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THE EFFECT OF IMPROVED AGROTECHNOLOGICAL ELEMENTS ON PLANT GROWTH AND DEVELOPMENT IN BLACKBERRY (RUBUS FRUTICOSUS L.) CULTIVATION UNDER GREENHOUSE CONDITIONS

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ABSTRACT

The article investigates the effect of improved agrotechnological elements on the growth and development of blackberry (Rubus fruticosus L.) plants under greenhouse conditions. The study evaluated the ‘Chester’ blackberry cultivar under different irrigation, nutritional, and plant training technologies. The effects of greenhouse microclimate optimization, drip irrigation, fertigation, and trellis systems on plant height, number of shoots, shoot diameter, leaf area, vegetative mass formation, and productivity were analyzed. The experimental results demonstrated that improved water and nutrient supply contributed to accelerated vegetative growth. The combination of improved agrotechnological elements enhanced the physiological condition of plants and promoted shoot development, leaf apparatus formation, and stable development of yield components. In particular, the integrated application of drip irrigation, fertigation, and a trellis system created favorable agrotechnical conditions for the growth and development of blackberry plants under greenhouse conditions.

KEYWORDS

Blackberry, Rubus fruticosus L., greenhouse, agrotechnology, microclimate, drip irrigation, fertigation, trellis, cultivar, plant height, number of shoots, leaf area, vegetative mass, yield.

Introduction

Today, the efficient use of protected cultivation systems, particularly modern greenhouse technologies, is becoming increasingly important for providing the population with high-quality fruit products rich in vitamins and biologically active compounds throughout the year. Changes in climatic conditions, increasing demand for fresh fruit during the off-season, and the need to cultivate highly profitable crops necessitate the improvement of technologies for growing berry crops under greenhouse conditions. In this regard, blackberry, which is a biologically and economically valuable berry crop, represents a promising crop for greenhouse production.

Blackberry (Rubus fruticosus L.) fruits contain sugars, organic acids, ascorbic acid, phenolic compounds, and other biologically active substances, giving them important nutritional and functional value. Plant growth and fruit-bearing characteristics depend not only on the biological properties of

the cultivar but also on temperature, relative humidity, light conditions, irrigation regime, mineral nutrition, and plant training methods. Therefore, maintaining these factors at optimal levels in greenhouse conditions is one of the important prerequisites for obtaining high and quality yields.

In studies aimed at improving blackberry cultivation technology under greenhouse conditions, the effects of drip irrigation, fertigation, and trellis systems on plant growth and development were evaluated. Blackberry is considered a highly productive berry crop, and its productivity largely depends on the development of vegetative organs. Therefore, plant height, number of shoots, shoot diameter, and leaf area were considered important indicators for evaluating plant growth and development.

The experimental results showed that the growth indicators of plants were relatively low in the control treatment where conventional technology was used. In particular, plant height was 164.8 cm, the number of shoots was 5.4, shoot diameter was 9.8 mm, and leaf area was 228.4 cm² (Table 1).

Table 1. Effect of improved agrotechnological elements on plant growth and development of blackberry under greenhouse conditions (2024–2026)

Variant	Cultivation technology	Plant height, cm	Number of shoots, pcs.	Shoot diameter, mm	Leaf area, cm²
Control	Conventional technology	164.8	5.4	9.8	228.4
T-1	Drip irrigation	178.6	6.2	10.9	257.3
T-2	Drip irrigation + fertigation	194.7	7.1	12.4	301.8
T-3	Drip irrigation + fertigation + trellis system	208.9	8.0	13.7	342.6

These indicators demonstrate that the plants in the control treatment had relatively limited water and nutrient availability. As a result, photosynthetic activity was relatively low, and the accumulation of assimilates required for the formation of generative organs was insufficient.

In our experiments, the use of drip irrigation in the T-1 treatment significantly improved plant growth. Plant height increased by 13.8 cm compared with the control and reached 178.6 cm. The number of shoots increased to 6.2, which was 14.8% higher than the control. The increase in shoot diameter to 10.9 mm indicated improved development of the mechanical tissues.

The leaf area reached 257.3 cm², indicating an expansion of the assimilatory apparatus responsible for photosynthesis. This was associated with maintaining a more stable soil moisture level through drip irrigation, which contributed to active root development and improved nutrient uptake.

In the T-2 treatment, where drip irrigation and fertigation were applied together, the morphobiological indicators increased further. Plant height reached 194.7 cm, which was 29.9 cm or 18.1% higher than the control. The number of shoots increased to 7.1, creating favorable conditions for the formation of a greater number of fruiting branches per plant. Shoot diameter reached 12.4 mm, which was 26.5% higher than the control. The leaf area of 301.8 cm² indicated improved development of the photosynthetic apparatus.

As a result of fertigation, mineral nutrients were supplied directly to the root zone according to plant requirements, which accelerated plant growth processes. In particular, the application of nitrogen, phosphorus, and potassium in an appropriate ratio stimulated the formation of new shoots and leaf development.

The highest growth indicators were recorded in the T-3 treatment, where drip irrigation, fertigation, and a trellis system were applied in combination. Plant height reached 208.9 cm, which was 44.1 cm or 26.8% higher than the control. The number of shoots was 8.0, representing an increase of approximately 48.1% compared with the control. Shoot diameter reached 13.7 mm, indicating strong vegetative growth. Leaf area reached 342.6 cm^2, which was 50% higher than the control. The trellis system ensured more upright and uniform positioning of shoots, thereby creating favorable conditions for more efficient utilization of light by the leaves.

Conclusion

The study demonstrated that the growth and development of blackberry plants under greenhouse conditions are directly associated with the integrated application of agrotechnological practices. Maintaining an optimal microclimate, using drip irrigation, supplying mineral nutrients through fertigation, and training shoots on a trellis system create favorable conditions for vegetative development.

Among the studied agrotechnological elements, the integrated application of drip irrigation + fertigation + trellis system contributed to improved biometric characteristics of the plants, better development of the leaf apparatus, and favorable formation of yield components. Since blackberry cultivars may respond differently to agrotechnological practices, irrigation and nutrient application rates should be determined with consideration of the biological characteristics of the cultivar.

Overall, the integrated application of modern agrotechnological elements in greenhouse blackberry cultivation provides an effective technological basis for regulating plant growth and development and obtaining high-quality yields.

References

1. Hancock J.F. Berry Fruit: Value-Added Crops for Health and Nutrition**.** London: CABI Publishing, 2020.
2. Funt R.C., Hall H.K. Raspberries and Blackberries: Production, Breeding and Markets. CABI, Wallingford, 2013.
3. Strik B.C. Horticultural practices for growing blackberries**.** Oregon State University Extension Service.
4. Clark J.R., Finn C.E. Small fruit breeding and genetics: blackberry breeding. Plant Breeding Reviews.
5. Pritts M.P. Raspberry and Blackberry Production Guide. Cornell University, Department of Horticulture.
6. Crandall P.C. Brambles: Production Management and Marketing. The Haworth Press, 1995.