Protective function of the humic preparation in relation to the antifungal activity of nystatin

Fedoseeva E.V.¹, Prudnikova E.V.^{1,2}, Uchanov P.V.², Terekhova V.A.^{1,2}

¹Moscow State University, Moscow, Russia, elenfedoseeva@gmail.com

²A.N. Severtsov Institute of Ecology and Evolution of the RAS, Moscow, Russia

Keywords: humic substances, nystatin, antifungal activity, soil filamentous fungi

DOI:10.36291/HIT.2021.019

Fungicides of various actions are widely used to struggle with pathogenic fungi. The advantages of polyene antibiotics, which include nystatin, are a wide spectrum of activity against pathogenic filamentous fungi and effectiveness against ergosterol-containing fungi [1]. Fungicidal activity along with protective properties is also characteristic of humic preparations (HPs) [2]. The experimental work was devoted to the study of the effect of HP (synergistic or antagonistic) on the antifungal activity of nystatin.

The strains of *Alternaria alternata*, *Ulocladium septosporum*, *Acremonium roseolum*, *Geomyces pannorum*, *Penicillium citreonigrum*, *Purpureocillium lilacinum*, *Trichoderma viridae* were used. We measured the fungal growth endpoints: the accumulation of mycelium biomass, the colony growth, and the conidia production. Fungi were cultivated on Chapek medium (C). Nystatin was added at two concentrations: 0.05 g/L (N1) and 0.01 g/L (N2). HP (potassium humate "Energy") was added at 0.2 g/L (HP). We created the variants of combined action (N1+HP and N2+HP).

Figure 1. Colony radius of a) *T. viridae*; b) *A. alternata* (explanations are in the text)

The addition of HP had a stimulating effect on the fungal growth endpoints (a significant increase in the colony radius, conidia production, and biomass accumulation were noted). At the same time, the positive effect of HP was more noticeable on the background of the introduction of nystatin, which inhibited the growth of fungi. Two species *P. lilacinum* and *G. pannorum* proved to be immune to either nystatin or HP, either separately or together in the medium. Thus, in the experiment, we revealed the protective function of HP, which reduces the susceptibility of soil filamentous fungi to nystatin.

Acknowledgements. This research was performed according to the Development program of the Interdisciplinary Scientific and Educational School of M.V. Lomonosov Moscow State University "The future of the planet and global environmental change". The authors are grateful to Cand. Sci. (Biol.) O.S. Yakimenko for the participation in discussion of the results, Cand. Sci. (Biol.) A.E. Ivanova for the providing of fungi cultures, to the RFBR for the partially financial support (grant 18-44-920007p-a).

References

1. te Welscher Y.M., ten Napel H.H., Balagué M.M., Souza C.M. et al. (2008) Natamycin blocks fungal growth by binding specifically to ergosterol without permeabilizing the membrane. J. Biol. Chem. 283: 6393–6401.
2. Wu M., Song M., Liu M., Jiang C., Li Z. (2016). Fungicidal activities of soil humic/fulvic acids as related to their chemical structures in greenhouse vegetable fields with cultivation chronosequence. Sci. Rep. 6: 32858.