth and blocks infection development. Registration: In Bulgaria Timorex 66 EC is registered against: Powdery mildew (Erysiphe cichoracearum and Sphaerotheca fuliginea) on greenhouse cucumbers. In other countries it is also registered against downy mildews and alternarioses. Dose: Applied at the following rates: 0.5% (500 ml/ha) for preventive treatment at 7–10 day intervals; 1.0% (1000 ml/ha) at high infection pressure. Spray volume 4000 l/ha.

Timorex Gold (botanical fungicide)

Manufacturer: Biomor, member of the Stockton Group.

Active substance: plant extract from Melaleuca alternifolia.

Mode of action: It has multiple effects – suppressive, curative and protective, against fungal and bacterial diseases. It demonstrates efficacy similar to that of systemic fungicides and is certified

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for conventional and organic production. It leaves no residues. An environmentally friendly fungicide, harmless to beneficial insects and bees.

Registration: Timorex Gold is registered against a broad spectrum of fungal pathogens: Ascomycetes, Deuteromycetes and Oomycetes, causing diseases in bananas, tomatoes, peppers, watermelons and melons, cucumbers, mango, strawberries, raspberries, grapes, peaches and others. In Bulgaria it is registered against powdery mildew (Erysiphe cichoracearum and Sphaerotheca fuliginea) on greenhouse cucumbers.

Dose: used at a concentration of 0.5%–1%.

Trilogy – botanical pesticide

Trilogy contains a natural oil extract from the seeds of the Neem tree. It has a broad spectrum of activity. It is effective against pathogenic fungi, insects and mites. As with other PPPs based on vegetable oils, Trilogy should be applied early in the morning or late in the evening in order to minimize the risk of leaf scorch.

Active substance: hydrophobic extract of Neem oil.

Concentration: 1–2%

Registration: Trilogy controls powdery mildew, rust, black leaf spots, aphids, whiteflies and mites.

Spray interval: 7–14 days

Preharvest interval: none.

Enzicur is a natural enzymatic fungicide. It contains the enzyme lactoperoxidase.

Manufacturer: Koppert

Active substance: potassium iodide – 52 g/kg and potassium thiocyanate – 22 g/kg. Mode of action: The product has a strong curative effect and no protective action. It should be used after the first symptoms of powdery mildew appear. Registration: Against powdery mildew Oidium spp., Leveillula taurica, Sphaerotheca spp.

Dose: 0.15%.

In order to achieve a good effect from the use of the product, it is necessary that plants which are infected and show symptoms of powdery mildew be thoroughly moistened beforehand and remain wet for 10–20 minutes after spraying. If the infected plant is dry and is sprayed with Enzicur, the product will have no effect!

Use only in the presence of powdery mildew infection!!! The product has no protective effect – it is curative only!

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Fusaclin Granulate – biological soil fungicide

Active substance: Fusarium oxysporum var. lycopersici.

Dose: The product is applied several times, which ensures reliable protection against soil-borne pathogens. – first application – 200–250 g of the product per square metre incorporated into the soil before planting the crops. – second application – at transplanting to the permanent site, 2–3 g of the product in the root zone of the plants. – third application – at the 7–8 leaf stage, which is the most susceptible to Fusarium infection. The dose is 2 g of the product around the stem of the plant. In this way a very good level of protection and a constant presence of the fungus during the vegetation period is maintained, which is a guarantee of effectiveness. Registration: In Bulgaria the product is registered against soil-borne pathogens Fusarium, Pythium, Rhizoctonia in greenhouse cucumber production.

Mode of action: The product FUSACLIN GRANULATE has a strong preventive effect.

Trichodermin NPA, Trichodermin NG

Manufacturer: ET Prof. G. Neshev. Trichodermin is a harmless biological fungicide that protects plants from soil phytopathogens.

The activity of the product is due to the presence of the fungus Trichoderma sp. strain 6, which suppresses the development of phytopathogenic fungi such as Fusarium, Verticillium, Pythium, Rhizoctonia and others.

Registration: The product is registered in Bulgaria at the following rates:

Trichodermin NPA – 10–20 kg/ha

Trichodermin NG – 5–15 kg/ha

Mode of action: The bioagent Trichoderma colonizes the soil around plant roots and protects them from pathogenic fungi through the following four mechanisms:

1. Competition for space and nutrients;

2. Secretion of biologically active substances;

3. Mycoparasitism – Trichoderma can grow on the mycelium of phytopathogenic fungi, enzymatically degrading it and feeding on the resulting substances – thus physically destroying the pathogen;

4. Improving plant condition.

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Polyversum – Biofungicide with dual action.

Active ingredient: Pythium oligandrum

Registration:

A) Control of soil-borne pathogenic fungi Pythium spp., Fusarium spp., Botrytis spp., Phytophthora spp., Alternaria spp.,

B) Stimulates growth and strengthens plants.

Supports germination and uniform plant growth.

Dose:

0.5 g/100 g seed for semi-wet seed treatment. During the growing season 10 g/ha with 200 l water, 2–4 treatments.

Suitable for organic production.

Cucumbers: Fruits grow faster. Increases resistance to Pseudoperonospora cubensis.

Tomatoes: Strengthens plants, increases the number of fruits and has a protective effect against Phytophthora infestans. In the presence of infection, soil drenching may be carried out.

Pepper: Increases yield (greenhouse).

Cabbage: Increases yield and protects plants against certain diseases: Clubroot (Plasmodiophora brassicae), Rhizoctonia solani.