

FUNGICIDE SYSTEMS OF POTATO PROTECTION USED IN TERMS OF INTENSIVE AGRICULTURAL TECHNOLOGIES

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The conducted testing of the potato crop protection system with preparations of the enterprise "Adam" has shown high efficiency of this treatment scheme, especially in terms of high wetness, approving itself in significant containment of leaf phytopathogens and pests during the growing season. The resulting crop of potatoes has significantly exceeded qualitative and quantitative indices of control fields where they were used standard production technologies.

Reduction in yields, protection systems, fungicide, potato varieties, late blight pathogens.

Potato crop is one of the most popular not only in Ukraine but in the whole world. During the growing season and the period of storage plants and tubers can be affected by over 40 different pathogens causing different fungal diseases. The development of these pathogens during plant growth leads to reduction in yields, reaching 23-29%, and during the storage period they can reach 30-40% [1]. Affected tubers are also a source of infection for next year plants and during their planting can lead to significant reduction in yields and affect the germination of plants at the beginning of the growing season. In today's world there are no varieties with complete resistance against pathogens causing major diseases. Due to the rise in temperature that adversely affects the stability of host plants, it respectively increases the risk of fast development of fungal diseases. Development of modern fungicides and putting them in technological scheme is one of the priority areas of research hold in leading manufacturers of pesticides and research laboratories. Examples of such modern systems of protection against late blight are such as Pro_Plant expert, ISIP (Germany) and PhytoPRE (Switzerland).

According to modern protection technologies, treatment is done with contact and combined preparations. The first treatment is done with combined preparations, which, unlike the contact ones, quickly penetrate the plant and redistribute in it, providing protection of growing and newly formed shoots. The most effective preparations of the combined action – Rydomil Gold MC, Thanos, and Acrobat MC – are applied up to two treatments at intervals of 10-14 days before flowering [2]. The main disadvantage of such fungicides is the emergence of resistance to the system component in pathogens. Therefore, all the combination preparations are used before the flowering period, after which the treatment is carried out only with the fungicides of contact action. Contact preparations can be used for the first treatments as well, but they are often washed away by rains, so the treatment should be repeated if within a period of 1.5 hours it has fallen 3 mm of precipitation. The high effectiveness against pathogens causing potato leaf spot has shown the protection system, which involves alternating treatments with contact and system-contact fungicides in every 10 days, and spraying with fungicide of only contact action, which includes the active substance mancozeb. It was established that in unfavorable conditions for the development of pathogenic fungi, the norm of preparation use can be reduced [3, 6].

According to the mechanism of action against late blight pathogen fungicides are divided into the following: 1) the protective action – spores die before germination or penetration. Fungicide must be either on or inside the leaf (stem) before spore germination or penetration; 2) therapeutic action – the fungicide is active against the causative agent immediately after infection but before the symptoms are noticeable; 3) eradicating action – the agent is neutralized in sporulated lesions preventing the further development of lesions.

This method of action prevents sporangiophores and has anti sporulate activity [4, 5].

It is known that the use of fungicides based on phenylamides contributes to the emergence of resistant strains of rot pathogens and reduces the effectiveness of other system components of the mixture. Such resistant to the phenylamide

fungicides strains are widespread in Europe and fenylamides are used only in mixtures containing protective fungicides. Effectiveness of fenylamide component for control of rot development depends on the proportion of resistant strains among the pathogen population. When resistant strains are present in large numbers, the protective effect on newly formed leaves and tubers is reduced.

The aim of research was to evaluate the effectiveness of the use of protection technology for potato crops, offered by enterprise “ADAMA”.

Materials and methods of research

The studies were conducted in public fields of Ltd “Eldorado”. The size of the test plots is 25 m². Repetition is threefold.

Herbicide treatment: – Mistral®, 0.8 kg/ha.

Fungicide-insecticide treatment: – Areva Hold® (2 kg/ha) + insecticide Kohinor TM (0.25 l/ha); – Areva Gold® (2 kg/ha) + Bandzho™ (0.3 l/ha) + Eco Oil Spray (1 l/ha) + insecticide Pirineks® (1.5 l/ha); – Sfinks™ Extra (2 kg/ha) + Kohinor™ (0.25 l/ha) + Eco Oil Spray (1 l/ha); – Folpan (2 kg/ha) + Eco Oil Spray (1 l/ha) + Kohinor™ (0.25 l/ha); – Bandzho™ (0,4 l/ha) + desiccant.

Statistical data processing was carried out by conventional methods [6].

Results and analysis

According to the technology, the first treatment was carried out at the beginning of the growing season after ridge forming with herbicide Mistral® (metribuzin, 700 g/kg) in a norm 0.8 kg/ha. This preparation is characterized by a wide range of effects on bipartite and some grassy weeds. The use of herbicides on potato crops allows improving gas exchange, saving for young potato shoots the necessary moisture as well as organic and mineral matter in the soil, and reducing infectious background of the pathogens, which can reproduce themselves on wild plant species. It is believed that it is advisable to apply herbicides for weed number of 5 units per 1 m². As a result of accounting it was proved high efficiency of this herbicide, which was stable up to the end of the growing season of potatoes.

The second treatment was performed under the experiment scheme prophylactic fungicide-insecticide treatment (Areva Gold®, 2 kg/ha + Kohinor™

0.25 l/ha). Fungicide Areva Gold® (dimethomorph 90 g/kg + mancozeb 600 g/kg) is the preparation of systemic-local and contact action. The high efficiency of its components is well known, particularly against blight and *Alternaria* in potatoes, in addition the fungicide has anti sporification effect (table). Insecticide Kohinor™ is a systemic preparation from the class of neonicotinoides applied against homopterous insects (*Homoptera*), beetles (*Coleoptera*), butterflies (*Lepidoptera*) and other pest insects. The conducted spraying significantly reduced the population of Colorado potato beetle in potatoes, the amount of which was significantly lower according to pest population density. Besides, after treatment it was found a significant inhibition on the potato leaves of pathogens causing late blight and *Alternaria* (dry spot).

The effectiveness of fungicidal active ingredients used to control late blight in Europe (Huub Schepers, Erno Bouma, 1998)

Active component	Fluazinam	Mancozeb or Maneb	Dimethomorph
The interval between spraying	7	7	7
Effectiveness			
Leaf rot	+++	++	++(+)
The new point of growth	0	0	0
Stem rot	+	+	++(+)
Tuber rot	++(+)	0	++(+)
Mode of action			
Protective	+++	++	++(+)
Treating	0	0	++
Exterminative	0	0	+
Before rain	++(+)	++	++(+)
Mobility	Contact	Contact	Translaminar

Note: 0 is no effect; + is moderate effect; ++ is good effect; +++ is very good effect.

The next four sprayings provided by potato protection technology showed low preparation efficacy against a complex of pests and pathogens. In particular, the mixtures included insecticide ECO OIL SPRAY (paraffin mineral oil, 820 g/l), which is the contact preparation against harmful insects on the basis of highly purified mineral oil having repellent effect on certain types of insects; Bandzho™ fungicide (fluazinam, 500 g/l), the preparation inhibiting sporification in zoosporangium; fungicide Sfinks™ Extra (dimethomorph, 113 g/kg + folpet, 600

g/kg) contact-system agent, which is used in the later stages of growth and leads to various functional alterations in pathogens; fungicide folpan (folpet, 800 g/kg) - contact preparation with a wide spectrum of effect, designed to combat late blight of potato.

The last treatment was done with fungicide Bandzho™ (fluazinam, 500 g/l) in a mixture of desiccant to reduce the development of pathogens in tubers that will be laid in store houses for next year.

Conclusions

The conducted testing of the potato crop protection agents by enterprise “ADAMA” showed high efficiency of the proposed treatment schemes, especially in the terms of high wetness that revealed in a significant containment of leaf pathogens and pests during the growing season. The obtained potato harvest was significantly higher according to the qualitative and quantitative indices when compared to control fields with standard growing technologies. The applied protection system is recommended for the intensification of agriculture in terms of sustainable agriculture for sustainable ecological, quantitative and qualitative potato crops in Forest-Steppe zones of Ukraine.

References

1. Anisimov B. V. Potato varieties cultivated in Russia / B. V. Anisimov - M. : Agrosplas, 2013. - 144 p.
2. Ahatov A. K. Diseases and pests of vegetable crops and potatoes / A. K. Ahatov. - M. : HUP Moscovskaia Tipografiia. - №2. - 2013. - 463 p.
3. Handbook of Plant Protection / L. I. Bagel, H. I. Vasechko, S. O. Trybel et. al.; Ed. M. P. Lisovyi. - K. : Urozhai, 1999. - 744 p.
4. Markov I. L. Handbook in protection of field crops against diseases and pests / I. L. Markov, M.B. Ruban. - K. : Uninvest Media, 2014. - 188 p.
5. Melnychuk F. S. Fungicide protection mechanisms / F. S. Melnychuk, M. S. Retman, I. V. Lepeshkin. - K. : Feniks, 2014. - P. 66 – 67.
6. Registration testings of fungicides in agriculture / S. V. Retman, M. P. Lisovyi, M.S. Retman et. al. - K. : Feniks, 2013. - P. 45-47.