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Field performance of highbush blueberries (*Vaccinium* × *corymbosum* L.) cv. 'Herbert' propagated by cuttings and tissue culture

Wojciech Litwińczuk *, Grzegorz Szczerba, Dorota Wrona

Department of Plant Production, Rzeszów University, 2 Ćwiklińskiej Street, 35-601 Rzeszów, Poland

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Abstract

'Herbert' highbush blueberry (*Vaccinium* × *corymbosum* L.) plants propagated by softwood cuttings (HT) and obtained by micropropagation (TC) of axillary (AX) and adventitious (AD) shoots of 1-year-old in vitro cultures or 11-year-old cultures (SH) were compared. Propagation methods exerted significant influence on nursery and field performance of blueberries. Cutting-derived HT plants grew more slowly, produced significantly less and shorter shoots and were more variable than micropropagated plants. However, the majority of HT plants developed flowers 1 year earlier, flowered more abundantly, bore significantly larger berries than TC plants. There was no clear difference between AX and AD plants. SH-derived plants had smaller berries with the fewest seeds compared to AX and AD-obtained plants. This reveals that culture age had more significant influence than shoot source for the variation observed among micropropagation systems. The present study underlines the necessity of frequent establishment of in vitro cultures of highbush blueberry and carry them out by limited number of passages.

Keywords: Field performance; Micropropagation; Highbush blueberry; Axillary shoots; Adventitious shoots; Cuttings; In vitro culture

* Corresponding author. Tel.: +48 17 8721649/8721646; fax: +48 17 8575273.
E-mail address: wlitw@univ.rzeszow.pl (W. Litwińczuk).

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1. Introduction

Micropropagation of highbush blueberry was achieved more than twenty years ago (Cohen and Elliot, 1979; Zimmerman and Broome, 1980). However, some problems remain unsolved. Adventitious shoots occur spontaneously, and are common in blueberry in vitro cultures (Zimmerman and Broome, 1980; Litwińczuk and Szczerba, 1998). Adventitious shoot cultures of many species are suspected to be the main source of somaclonal variation (De Klerk, 1990). Some successful studies have developed micropropagation systems using adventitious buds initiation on leaves and internodes of highbush blueberry (among others: Dweikat and Lyrene, 1988; Rowland and Ogden, 1992, 1993; Hruskoci and Read, 1993; Cao and Hammerschlag, 2000). However, to the best of our knowledge, an efficient propagation method solely through axillary shoots (without participation of adventitious shoots) has not been yet defined. Field performance of blueberries propagated in vitro especially through adventitious shoots has not been thoroughly evaluated. Dweikat and Lyrene (1988) found no off-types among young blueberry plants (*Vaccinium corymbosum* × *V. elliottii*) obtained from adventitious shoots but this study did not evaluate fruit characteristics as examined plants were only several-month-old. The objective of the current study was to evaluate growth and fruit characteristics of highbush blueberries propagated traditionally from cuttings compared to in vitro by axillary or adventitious methods.

2. Materials and methods

2.1. Plant material

Highbush blueberry (*Vaccinium* × *corymbosum* L.) cv. Herbert were propagated by cuttings (HT) and micropropagation (TC). HT plants were propagated from softwood cuttings collected from young 2-year-old stock plants grown at the Blueberry Research Station of Warsaw Agricultural University. HT plants were not previously propagated in vitro. Three groups of TC blueberry plants were studied. They were micropropagated in three separate systems to provide plantlets that originated from 1-year-old axillary shoots (AX) and adventitious shoots (AD), or mixed adventitious and axillary shoots obtained from at least 11-year-old cultures (SH). AX cultures were established from HT stock plants. Subsequently, they were micropropagated by subculturing three-node explants (without two-node shoot tip) exclusively derived from the distal microshoots originated from and firmly attached to the upper nodes of initial explant. AD cultures were obtained from adventitious shoots developed spontaneously in vitro on leaves of AX explants in contact with the medium. Subsequently, they were multiplied through two subcultures of three-four-node explants. SH plants were from 11-year-old in vitro cultures multiplied under standard commercial conditions with nodal explants subcultured without regard for whether the shoots were of adventitious or axillary origin.

2.2. Propagation of plants

AX in vitro cultures were initiated in March 1998 on ZB medium (Zimmerman and Broome, 1980) supplemented with N^6-[γ,γ-dimethylallyl]adenosine (2iP, 10.0 mg dm^{-3}),