



Productivity of Potato Variety Belmonda under Folio-Root Treatment with Humic Preparations

Syromyatnikov Yu. N. ¹

¹ Latvia University of Life Sciences and Technologies

Summary: We studied the effect of fertilization systems and foliar treatment with humic preparations on the productivity of potato variety Belmonda. A field experiment was laid to study productivity when using various types of humic preparations with organic, mineral and organomineral fertilizers using the method of split plots in triplicate. Double foliar feeding of potato plantings was carried out with a tank mixture of the studied humic preparations with a fungicide. Against the background with an organomineral fertilizer system, the yield of marketable tubers was 43.3%, while against the background without fertilizers it was 16.4%. With an organic fertilizer system, the number of tubers in the seed fraction increases from 25.7 to 31.7%. Against the mineral background, there was a decrease in the number of small fraction tubers from 57.9 to 52.9%.

Keywords: Potatoes, fertilizer, humic preparations, foliar feeding, field experience, vegetable growing, processing, technology, productivity.

Introduction. It has been scientifically proven that each soil-climatic zone requires its own fertility parameters and norms of organic and mineral fertilizers, ensuring the reproduction of organic matter in the soil [1, 2]. Preservation and restoration of soil fertility is a very important task. The use of mineral and organic fertilizers, along with the impact on the overall level of crop productivity, is the most significant factor contributing to the preservation and increase of soil fertility [3, 4].

Agrochemical studies conducted on long-term stationary experiments show that the systematic use of organic fertilizers promotes the accumulation of humus, improves the physicochemical properties of the soil, reduces acidity, increases nutrient reserves, buffer capacity, moisture capacity and water permeability [5, 6]. In addition, it enriches the soil with microflora, enhances its biological activity and the release of carbon dioxide, and creates optimal conditions for mineral nutrition of plants [7, 8].

On acidic sandy loam soils, with their poor water permeability and high redox potential, a noticeable reduction in acidity cannot be achieved even with the annual application of 35 - 50 t/ha of manure, which is largely explained by a sharp increase (1.6 - 3.1 times) calcium and magnesium consumption by increasing yields [9, 10]. To compensate for infiltration losses of foundations, it is necessary to annually apply at least 26 - 31 t/ha of manure. Moreover, this effect is better manifested when manure is combined with mineral fertilizers and [11, 12]. With long-term use of physiologically acidic mineral fertilizers, the acidity of the soil increases, the absorption capacity and the degree of saturation with bases decrease, and the content of mobile toxic elements in the soil increases: aluminum, manganese, iron [13, 14]. Acidification when applying nitrogen fertilizers is associated mainly not with increased formation of acids, but with an increase in productive and non-productive losses of bases [15, 16]. The use of foliar treatment of plants with humic preparations against the background of applied mineral and organic fertilizers for crops in the field crop rotation had a

positive effect impact on productivity, crop structure, quality and safety of marketable crop products [17, 18].

It has been established that foliar treatment with humic preparations, by optimizing plant nutrition, affects the yield, removal and utilization rates of nutrients from the soil and fertilizers, which helps to increase the efficiency of fertilizers applied to the soil [19, 20].

The introduction of humic preparations into production in the form of foliar treatment on a high agrochemical nutritional background makes it possible to make maximum use of limited soil resources and more productively realize the genetic potential of agricultural crops, improve the quality and environmental safety of products. Foliar processing of potatoes during the budding phase with an organomineral fertilizer system allows you to obtain an additional increase of 2.8–3.8 t/ha with high quality products [21, 22].

The effectiveness of humic preparations is related to their chemical nature and the type of raw materials from which they are made. Currently, the use of environmentally friendly technologies for growing crops is becoming increasingly important.

In the literature there is a small amount of scientific and practical material on the effects of humic preparations on the yield, chemical composition and quality of agricultural crops. The purpose of the study is to determine the nature of the impact of humic preparations on the yield and structural parameters of the potato crop.

The purpose of the study is to study the effect of fertilization systems and foliar treatment with humic preparations on the productivity of Belmonda potato variety .

Materials and methods. Field experience to study the productivity of field crop rotation when using various types of humic preparations with organic, mineral and organomineral fertilizers was launched in 2014.

Field experiments were carried out using the split plot method in triplicate. The total area of 1st order plots (factor A - fertilizers) was 125 m², accounting 95 m², the total area of 2nd order plots with foliar feeding with humic preparations (factor B) was 14 m² , accounting 10.9 m² .

The following types of fertilizers were used in the experiment: organic - semi-rotted manure; mineral - ammonium nitrate, double superphosphate, potassium chloride. Organic fertilizers were applied in the spring of 2013, and mineral fertilizers were applied annually in the spring before sowing for pre-sowing tillage. All studied drugs were prepared according to the manufacturer’s recommendations by dilution method. Foliar feeding of potato plantings was carried out with a tank mixture of the studied humic preparations with a fungicide.

Table 1—Scheme of field experiments

Factor a	FactorB
Control without fertilizers;	Water
Manure, 25t/ha;	Humate (0.34%)
Manure, 25t/ha+N ₆₅ P ₆₅ K ₆₅ ; N ₆₅ P ₆₅ K ₆₅	Humate sodium (0.37%)

The preparations were prepared per 1 liter, for the preparation of solutions of which 4 ml of Humate and 15 ml of sodium humate stock solution were used . All solutions were prepared using distilled water.

In a microfield experiment with potatoes planted in 2014, 2016 and 2018, double foliar treatment with humic preparations was carried out.

Harvesting and recording of the crop were carried out using a continuous method, followed by weighing on technical scales. Soil cultivation and plant care are generally accepted for our area.

Belmonda potato variety.

Results and discussions. The main structural indicators characterizing potato productivity are the mass of tubers, their distribution among fractions, as well as the average number of tubers per bush.

All fertilizer systems used had a positive effect on the structural indicators of potato yield (Table 2). The high responsiveness of potatoes to the application of both organic and mineral fertilizers contributed to an increase in the average weight of tubers from 1 bush on an organomineral background compared to the control by 0.40 kg or 77%. The mineral fertilizer system was slightly inferior to the organomineral system in terms of its effect on the structural parameters of potatoes, where the increase in the mass of tubers per bush was 0.23 kg (44%).

Table 2 - The influence of various fertilizer systems on the structural indicators of potato yield (average for 2014, 2016, 2018)

Background	Average weight of tubers per bush, kg	Distribution of tubers by fractions, %			Average number of tubers per bush, pcs.
		<50	50-80	>80	
No fertilizers	0.52	57.8	25.8	16.5	11
Manure	0.68	43.7	31.8	24.8	14
Manure + NPK	0.91	33.6	23.3	43.4	14
NPK	0.74	52.8	22.8	24.5	12
LSD ₀₅	0.14				1,3

Organic fertilizer system had the least effect on the mass of tubers per bush, which is associated with a lack of nitrogen and potassium nutrition, as well as dry conditions of the growing season during the years of research. In addition, May and June 2014 and 2016 were dry. Negatively affected the process of mineralization of applied manure. The lack of moisture slowed down the biological activity of soil microorganisms that carry out the mineralization of organic matter in manure, which affected the structure of the potato yield against this nutritional background.

However, organic fertilizers had the greatest positive effect on the fractional composition of the potato crop, which is primarily due to the influence of organic fertilizers on the soil structure. With organic and organomineral fertilizer systems, there was a decrease in the proportion of the fine fraction with a tuber weight of less than 50 g by 26 - 43%, and a tendency was noted to increase the proportion of tubers over 50 g by 35 - 59%.

Against the background with an organomineral fertilizer system, the yield of marketable tubers was 43.4%, while against the background without fertilizers it was 16.4%. With an organic fertilizer system, the number of tubers in the seed fraction increases from 25.8 to 31.8 %, which is mainly associated with nitrogen-potassium nutrition. On the mineral background, there was a decrease in the number of fine-fraction tubers from 57.8 to 52.8% due to a more complete satisfaction of plants with available nutrients. There was a significant increase in the number of tubers per bush on organic and organomineral backgrounds from 11 to 14 pieces.

Conclusions. Thus, both fertilizers and humic preparations have a positive effect on the structural parameters of potato yield. The organomineral fertilizer system, both in action and in aftereffect, played a decisive role in the formation of the structural indicators of the crop. The effect of humic preparations, as our observations have shown, is associated with the nature of the applied fertilizers and the biological characteristics of the crop.

The most effective was shown by a preparation made on the basis of low-lying peat (Humate), containing the largest amount of humic acids.

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