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**Instructions for Use
of “April” PHMG in Agriculture to Increase Crop Yield and Quality of Crops**

**1. General Information**

1.1. “April” PHMG is solid polyhexamethylene guanidine hydrochloride, transparent to light-yellow crystals of different size.

1.2. “April” PHMG is an antimicrobial agent protecting soil against water and wind erosion and killing fungi and pathogens in contaminated soil. In crop growing the agent is used for fungicidal treatment of seeds; for management of various diseases of vegetating plants; and for increasing storage life of crops during winter storage.

1.3. By its acute toxicity parameters, “April” PHMG is classified as a class 3 moderately hazardous substance per GOST 12.1.007-76 if ingested, and class 4 low-hazardous substance in contact with the skin. If inhaled in saturating concentrations, the vapours are low toxic and classified as hazard class 4 by their volatility. “April” PGMH has prominent local irritating effect. The threshold of one-time local irritating effect of the agent solution is above 20% concentration, and the threshold of repeated local irritating effect on the skin is at 1% concentration. In case of contact with eyes, the agent has distinct irritating effect on the mucous membrane, involving the cornea, which may pose a risk of vision loss.

1.4. The maximum permissible concentration (MPC) of polyhexamethylene guanidine hydrochloride (PHMG-HC) in air in working zones is 2.0 mg/m3 (in spray).

1.5. The agent can be stored in sealed original packaging during 3 years; freezing and defrosting has no effect on properties of the active substance. The agent should be kept away from children.

1.6 Before use PHMG crystals should be completely dissolved in water.

**2. Instructions for Use**

2.1. **In crop growing:**

2.1.1 *PHMG for treatment of seeds and tubers*

Planting stock (seeds, tubers and bulbs) is often contaminated with plant pathogens. Planting such stock will result in development of plant diseases such as mycosis, bacteriosis and viral diseases, with fusariosis, mold of seeds and root rot etc. the most common among them. Therefore, seeds are usually treated with chemical biocides before being planted.

Treating stock before planting with 0.1-1.0% aqueous PHMG solution in concentration 100 g of the agent per ton of tubers or seeds is the most common method used to fight diseases of crops.

Laboratory tests have revealed that treatment of seeds with such 0.1-1.0% aqueous PHMG solution (in concentration 100 g of the agent per ton of seeds) ensures 96.7% protection against septoriosis and almost 100% protection against contamination with *Fusaria* and *Helminthosporia.* Such treatment is more effective than 10-time concentrations of imported protectants such as benomyl, baitan, fundazol and thiuram.

2.1.2 *PHMG for treatment of plants*

PHMG solutions are rather effective for protection of vegetating plants contaminated with *Septoria*, *Fusaria*, *Helminthosporia*, *Alternaria* and *Phytophthora.* Such treatment is safer and more effective than treatment with imported agents. It helps to improve crop yield of horticultural, vegetable and cereal crops.

In case of detection of any symptoms in vegetating plants, such plants should be treated with 0.01-1.0% aqueous PHMG-phosphate-based solution.

2.1.3 *PHMG for soil treatment*

0.01% PHMG solution (50-100 g per ha) effectively decontaminates soil and ensures long-standing protection of plants against infectious diseases caused by bacterial, viral and fungal plant pathogens. Such treatment also reduces toxin concentrations in agricultural products.

Thanks to its high chemical and biocidal activity, PHMG binds pesticides and herbicides in soil transforming them into complexes non-toxic for plants. At the same time, it kills plant pathogens.

Our Company offers a composition containing humic acids, QACs and PHMG in proportion 1:1-2:1 (mass %) and water, which is used to remove pesticides from soil. This composition considerably improves crop yield and effectively fights plant pathogens.

2.1.4 *Fungicidal and seed growth stimulating properties of PHMG*

Treatment of seeds with biologics, growth-regulating chemicals and bio- and microfertilizers is an effective method to boost plant immunity, to increase germinating power and field survival of seeds and to improve crop yield. Treatment with undiluted PHMG increases crop yield by 13%. Such treatment includes 3 stages: 1) Treatment of seeds (200 mL per ton); 2) Treatment of tillering crops (200 mL per ha); and 3) Treatment of booting crops (200 mL per ha). Such treatment improves growth, development, tillering capacity and yield of cereal crops.

2.2 **Treatment and storage of agricultural products:**

Treatment of vegetables, fruits and grain in vegetable stores with PHMG disinfectant solutions reduces the risk of development of viral, bacterial and fungal infections and, thus, the risk of loss of crop. PHMG-phosphate-based solutions are used to treat vegetables and fruits before their dispatch for storage. Such solution covers fruit surface with a very thin polymer film, which will protect the treated fruits against various microorganisms but, if required, can easily be washed away with water.

2.2.1 *Pre-sowing treatment* is carried out with 0.1-1.0% PHMG solution (70 L per ton of seeds), which inhibits growth of pathogenic microflora in vegetable seeds.

2.2.2. *Potato*: The tubers should be treated with PHMG solution in mounds no more than 50 cm high, or on conveyor belts of loaders. The agent dose for treatment with 0.1-0.5% solution should be 50 to 70 L per ton (50 to 250 g per ton) of potato. The treated tubers should be planted the next day after treatment, which will facilitate earlier (by 3-4 days) and more concurrent emergence of seedlings; will prevent their contamination with *Phytophthora* and drying of stalks; and will increase crop yield from 184 to 215 cwt per ha. Vegetating potato plants should be treated with 0.01-0.10% aqueous PHMG solution (with standard consumption 1.2 kg per ha), which will improve crop yield by 62-63 cwt per ha.

Dosage: 0.25% aqueous PHMG-phosphate solution applied to potato tubers before dispatch for winter storage inhibits growth of all common causative agents. Potato tubers should be sprayed or washed with the solution. At the same time, there is no need to dry the treated tubers. The effect produced will persist during the entire five-month period of winter storage.

2.2.3. *Cucumber*: Treatment of vegetating cucumber plants with 0.1-1.0% aqueous PHMG solution (with standard consumption 1.2 kg per ha) improves crop yield by 40 cwt per ha.

2.2.4. *Tomato*: Studies showed that treatment of seeds with 0.1-1.0% aqueous PHMG solution improved crop yield by 50 to 190 cwt per ha. In order to prolong their storage life, tomatoes should be treated with 0.1-0.5% PHMG-chloride or PHMG-phosphate solution. After treatment, tomatoes should be stored at 20 to 25°C in perforated polyethylene bags. Such approach ensures 80% storability during a month.

2.2.5. *Carrot and cabbage:* The vegetables should be treated with 0.1% aqueous PHMG-phosphate solution and then stored in perforated polyethylene bags. The treated vegetables can be stored at 22°C during 2 weeks.

2.2.6. *Apples*: The fruits should be treated with 0.05% PHMG-phosphate solution and then stored in crates at 22°C.

2.2.7. *Oranges*: Treatment with 0.2% PHMG solution ensures 5-time increase in storage life of the fruits.

2.2.8 *Tobacco:* Spraying of leaves at the active growth phase with 0.01% PHMG-phosphate solution (100 g per ha) reduces the risk of development and spread of diseases caused by plant pathogens by 90 to 96%. At the same time, the solution does not have any negative effect on growth and development of tobacco.

**3. Safety Measures and First Aid in Case of Poisoning**

3.1. Pregnant women, breast-feeding mothers, and minors (younger than 18) must not be engaged in disinfection using the agent. It is prohibited to smoke, drink and eat in the process of disinfection.

3.2. In case of accidental leakage or spill of the agent, it should be diluted or washed away with plenty of water.

3.3. When handling the concentrate, avoid its direct contact with skin and eyes. After handling the concentrate, wash your hands and face with soap thoroughly. In case of contact with eyes, keep washing them with tap water during 10 to 15 min. If hyperemia develops, use 30% sulfacyl sodium eye drops. Call a doctor, as appropriate.

3.4. Inhalation toxicity (with vapours) is unlikely, since the agent is low volatile.

**4. Transportation, Storage, and Packaging**

4.1. “April” PHMG can be transported by any mode of transport as provided by relevant transport regulations.

4.2. The agent should be stored in warehouses away from heaters and open fire at temperatures from 0°C to + 55°C. Defrosting does not affect application characteristics of the agent.

4.3. The agent is delivered in polyethylene containers of different capacity.

**5. Environmental Protection Measures**

5.1. Prevent penetration of undiluted product into waste, surface and subterranean waters and into sewage.

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