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EVALUATION OF HORMONAL BALANCE INFLUENCE ON THE MICROPROPAGATION OF SOME ROOTSTOCKS FOR PLUM

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Abstract:

Numerous researches support the importance of growth hormones for the *in vitro* propagation of various species included in *Prunus* genus. The influence of BAP, IBA and NAA hormones, in five variants of MS medium, on the micropropagation of four plum rootstocks was investigated, using two types of explants (shoot tip and node explant). The best results were obtained with explants obtained from the shoots tips, grown on MS medium supplemented with concentrations of 0.5 and 0.6 mg/l of BAP and 2 mg/l of NAA.

• Introduction

Many researchers uphold the importance of growth hormones for the *in vitro* propagation of various species included in *Prunus* genus. The experimental results obtained by Ancu et al. (2015) reveal that, regardless of the composition of base medium, the best hormonal combination was composed of BAP (1.0 mg/L) and IBA (0.1 mg/L). Sabbadini et al (2019) achieved good results when the rootstock 'Hansen 536 MB' was grown on WPM medium, enriched with 4,4 µM 6-Benzyladenine (BA), 0,1 µM 1-naphthaleneacetic acid (NAA) and 6.0 g/l agar. Nas et al. (2010) investigated the *in vitro* regeneration capacity of *Prunus microcarpa* rootstock on NRM medium and benzyladenine (BA), meta-Topolin (mT) and thidiazuron (TDZ) in various concentrations. The best rooting hormone reported by Vaez-Livari and Salehi-Soghadi (2005) was IBA (0.5 mg/L) with sucrose (30 g/L).

• Material and method

The study was conducted at the University of Craiova (INCESA - Plant Biotechnology Laboratory). The branches were harvested from the rootstock collection of the Horticulture Faculty, at the end of February and were placed in the laboratory for forcing. After 20 days, the shoots obtained were put under a sterilization protocol, by washing them with soap and water, followed by treatment with sodium hypochlorite (Domestos commercial product, diluted with distilled water, in a ratio of 2: 5), ethyl alcohol 70 % (15″), three consecutive washes with sterile distilled water. From the shoots were made top and nodal micro-cuttings, 5-6 mm long. The Murashige and Skoog culture medium (MS Sigma M 5519), to which 20 g of sucrose and 8 g of agar were added, was sterilized in an autoclave at 121°C and pressure of 1(2) atmospheres for 15-20 minutes. The pH was adjusted to 5.8 with NaOH solution before the agar was added. Five experimental variants were studied: V1: 0.5 mg/l BAP, V2: 0.6 mg/l BAP, V3: 0.5 mg/l BAP + 1mg/l NAA, V4: 6 mg/l IBA, V5: 2 mg/l NAA. The following conditions were ensured in the growth chamber: temperature of 25°C (±1) and a lighting regime of 16 hours of light/8 hours of darkness. After 30 days, observations and measurements were performed, which focused on: diameter of vegetative mass developed from the explant, the height and number of leaves. All experiments were arranged in a completely randomized design.

Statistical analysis. Data have been statistically processed using EXCEL, DATA ANALYSIS.

• Results and discussions

Plant growth regulators play an important role in high value horticultural crops to increase yield, increase crop quality and management (Davies, 1995; Latimer, 1992). Bhagwat and Lane (2004) argue that the percentage of regeneration is influenced by plant growth hormones and the type, orientation and size of the explant. From the explants used for inoculation, a vegetative mass of shoots and calluses was obtained. The results on its average diameter for the shoots obtained from the top of the shoot and the nodal explant are presented in Table 1.

[illegible]

Rootstock / variant	Descriptive statistics	Hormonal balance and type of explant									
		V1		V2		V3		V4		V5	
		a*	b	a	b	a	b	a	b	a	b
Prunus cerasifera Selection	Mean	2.32	0.95	-	-	0.66	0.46	1.62	1.72	-	-
	SD	0.08	0.01	-	-	0.05	0.05	0.08	0.08	-	-
	Minimum	2.20	0.93	-	-	0.60	0.40	1.50	1.60	-	-
	Maximum	2.40	0.96	-	-	0.70	0.50	1.70	1.80	-	-
	Cv%	3.61	1.38	-	-	8.29	11.91	5.16	4.86	-	-
Miroval (sin. MVL 2)	Mean	2.44	-	-	-	1.12	1.16	2.72	2.62	1.92	2.54
	SD	0.09	-	-	-	0.08	0.11	0.08	0.08	0.08	0.11
	Minimum	2.30	-	-	-	1.00	1.00	2.60	2.50	1.80	2.40
	Maximum	2.50	-	-	-	1.20	1.30	2.80	2.70	2.00	2.70
	Cv%	3.67	-	-	-	7.47	9.83	3.08	3.19	4.36	4.49
Plamval (sin. H19-5-85; Rival)	Mean	2.90	1.02	2.80	1.72	1.12	0.82	0.92	2.12	1.72	1.68
	SD	0.10	0.08	0.16	0.01	0.08	0.01	0.08	0.08	0.08	0.13
	Minimum	2.80	0.90	2.60	1.71	1.00	0.80	0.80	2.00	1.60	1.50
	Maximum	3.00	1.10	3.00	1.73	1.20	0.83	1.00	2.20	1.80	1.80
	Cv%	3.45	8.20	5.65	0.52	7.47	1.59	9.09	3.95	4.86	7.76
Fortival (sin. H1-2V; Corval)	Medie	3.12	-	2.48	1.78	-	-	-	-	-	-
	SD	0.08	-	0.13	0.13	-	-	-	-	-	-
	Minimum	3.00	-	2.30	1.60	-	-	-	-	-	-
	Maximum	3.20	-	2.60	1.90	-	-	-	-	-	-
	Cv%	2.68	-	5.26	7.32	-	-	-	-	-	-

*a = shoot tip, b = node explant

Table 2. The height of vegetative mass obtained from shoots tip and nodal explants (cm)

Rootstock / variant	Descriptive statistics	Hormonal balance and type of explant									
		V1		V2		V3		V4		V5	
		a*	b	a	b	a	b	a	b	a	b
Prunus cerasifera Selection	Mean	1.12	1.14	-	-	0.72	-	0.90	1.50	-	-
	SD	0.08	0.05	-	-	0.08	-	0.10	0.16	-	-
	Minimum	1.00	1.10	-	-	0.60	-	0.80	4.30	-	-
	Maximum	1.20	1.20	-	-	0.80	-	1.00	1.70	-	-
	Cv%	7.47	4.80	-	-	11.62	-	11.11	10.54	-	-
Miroval (sin. MVL 2)	Mean	1.82	-	-	-	1.74	0.82	1.72	2.10	2.06	1.70
	SD	0.08	-	-	-	0.05	0.01	0.08	0.10	0.09	0.10
	Minimum	1.70	-	-	-	1.70	0.80	1.60	2.00	2.00	1.60
	Maximum	1.90	-	-	-	1.80	0.83	1.80	2.20	2.20	1.80
	Cv%	4.60	-	-	-	3.15	1.59	4.86	4.76	4.34	5.88
Plamval (sin. H19-5-85; Rival)	Mean	1.80	0.95	1.96	1.42	1.90	1.22	1.86	2.12	2.06	1.76
	SD	0.45	0.01	0.11	0.08	0.16	0.01	0.11	0.08	0.09	0.11
	Minimum	1.00	0.94	1.80	1.30	1.70	1.20	1.70	2.00	2.00	1.60
	Maximum	2.00	0.96	2.10	1.50	2.10	1.23	2.00	2.20	2.20	1.90
	Cv%	24.85	0.88	5.82	5.89	8.32	1.07	6.13	3.95	4.34	6.48
Fortival (sin. H1-2V; Corval)	Medie	1.54	-	1.74	0.99	-	-	-	-	-	-
	SD	0.09	-	0.11	0.01	-	-	-	-	-	-
	Minimum	1.40	-	1.60	0.98	-	-	-	-	-	-
	Maximum	1.60	-	1.90	1.00	-	-	-	-	-	-
	Cv%	5.81	-	6.55	0.84	-	-	-	-	-	-

*a= shoot tip, b= nodal explant

Table 3. Number of leaves / vegetative mass in shoot tip and nodal explants

Rootstock / variant	Descriptive statistics	Hormonal balance and type of explant									
		V1		V2		V3		V4		V5	
		a*	b	a	b	a	b	a	b	a	b
Prunus cerasifera Selection	Mean	8.40	3.60	-	-	2.80	-	3.80	5.80	-	-
	SD	1.14	0.55	-	-	0.84	-	0.84	0.45	-	-
	Minimum	7.00	3.00	-	-	2.00	-	3.00	5.00	-	-
	Maximum	10.00	4.00	-	-	4.00	-	5.00	6.00	-	-
	Cv%	13.57	15.21	-	-	29.88	-	22.02	7.71	-	-
Miroval (sin. MVL 2)	Mean	11.00	-	-	-	7.80	7.00	8.20	7.60	6.20	8.60
	SD	1.00	-	-	-	1.30	0.71	1.30	0.55	1.30	0.55
	Minimum	10.00	-	-	-	6.00	6.00	7.00	7.00	5.00	8.00
	Maximum	12.00	-	-	-	9.00	8.00	10.00	8.00	8.00	9.00
	Cv%	9.09	-	-	-	16.72	10.10	15.90	7.21	21.03	6.37
Plamval (sin. H19-5-85; Rival)	Mean	13.60	8.60	15.80	10.80	8.20	10.40	3.60	4.40	3.20	8.20
	SD	0.89	0.55	1.10	1.48	0.84	1.14	0.55	1.14	0.45	1.30
	Minimum	13.00	8.00	14.00	9.00	7.00	9.00	3.00	3.00	3.oo	7.00
	Maximum	15.00	9.00	17.00	13.00	9.00	12.00	4.00	6.00	4.00	10.00
	Cv%	6.58	6.37	6.93	13.73	10.20	10.96	15.21	25.91	13.98	15.90
Fortival (sin. H1-2V; Corval)	Medie	8.00	-	13.60	9.40	-	-	-	-	-	
	SD	1.00	-	0.89	1.14	-	-	-	-	-	
	Minimum	7.00	-	13.00	8.00	-	-	-	-	-	
	Maximum	9.00	-	15.00	11.00	-	-	-	-	-	
	Cv%	12.50	-	6.58	12.13	-	-	-	-	-	

*a= shoot tip, b= nodal explant

• Conclusions

The best results were obtained with explants obtained from the shoots tips. The different concentrations of growth hormones do influence the development of explants (their diameter, height and number of leaves) in both the shoots obtained from the shoot tip and the nodal ones. The best results were obtained in the explants from the shoot tip, with concentrations of 0.5 and 0.6 mg/l BAP and 2 mg/l NAA. In nodal explants the best results were obtained on media containing concentrations of 0.6 mg/l BAP, 6 mg/l IBA and 2 mg/l NAA.

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