

Performance of bioproduct Albit on potatoes

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ABSTRACT

This article summarizes the data of field trials and practical application of biostimulant Albit on potatoes. It was shown that Albit increases the tuber germination, accelerates the emergence of shoots and maturation, improves the quality and marketability of the potato crop, and on an average increases the yield of potato up to 28%. When applied together with chemical pesticides, Albit relieves their phytotoxic effect acting as antidote. Immunizing effect of Albit against late blight and other diseases was also demonstrated.

Key Words : Albit, antidote, growth regulator, immunization, late blight, marketability, potato

INTRODUCTION

Biological plant protection products have become an increasingly important part of agrotechnical practices used in potato cultivation (Fedotova *et al.*, 2018). Plant protection products of natural origin are especially in demand in the field of protection against viruses and abiotic stresses, where traditional pesticides are ineffective (Anju *et al.*, 2006; Pal and Gardener, 2006; Hosseininejadian and Naderidarbaghshahi, 2018; Bayan *et al.*, 2019). In particular, plant protection product of biological origin biostimulant Albit (a.i. poly-beta-hydroxybutyric acid from soil bacteria *Bacillus megaterium*) has proved to be effective in the potato cultivation system (Andrianov *et al.*, 2009). The purpose of this article is to summarize the results of the long-term application of Albit on potato crop.

Albit is registered on the potato crop as a plant growth regulator for the increase in field germination, acceleration of growth and development, increase in resistance to unfavorable environmental conditions and disease damage (*Rhizoctonia*, late blight, early

blight), increase in productivity and the amount of marketable potato tubers, and improvement of the product quality (Ministry of Agriculture of the Russian Federation, 2020). Albit is used in the pre-sowing treatment of potato tubers and applied during the growing season twice by foliar spraying the crops at the budding stage and 10-15 days later.

MATERIALS AND METHODS

Albit has been tested and studied in the labs and experimental fields of various research institutes and universities in Russia (Vologda State Dairy Farming Academy, Federal Scientific Center for Vegetable Growing and Lorch Potato Research Institute in Moscow oblast, Bashkir State Agrarian University) and abroad in Belarus ('Fortuna' farms of Brest region), Romania (Valenii Doamnei farm), Poland (Institute of Soil Science and Plant Cultivation in the National Research Institute), Latvia (State Institute of Field Crops Breeding), Czech Republic (Research Institute of Potato Growing Havlíčkův Brod), USA (the University of Colorado). Albit was applied

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following the conventional methods of potato growing on the following varieties: *Nevskiy*, *Skarb*, *Esmee Elita*, *Owacja*, *Canela Russet* and others. Yield, marketability, as well as biological effectiveness were taken into account in field trials.

RESULTS AND DISCUSSION

The conducted trials show that the application of Albit on potato provides statistically significant surplus yield (13.1 to 36.9% over control through field trials of 2001 to 2007). Also, Albit allows to decrease the amount of nitrogen fertilizers without yield loss (trial of Bashkir State Agrarian University). The synergy of Albit and fertilizer in chelated form was observed as well, allowing to obtain a consistent increase in yield. Combining with mineral fertilizer application did not show such a synergy.

In 2016-17, Albit was used on potatoes in the field trials at the experimental fields of Vologda State Dairy Farming Academy (Tokareva *et al.*, 2019). The trials showed that Albit reduced the negative effect of the herbicide (a.i. metribuzin) on potato crops, enhanced the growth process, increased the resistance of the crop to unfavorable weather conditions. Overall, Albit contributed to a 10 to 12.5% increase in the potato tuber yield, 4.6 to 6.5% increase in green biomass, 2.0 to 2.6% increase in starch content and 13.4 to 19% decrease in nitrate content in tubers. It is important to note that the effect of Albit was more prominent when the product was used together with fertilizers. The fertilized treatment groups showed a higher increase in the potato tuber yield than groups without NPK. Albit was also observed to increase plant immunity to diseases.

The product trials conducted in Belarus in "Fortuna" farm of Brest oblast in 2016 showed that a group with a pre-sowing Albit treatment on potato tubers (0.1 l/t) provided 8.9 t/ha of extra yield (+25% over control), while the group with the traditional chemical protection products without Albit provided 2.2 to 5.6 t/ha of extra yield.

The trials in Romania at the Valenii Doamnei farm (2016) showed that with Albit, the yield of potato increased by 28%. The biological efficacy of Albit against late blight was 65%.

In 2015, the Institute of Soil Science and Plant Cultivation in Pulawy (Poland) conducted a trial to study the effect of Albit on potatoes of the *Owacja* variety. The study evaluated potato yield and class of potato marketability, and the yield of potatoes in each class with tubers sized 35, 35-55, and 55 mm. The treatment groups assessed were: Control – a standard plant protection system with chemical pesticides, 40 ml/ha Albit treatment during the growing season in BBCH stage 38, 40 ml/ha Albit treatment during the growing season in the BBCH stage 46 and 40 ml/ha Albit treatment during the growing season in the BBCH stage 61.

Spraying potato crops with Albit had a positive effect on yield. The maximum increase was obtained in the group with Albit treatment in the BBCH stage 38 (13.8% higher than in control of 21.6 t/ha). Using Albit at the stages of tuber formation and the beginning of the flowering did not have a significant effect on the potato tuber yield. Using Albit at the BBCH stage 38 had a positive effect on the yield of 55 mm potato tubers (2.2 t/ha higher than in control) and reduced 35 mm tubers' yield by 2 t/ha. In all phases (BBCH 38, 46 and 61), Albit had significantly increased the yield of medium-sized potato tubers (35-55 mm), as compared to control. Using Albit at BBCH stage 38 decreased the percentage of small tubers by 13%. However, the number of large tubers increased by 6%. While the total yield increased by 1-14%, depending on the application, the fraction of commercial/middle-sized yield increased by 22-34% (Fig. 1). These patterns were confirmed in the experiments conducted earlier at Lorch Potato Research Institute in Moscow oblast on *Sante*, *Karlana* and *Bryansky nadezhny* varieties. For example, in an early variety *Sante* the total

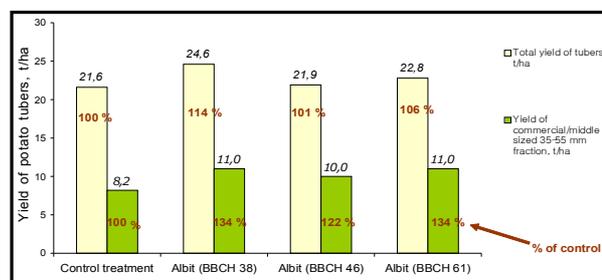


Fig. 1. Effect of Albit spraying at different stages of growth on the yield of potato tubers (Institute of Soil Science and Plant Cultivation, Pulawy, 2015).

potato yield increased by 11.8%, while the yield of healthy marketable tubers increased by 23%. Most importantly, in this and other experiments, Albit increased the yield of medium-sized marketable potato.

In 2016, the University of Colorado (USA) evaluated the effect of supplemental application of Albit on the performance of *Canela Russet* potato. Data from the field trial conducted by Prof. Samuel Y. C. Essah indicate that application of Albit increases sprout emergence, stem numbers, tuber set, and enhances early tuber bulking. Application of Albit increased total and marketable tuber yield in this study. It should be noted that 'in-furrow + foliar' and 'foliar only' treatments increased medium size tuber yields by 6 and 9%, respectively.

CONCLUSIONS

The results of trials and many years of practical application in Russia and abroad determine that Albit is an effective multi-purpose product designed for increasing yield, its marketability and protection of potato crops.

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