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Sucrose, Photosynthetic Photon Flux Density, & CO_2 Concentration Affect Growth & Development of Micropropagated Mountain Ash

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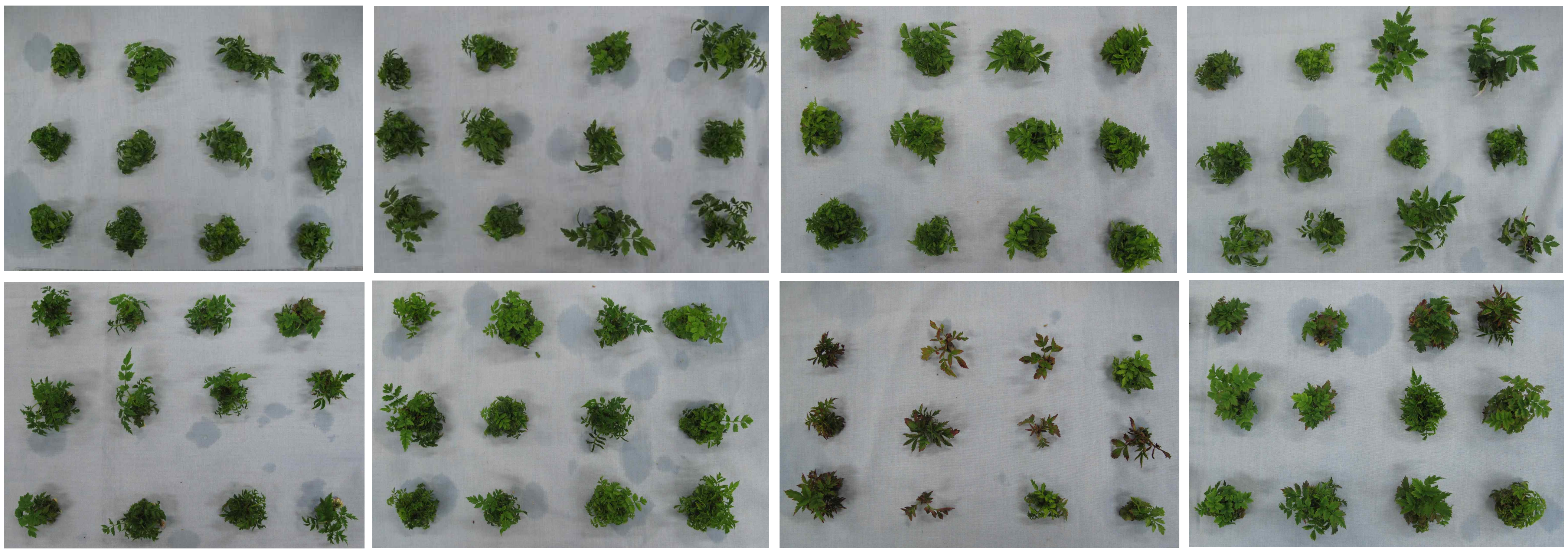
Abstract

Mountain ash (*Sorbus commixta* Hedl.), is an important medicinal woody plant in Korea used for the treatment of cough, asthma, & other bronchial disorders. Unfortunately, the species is gradually disappearing due to over exploitation of the natural habitats. Tissue culture is a common & powerful technique for the clonal mass propagation which can be adapted to Mountain ash for ecosystem restoration. In an effort to establish a micropropagation method at the stage II for proliferation of shoots, Mountain ash was micropropagated under the so called a photo-autotrophic or photo-mixotrophic culture conditions.

Results

Sucrose ($g·L^{-1}$) 0 30



CO_2 ($\mu mol·mol^{-1}$) 350 1,000 350 1,000
Light intensity ($\mu mol·m^{-2}·s^{-1}$ PPFD) 50 200

Fig. 1. Growth & development of mountain ash plantlets cultured in vitro for 4 weeks as affected by medium sucrose concentration, light intensity, & CO_2 concentration.

Table. 1. Growth & development of mountain ash plantlets cultured in vitro for 4 weeks as affected by medium sucrose concentration, light intensity, & CO_2 concentration.

Sucrose ($g·L^{-1}$)	Light intensity ($\mu mol·m^{-2}·s^{-1}$ PPFD)	CO_2 ($\mu mol·mol^{-1}$)	Shoot Length (cm)	Shoot Number	Shoot No. of nodes	Shoot Fresh wt. (mg)	Shoot Dry wt. (mg)	Leaf Length (mm)	Leaf Width (mm)	Leaf Chlorophyll ($\mu g·mg^{-1}$FW)	Stem diameter (mm)	Tissue water content (%)
0	50	350	1.18c^z	5.3b	2.7c	939.5c	84.9f	7.7c	3.9c	1.19d	2.16ab	91.0a
		1,000	1.33b	3.4d	3.2ab	874.4c	81.5f	10.9ab	5.7ab	1.48ab	2.51a	90.8a
	200	350	1.41b	4.5c	2.9bc	1,217.9b	131.5d	9.8abc	5.5ab	1.45abc	2.21ab	89.2a
		1,000	1.40b	3.9cd	3.4a	965.0c	112.8de	11.5a	6.0a	1.63a	2.24ab	88.2a
30	50	350	1.62a	5.4b	2.9bc	889.7c	161.1c	8.2c	5.0b	1.23cd	2.08bc	81.5c
		1,000	1.59a	6.6a	3.2ab	1,651.8a	246.8a	9.1bc	6.0a	1.33bcd	2.28ab	85.0b
	200	350	0.85d	1.9e	2.3d	493.8d	91.0ef	8.8bc	5.8ab	1.41abc	1.85c	80.0c
		1,000	1.44b	5.7b	3.4a	960.1c	219.3d	8.0c	5.0b	1.44abc	2.23ab	76.9d

^{z}Lower case letters within a column indicate the significant difference according to the Duncan's multiple range test at a 0.05 level.

Conclusion

The treatment with a high light intensity & a high CO_2 concentration, but without supplementation of sucrose to the medium (a photoautotrophic condition) was the best for growth & development of micropropagated mountain ash in terms of number of nodes, tissue water content, leaf length, leaf width, & chlorophyll content.