



Foliar application of amino acid-based bioorganic stimulator as a tool to increase the yield of potato

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INTRODUCTION

An intensive production of potato requires not only the use of fertilizers and various pesticides, but also biostimulants. Some biostimulants are based on amino acids (AAs) representing precursors and constituents of proteins. In Russia the most popular AA-based biostimulant is Izbion containing a mix of amino acids and peptides. However, the data on its effect in relation to potato are rather controversial; it is also unclear, whether this preparation provides only growth-stimulating and nutritive effect, or also has some protecting activity. In our preliminary studies, Izbion used together with standard chemical treatments showed a significant increase in the tuber yield and % of marketable potatoes comparing to the chemical protection alone. The aim of this study was to determine the contribution of Izbion applications into the yield and quality of potatoes and the reduction of yield losses caused by leaf blights, as well as the determination of the optimal scheme of such applications together with fungicides.

MATERIALS AND METHODS

The experiments were arranged on small randomly distributed 42-m² plots at the experimental field of the All-Russian Research Institute of Phytopathology (Moscow region) using a late blight susceptible cv. Red Scarlett. In total, 11 experimental variants were studied, each in four replications (Table 1). The first Izbion application was carried out, when plant height reached 15 cm, the second one - during the flowering phase, and the third one - 10-14 days later. The level of the leaf blight development was assessed according to the British Mycological Society scale. The yield was determined after a manual harvesting. The yield losses and the % of marketable tubers were determined as described earlier [1]. Biological efficiency was calculated by a standard Abbott's formula. Statistical treatment of the data was carried out by ANOVA at the 95% confidence level.

RESULTS

In the first decade of September, the total level of infection in the untreated control exceeded 90% (Fig. 1). Izbion alone (var. 7 and 10) or in combination with Quadris (var. 3) was not able to reduce the disease development level; in all three cases, the biological efficiency of its application did not exceed 10.5%. The data on the yield and marketable fraction of potatoes in different experimental variants is shown in Fig. 2. Again, Izbion did not significantly influence on the yield in both variants of its application (vars. 7 and 10), but significantly increased the marketable fraction of tubers (by 16 and 13%, respectively).

REFERENCES

1. M.A. Kuznetsova, Zashchita i karantin rastenii 5 (suppl.), 1-42 (2007).

TABLE 1. Treatment schemes and their biological protection efficiency

No.	In-furrow tuber treatment	Field treatment of plants	Yield losses, %	Biological efficiency, %
1	Quadris*	Standard**	0.8	95.5
2	Quadris	Standard + Izbion 3x***	0.06	99.6
3	Quadris	Izbion 3x	14.5	19.8
4	Quadris	—	16.0	13.2
5	Quadris + Izbion	Standard	0.1	99.3
6	Izbion	Standard	1.1	93.5
7	Izbion	—	1.7	7.3
8	—	Standard	1.5	91.8
9	—	Standard + Izbion 3x	0.5	97.7
10	—	Izbion 3x	16.9	10.5
11	Untreated control		18.1	—
<i>LSD_{0.95} (the least significant difference)</i>			2.9	6.8

* Dosage: 3L/ha; ** Treated control, i.e., 5 treatments per a season: (1) Shirlan, 0.4 L/ha; (2) Ridomil Gold MX, 2.5 kg/ha; (3) and (4) Revus, 0.6 L/ha + Score, 0.4 L/ha; (5) Shirlan, 0.4 L/ha; *** Dosage: 2L/ha.

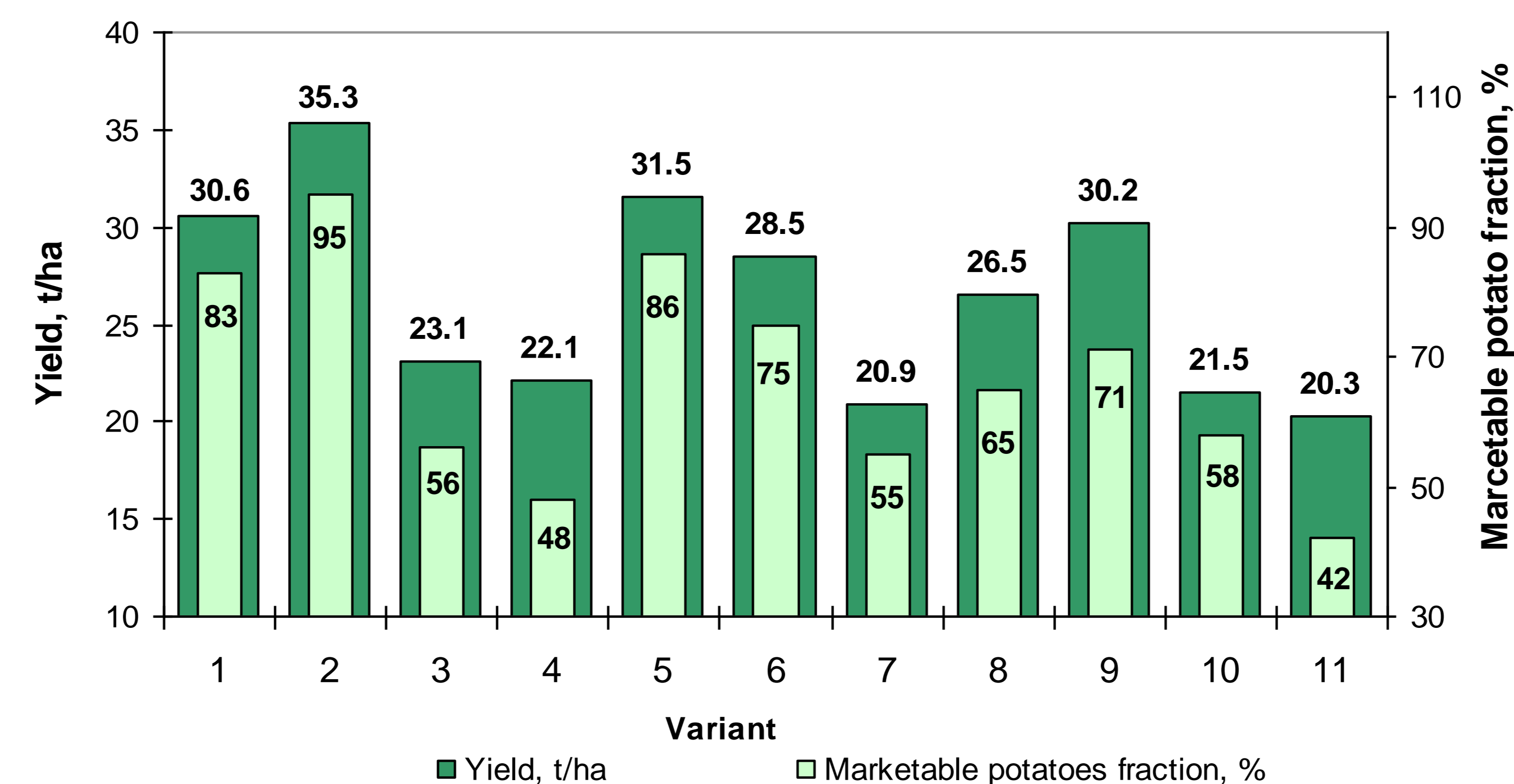


FIGURE 2. Effect of different protection variants on the potato yield ($LSD_{0.95} = 2.37$) and marketable fraction ($LSD_{0.95} = 9.2$). See Table 1 for description of variants.

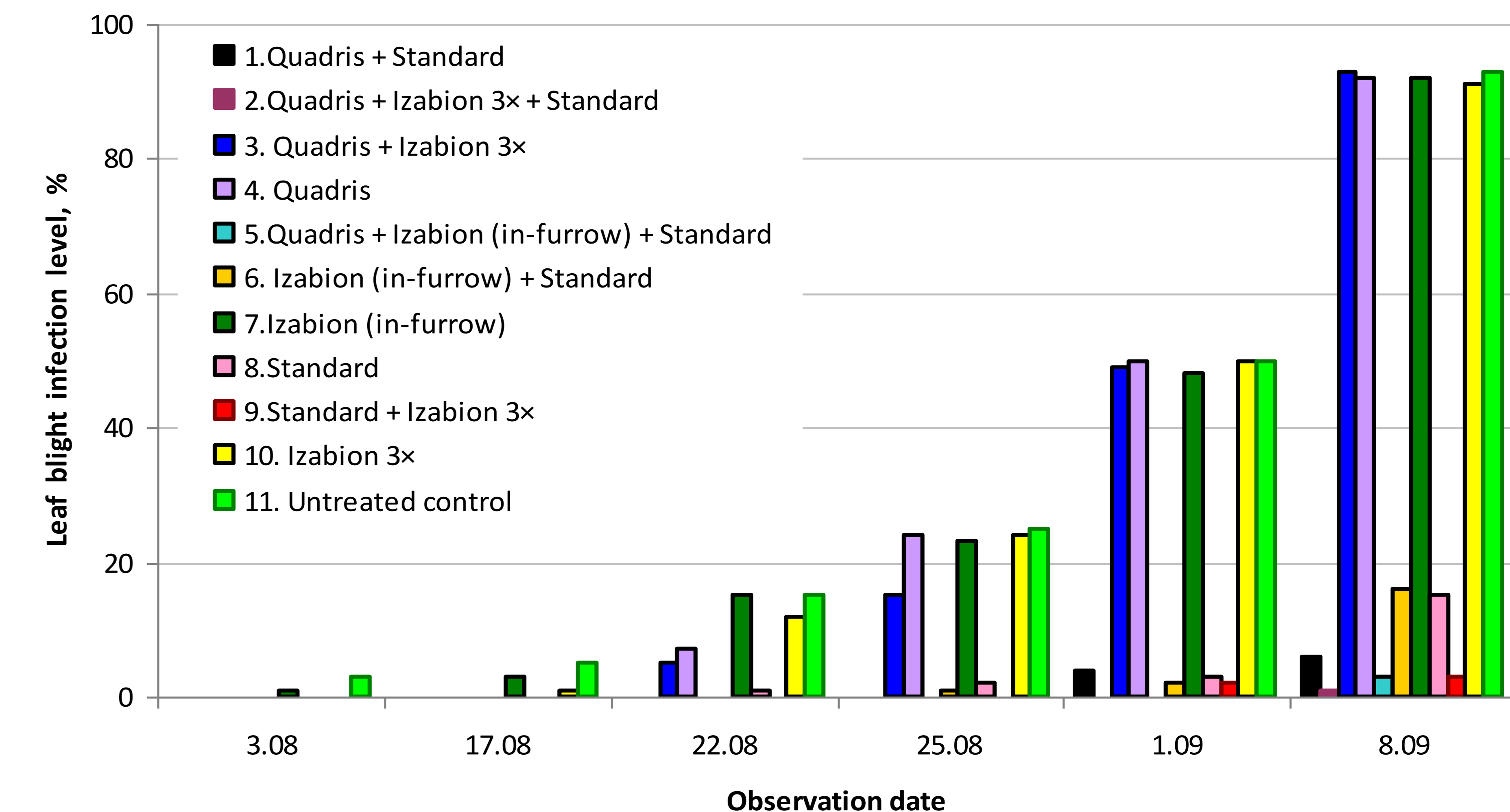


FIGURE 1. Effect of different protection variants on the development of leaf blight infections. See Table 1 for description of treatment variants.

CONCLUSIONS

1. Irrespectively of the application mode, the AA-based Izbion biostimulator does not have a protecting activity in relation to the leaf blight infections of potato, though its use significantly improves the marketability of tubers.
2. A combined use of Izbion biostimulator with other fungicides provides better suppression of leaf infections and yield increase, as well as the higher output of marketable potatoes as compared with the use of fungicides only.
3. The study demonstrated a high efficiency of a sequential application of the following treatments: (1) in-furrow application of Quadris (3 L/ha) and (2) seasonal treatment of plants with the tank mix of Izbion and fungicides. Comparing to the untreated control, the resulting yield increase was 15 ton/ha, while the marketable fraction increased by 53%; comparing to the treated control, these values increased by 8.8 ton/ha and 30%, respectively.

ACKNOWLEDGMENTS

The study was performed within the framework of the State Assignment no. 0598-2019-0003.