

Mirela Kotlicka

The effect of nitrogen fertilization on plant growth and development, physico-chemical properties of the substrate, and cost and energy intensity of the cranberries production
(Vaccinium macrocarpon Aiton)

SUMMARY:

On an industrial scale, cranberries are grown mainly in the USA and Canada, and in Europe, in Belarus and Latvia. Latently, Poland's climate and soil conditions can be victoriously used for the growing of this plant. However, in spite of the average requirements of cranberries and rather uncomplicated growing technology, the very establishment of a plantation is very expensive. Moreover, in order to engender optimal conditions for the growth, development and yield of cranberries on the plantation, it is indispensable to get well acquainted with its specific requirements. Therefore, it is essential to conduct further research on the feasibility of adapting the commodity production of large cranberries to Polish climatic and soil conditions.

The objective of this doctoral dissertation was to originate a modified technology of cranberry production in terms of optimizing the amount of nitrogen fertilization. The impact of the dose and date of nitrogen application and the cultivar on biometric features of plants during the growing season, as well as the size and quality of the final large cranberry fruit yield were specified. The paper also adduces an analysis of the cost and energy intensity of large cranberry fruit production depending on the applied nitrogen dose and the variety cultivated.

In 2017-2019, in South-Eastern Poland, in the Podkarpackie Voivodeship, strict field experiments were carried out on determining the doses and dates of nitrogen fertilization of large cranberries, the most effective in terms of yield in Polish climatic and soil conditions. Different doses were actuated (22.5, 32.5, 33.6 kg N·ha⁻¹) and nitrogen application dates as compared to the control, which was set on the grounds of the literature on cranberry growing in Poland (40 kg N·ha⁻¹). Multicomponent fertilizer was utilized for nitrogen fertilization Ogród 2001. The effect of the applied N doses and the date of fertilization on the yield of two cranberry varieties (Pilgrim and Stevens) were marked. Moreover, each year, during field experiments, measurements of selected morphological features of plants determining the yield were carried out, uprights, runners and damaged shoots, the number of hooks, open flowers, fruit buds,

damaged fruit, "*Aborted fruits*". The substrate from individual variants of the experiment was subjected to laboratory analyses so as to define the impact of the used fertilizers on the content of selected macro and micronutrients in it. Analyses were also conducted in terms of the mineral composition of cranberry plants to depict the nutritional state of both varieties depending on the fertilizer variant applied. An analysis of the cost and energy intensity of large cranberry production depending on the fertilizer variant and cultivar applied was also conducted.

The conducted field experiments displayed that the applied variants of nitrogen fertilization (dose and date of application) and the cultivar had a significant effect on the final yield of cranberry fruit (the highest average yield in the years 2017-2019 was obtained from the experimental plots with the lowest N doses). The impression of the dose and the date of the procedure was also observed in the case of the values of the morphological features studied. The quantity of uprights of the Stevens cultivar, which are the fundamental morphological feature determining the yield, had the greatest effect on the dose and date of fertilization of the fertilizer variant in which the smallest amount of nitrogen was supplied with the fertilizers (22.5 kg ha⁻¹). On the other hand, too early application (prior to the beginning of vegetation) of the first dose of nitrogen resulted in the element being rinsed deep into the sand substrate and the plants' negligible use of nitrogen. The application of the initial dose of nitrogen in the bud break phase affected the excessive, unfavourable vegetative growth of cranberry plants. It was found that the optimal time for the application of the initial dose of nitrogen is the final phase of flowering (80% of fruit set). The additional field experiments conducted allowed to determine the profitability of large-fruited cranberry production, taking into consideration the amount of obtained crops, incurred financial outlays and obtained profits. The highest economic efficiency index was recorded for the Pilgrim cultivar fertilized with the lowest dose of N.

DATA:.....

PODPIS: