Effects of Coal-Bed Methane Discharge Water on Peppermint

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Introduction

Wyoming is one of the largest energy-producing states in the country and a large producer of coal-bed methane (CBM). To release methane out of coal seams, ground water must be pumped to the surface. The water may then be reinjected into an aquifer or, as is most commonly done, dealt with on the surface. Wyoming is an arid state with relatively inadequate fresh water supplies for irrigation. Hence, some agricultural producers use CBM discharge water for irrigation of various crops, mainly forages. CBM discharge water has various qualities at different locations. Typical issues are high salt content and high sodium adsorption ratio (SAR). There is limited information on the effect of CBM discharge water on various crops, and no known information on how CBM water affects the synthesis and accumulation of plant secondary metabolites, such as essential oils. A controlled-environment container experiment was conducted by the Sheridan Research and Extension Center (ShREC) to address this knowledge gap (Fig. 1).

Objectives

The objectives of this study were to evaluate the effect of CBM discharge water on peppermint productivity, essential oil content, and composition grown in commercially available growth medium.

Materials and Methods

This experiment was conducted in 2011 at ShREC. The effect of CBM water on plant height, fresh herbage yield, oil content, oil yield, oil constituents, and nutrients in the growth medium was measured at the end of the experiment.

All plants were harvested at the same time—flowering. Fresh herbage samples were extracted immediately for essential oil. The oil content was calculated as g of oil per 100 g of fresh peppermint herbage. The extracted oil samples were analyzed for chemical constituents on gas chromatograph.

Results and Discussion

CBM discharge water treatments affected plant height, fresh herbage yields, and oil yields. Growth medium characteristics also changed as a result of CBM water treatments. Overall, the oil quality was within the acceptable range for peppermint and comparable to literature reports. This preliminary study demonstrated that CBM discharge water could be utilized for
irrigation of peppermint, a high-value crop produced in the Northwest. However, it is suggested that irrigation with CBM water should be supplemented with other higher quality water for best peppermint yields and quality.

**Acknowledgments**

The project was funded by the Department of Plant Sciences.

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**Key words:** coal-bed methane discharge water, salt tolerance, crop response, essential oil

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**Figure 1.** Peppermint being irrigated with coal-bed methane discharge water in 2011 (Photo: Valtcho Jeliazkov).