

Efficiency of foliage applications of copper fungicides in sowings of winter wheat

Aim. To investigate efficiency of row of inorganic fungicides on the basis of copper against the causative agent of farinaceous dew, their influence on the productivity and on content of copper in grain of wheat winter-annual. **Methods.** Field tests, statistical analysis. Content of copper in grain of wheat was determined by the method of emission Mass spectrometry. **Results.** High activity of fungicides is shown on the basis oxychloride and sulfate of copper against the causative agent of farinaceous dew. Application of these fungicides gives an opportunity to promote structural indexes and productivity of wheat of winter-annual without the increase of content copper in grain. **Conclusions.** Preparations on the basis of copper — Kocide 2000, Meteor, XOM are the important components of technologies of feed of wheat winter-annual, especially on soils with subzero content of microelements.

Key words: farinaceous dew, copper fungicides, Triticum of aestivum of L., productivity

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A wheat is one of cultures that is most cultivated in the whole world. Hasty growth of population and reduction of sowing areas require creation of new high-yield varieties and developments, that would give an opportunity of wheat to realize the genetic potential [4]. The increase of the productivity increases the requirements of plant in macro - and microelements. A copper is important microelements, by a necessity for development of plants of wheat and forming of valuable ear and gap-filling grain. It should be noted that even the small deficit of element results in the decline of the productivity.

During a vegetation period, sowing of wheat winter-annual can be struck by numerous mushroom diseases that result in the loss of harvest. Fungicides that use for control require to the 20% charges on growing of wheat [7, 11]. Among mushroom diseases it costs to distinguish most widespread: farinaceous dew, brown puff blight, ear, yellow blight and root to the rot [5]. Farinaceous dew of cereal [causative agent *Blumeria graminis* (DC) of Speer] it is widespread illness of cereals, especially in the districts of growing of winter-annual to the wheat and barley [10]. A mushroom predetermines the premature dying off of sheets, плюсклість of grain and decline of the productivity. Fungicide properties of copper do her the important component of many agrochemicals. At the same time, as a copper belongs to the heavy metals, her content in grain must be carefully controlled. Many fertilizers and fungicides that contain a copper are registered in Ukraine. Information in relation to their biological activity is limited.

Aim of researches — to define efficiency of row of inorganic fungicides on the basis of copper against the causative agent of farinaceous dew, their influence on the productivity and on content of copper in grain of wheat winter-annual.

Methods of researches. A test the wheats of winter-annual in the Experienced agricultural production of Institute phytophysiology and genetics of NAS of Ukraine carried out on sowing the Registration area of areas presented 100 m². Control variants without treatment and background of N150P80K80 served as. The amount of movable forms of copper presented in soil <0,5 мг/кг [6]. The chart of experience foresaw treatment the fungicides known at the market of Ukraine on the basis of copper: (DuPont) 150 gs/and; Meteor, с.п. (of Sunrise of chemicals) 68 gs/and, Oxychloride of copper (of UkragroService) 70

gs/and, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (Reaxim) 83 gs/and. The concentration of Cu^{2+} in all solutions was identical and presented 0,35 mol/l.

The inspection of sowing and account of defeat of plants conducted in spring at the end of bushing out — at the beginning of exit in a tube. Intensity of defeat of plants was determined after the actually busy at мицении area of sheet and stem, expressed in points: 0 — illness is not, a plant is healthy; 1 (very weak) are single pillows of mushroom on sheets of understory, staggered to the 10% area; 2 (weak) is a moderate amount of pillows of mushroom on sheets of understory, 11-25% areas are staggered; 3 (middle) — on bottom sheets development is considerable, on overhead — the pillows of mushroom are dissipated, 26-50% areas are staggered; 4 (strong) — all sheets and merithallus are strongly staggered, pillows meet with numerous, staggered over 50% areas. An ear can be struck [1].

The table of contents of copper in grain was determined by the method of mass spectrometry with the inductively constrained plasma on Agilent 7700x after ozonation of standards (0,400 r) in the aquafortis of qualification of ICP - grade in the microwave system of Milestone Start D. As a gauge standard was used by solutions of Multielement of standard solution 5 for of ICP (Fluka).

The dispersible and cross-correlation analyses of the obtained data carried out in the program «Statistica 6.0».

Results of researches. The fungicide action of preparations of copper was observed already in 2 weeks after treatment. High efficiency against a causative agent was characteristic for $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, $\text{CuCl}_2 \cdot 3\text{Cu}(\text{OH})_2$ and Water-soluble

$\text{Cu}(\text{OH})_2$ (tables). For comparison of action of 2th preparations on the basis of copper (of Meteor) the best fungicide properties are marked 2000. Most investigational copper fungicides are characterized by the high level of solubility in water, unlike a variant from $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. Without regard to the high solubility declared a producer, during preparation of working solution there were uncut-in crystals of salt.

Sharma with employees [12] showed that the main source of receipt of heavy metals in the organism of man is a consumption of muddy by them meal. FAO (food and agricultural organisation), WHO (world health organization) and other organizations in the whole world severely regulate content of heavy metals in foodstuffs [8, 9].

In our experiments treatment preparations on the basis of copper in the phase of Tubing resulted in the insignificant vibrations of content of element in grain of wheat. Some decline of amount of copper in variants with $\text{Cu}(\text{OH})_2$ can be explained by the effect of breeding. The coefficient of correlation presented between content of copper in grain of wheat and productivity - 0,6. It testifies that the increase of the productivity of culture is accompanied by the decline of content of copper in grain.

Application of fungicides in the phase promoted the productivity of wheat winter-annual on 5-6,5 c. An exception presented a variant with the sulfate of copper, where the meaningful increase of the productivity was not observed statistically. In works with employees [2, 3] it was also shown that application of composition of copper with herbicides of group τ gives an opportunity to enrich plants the elements of feed and to promote the productivity of wheat winter-annual.

A valuable nitric feed of plants is a necessity for the receipt of high harvests. At the same time at plants that is grown on the high background of nitric fertilizers, the symptoms of deficit of copper appear. In turn, a copper can assist to more active development of plant through the increase of efficiency of the use of nitrogen. In a robot Yakout i of Bitar it is shown that signup in combination with nitric fertilizers gives an opportunity considerably to promote the productivity of wheat a copper [4, 13].

Conclusions

Preparations on the basis of copper — Kocide 2000, Meteor, XOM are the important components of technologies of feed of wheat winter-annual, especially on soils with subzero maintenance of microelements. As a copper is the important component of of plants, her application assists to more active development of plant that appears in the increase of structural indexes of harvest and increase of the grain-growing productivity of plants of wheat winter-annual. Treatment of plants fungicides on the

basis of copper is effective for control after farinaceous dew. Non-permanent позакореневе application of copper in the period of vegetative development does not result in the increase of her content in grain.

Thus, preparations on the basis of and oxochloride of copper are the important constituents of the systems of feed and protecting from illnesses of the high-performance sowing of wheat winter-annual.

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