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Influence of storage conditions on quality of 'cherry' tomato fruits (*Solanum lycopersicum* L. var. cerasiforme)

INTRODUCTION

It is proved that daily intake of fresh and processed tomato fruits decreases risk of chronic diseases, like cardiovascular diseases and cancer. Lycopene and other carotenoids protect health because of antioxidant activity. Tomato fruits are the main source of lycopene, and important source of β -carotene, the precursor of vitamin A. Physical, chemical and sensory traits of tomato fruit can be modified by environmental factors. Many studies indicate that the key factor for plant growth, yield, fruits quality and their storage ability may be the growing medium used in greenhouse cultivation. Nowadays, the most popular growing medium in a modern soilless vegetable cultivation is a rockwool. However, rockwool is not suitable for recycling, so a new environmental friendly growing medium is needed to protect environment. Good alternative for the rockwool may be a coconut fibre. It is a biodegradable material of good physical and chemical traits. After completing the growing season, coconut fiber slabs can be composting and then use as organic soil fertilizer.



Table 1. Dry matter of fruits of 'Dasher' cultivar (%

	Storage	0 days		21 days					28 days			
	duration		conc	entration of	1-MCP			conc	entration of	1-MCP	_	
Growing medium	Stage of maturity	Fresh fruits	Control	0.5 1-MCP	1.0 1-MCP	Mean for growing medium	Mean for stage of maturity	Control	0.5 1-MCP	1.0 1-MCP	Mean for growing medium	Mean for stage of maturity
Coconut	3rd stage	7.61	7.29	7.49	6.94	7.46 *	3rd stage	7.31	7.2	7.25	7.41 *	3rd stage
fibre	5th stage	8.04	8.06	8.04	6.91	7.40	7.12	7.55	7.4	7.73	7.41	7.19
Mineral	3rd stage	7.60	7.38	6.63	6.96	7.09	5th stage	7.11	7.31	6.98	7.20	5th stage
wool	5th stage	7.89	6.56	7.51	7.51	7.03	7.43 *	7.12	7.27	7.42	7.20	7.41 *
	Mean	7.79	7.33 ns	7.42 ns	7.08 ns			7.27 ns	7.29 ns	7.35 ns		

Table 2. Total sugars content in fruits of 'Dasher' cultivar (g 100 g⁻¹ FW)

	Storage	0 days		21 days		_			28 days		_	
	duration		Conc	entration of	1-MCP			Conce	entration of	1-MCP	_	
Growing medium	Stage of maturity	Fresh fruits	Control	0.5 1-MCP	1.0 1-MCP	Mean for growing medium	Mean for stage of maturity	Control	0.5 1-MCP	1.0 1-MCP	Mean for growing medium	Mean for stage of maturity
Coconut	3rd stage	4.06	3.35	3.98	3.65	3.99 ns	3rd stage	4.5	4.07	4.03	4.56 *	3rd stage
fibre	5th stage	4.77	4.11	4.56	4.30	3.33 118	3.75	5.19	5.00	4.58	4.30	4.43
Mineral	3rd stage	4.32	3.94	3.74	3.82	1 01 nc	5th stage	5.46	4.41	4.13	1 1E	5th stage
wool	5th stage	4.61	3.94	4.46	4.17	4.01 ns	4.26 *	4.06	4.15	4.46	4.45	4.58 *
	Mean	4.44	3.84 b	4.19 a	3.99 ab			4.80 a	4.41 b	4.30 b		

Table 3. Soluble solids in fruits of 'Dasher' cultivar (º Brix)

	Storage	0 days		21 days		_			28 days		_	
	duration		conc	entration of	1-MCP	_		conc	entration of	1-MCP	_	
Growing	Stage of	Fresh				Mean for	Mean for				Mean for	Mean for
medium	maturity	fruits	Control	0.5 1-MCP	1.0 1-MCP	growing medium	stage of maturity	Control	0.5 1-MCP	1.0 1-MCP	growing medium	stage of maturity
Coconut	3rd stage	7.37	7.37	7.47	7.6	7 02 ns	3rd stage	7.28	7.51	7.07	7.61 *	3rd stage
fibre	5th stage	8.55	8.40	8.48	8.27	7.93 ns	7.56	7.75	8.38	7.70	7.61	7.32
Mineral	3rd stage	7.20	7.43	7.88	7.60	7.95 ns	5th stage	7.20	7.34	7.50	7.50	5th stage
wool	5th stage	8.52	7.98	8.43	8.38	7.95 118	8.33 *	7.87	7.68	7.97	7.59	7.89 *
	Mean	7.91	7.80 c	8.07 a	7.96 b			7.53 b	7.51 b	7.73 a		

Table 4. Juice pH of fruits of 'Dasher' cultivar

	Storage	0 days		21 days		_			28 days		_	
	duration		conc	entration of	1-MCP	_		conc	entration of	1-MCP	_	
Growing	Stage of	Fresh	_			Mean for	Mean for	_			Mean for	Mean for
medium	maturity	fruits	Control	0.5 1-MCP	1.0 1-MCP	growing medium	stage of maturity	Control	0.5 1-MCP	1.0 1-MCP	growing medium	stage of maturity
Coconut	3rd stage	4.20	4.23	4.09	4.07	4.25	3rd stage	4.37	4.25	4.27	4.35 *	3rd stage
fibre	5th stage	4.43	4.45	4.38	4.28	4.25	4.16	4.44	4.46	4.32	4.33	4.28
Mineral	3rd stage	4.25	4.27	4.17	4.15	4.29 *	5th stage	4.24	4.24	4.29	4.31	5th stage
wool	5th stage	4.40	4.39	4.37	4.36	4.29	4.37 *	4.35	4.35	4.39	4.51	4.38 *
	Mean	4.32	4.34 a	4.25 b	4.22 c			4.35 a	4.32 b	4.32 b		

Table 5. Titrable acidity expressed as citric acid equivalents of fruits of 'Dasher' cultivar (%)

	Storage	0 days		21 days		_			28 days		_	
	duration		cond	entration of	1-MCP	_		conce	entration of	1-MCP	_	
Growing	Stage of	Fresh				Mean for	Mean for				Mean for	Mean for
medium	maturity	fruits	Control	0.5 1-MCP	1.0 1-MCP	growing medium	stage of maturity	Control	0.5 1-MCP	1.0 1-MCP	growing medium	stage of maturity
Coconut	3rd stage	5.91	5.77	6.96	7.31	6.10 *	3rd stage	4.35	4.03	5.92	4.48	3rd stage
fibre	5th stage	5.15	5.06	5.44	6.07	0.10	6.46 *	4.29	3.60	4.69	4.40	5.14 *
Mineral	3rd stage	5.73	5.44	6.60	6.66	5.79	5th stage	5.32	5.78	5.44	5.19 *	5th stage
wool	5th stage	5.23	5.08	5.38	5.57	3.73	5.43	4.80	5.06	4.76	5.19	4.53
	Mean	5.51	5.34 c	6.09 b	6.41 a			4.69 b	4.62 c	5.20 a		

Table 6. Total phenolic acids expressed as caffeic acid equivalents in fruits of 'Dasher' cultivar (%)

	Storage	0 days		21 days		_			28 days		_	
	duration		conc	entration of	1-MCP			conce	entration of	1-MCP		
Growing	Stage of	Fresh	Caralanal	0.5.4.8460	1 0 1 NACD	Mean for	Mean for	Caraland	0.5.4.8460	1.0.1.1460	Mean for	Mean for
medium	maturity	fruits	Control	0.5 1-MCP	1.0 1-MCP	growing medium	stage of maturity	Control	0.5 1-MCP	1.0 1-MCP	growing medium	stage of maturity
Coconut	3rd stage	0.0172	0.0190	0.0179	0.0177		3rd stage	0.0166	0.0168	0.0300		3rd stage
fibre	5th stage	0.0152	0.0475	0.0198	0.0168	0.0231 ns	0.0172 ns	0.0160	0.0154	0.0200	0.0191 ns	0.0198 ns
Mineral	3rd stage	0.0164	0.0169	0.0172	0.0148	0.0100 nc	5th stage	0.0331	0.0118	0.0105	0.010E nc	5th stage
wool	5th stage	0.0221	0.0238	0.0202	0.0210	0.0190 ns	0.0248 ns	0.0134	0.0100	0.0380	0.0195 ns	0.0188 ns
	Mean	0.0177	0.0268 ns	0.0188 ns	0.0176 ns			0.0198 ns	0.0135 ns	0.0246 ns		

Means in rows marked with different letters and means in columns marked with asterisk differ significantly at α = 0.05, Tukey's test

MATERIAL AND METHODS

The study was carried out in 2012 in the greenhouse and laboratories of the Department of Vegetable and Medicinal Plants of Warsaw University of Life Sciences. The objective of the study was to determine the effect of different growing mediums on the yield and fruits quality of 'cherry' tomato cultivars. Two cherry tomato cultivars – 'Dasher' and 'Pareso', were taken for the experiment. The seeds were sown in December, seedlings were planted in January to rockwooll and coconut fibre slabs. Fruits were harvested in June at 3rd and 5th stage of maturity, according to USDA classification (light-red) and stored for three and fourth weeks with different concentration of 1-MCP. The factors for the three-factors experiment were: concentration of 1-MCP, growing medium type and stage of maturity. There were determined for the fruits: dry matter, total sugars content, soluble solids, juice pH, titrable acidity and phenolic acids.

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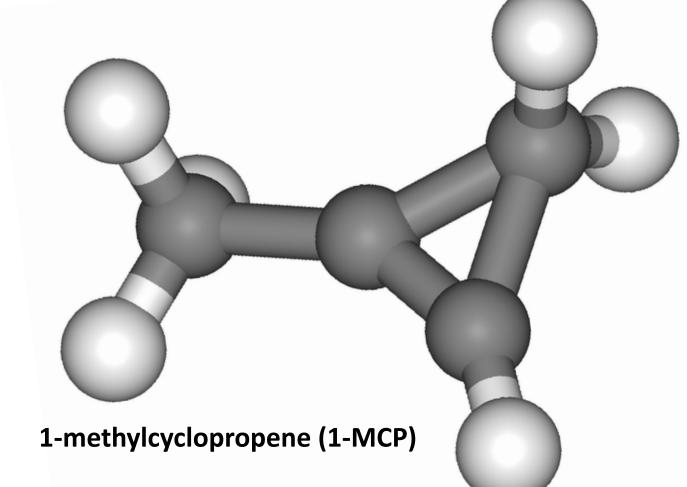


Table 7. Dry matter of fruits of 'Pareso' cultivar (%)

	Storage	0 days		21 days					28 days			
	duration		concentra	ation of 1-MC	:P	_		conc	entration of :	1-MCP	-	
Growing medium	Stage of maturity	Fresh fruits	Control	0.5 1-MCP	1.0 1-MCP	Mean for growing medium	Mean for stage of maturity	Control	0.5 1-MCP	1.0 1-MCP	Mean for growing medium	Mean for stage of maturity
Coconut	3rd stage	7.41	7.47	7.37	7.16	7.37 *	3rd stage	7.68	7.05	7.53	7.44 *	3rd stage
fibre	5th stage	8.15	7.50	7.66	7.06	7.37	7.17 ns	7.51	7.65	7.20	7. 44	7.32 ns
Mineral	3rd stage	7.66	7.26	6.66	7.12	7.00	5th stage	7.15	7.21	7.32	7 27	5th stage
wool	5th stage	7.57	7.53	6.84	7.08	7.08	7.28 ns	7.22	7.31	7.40	7.27	7.39 ns
	Mean	7.70	7.44 a	7.13 b	7.12 b			7.39 ns	7.31 ns	7.36 ns		

Table 8. Total sugars content in fruits of 'Pareso' cultivar (g 100 g⁻¹ FW)

	Storage	0 days		21 days					28 days			
	duration		conc	entration of	1-MCP	_		conce	entration of	1-MCP	_	
Growing medium	Stage of maturity	Fresh fruits	Control	0.5 1-MCP	1.0 1-MCP	Mean for growing medium	Mean for stage of maturity	Control	0.5 1-MCP	1.0 1-MCP	Mean for growing medium	Mean for stage of maturity
Coconut	3rd stage	3.79	3.79	3.43	3.45		3rd stage	4.19	4.24	4.34		3rd stage
fibre	5th stage	4.88	2.61	3.99	3.70	3.50 ns	3.54 ns	4.63	4.28	4.05	4.29 ns	4.00
Mineral	3rd stage	3.60	3.82	3.32	3.40	2 E 9 ns	5th stage	3.60	3.82	3.79	4 12 pc	5th stage
wool	5th stage	4.17	3.63	3.74	3.57	3.58 ns	3.54 ns	5.41	4.29	3.86	4.13 ns	4.42 *
	Mean	4.11	3.46 ns	3.62 ns	3.52 ns			4.46 a	4.16 b	4.01 b		

Table 9. Soluble solids in fruits of 'Pareso' cultivar (º Brix)

	Storage	0 days		21 days		_			28 days		_	
	duration		concentra	tion of 1-MC	Р	_		conc	entration of 3	1-MCP	_	
Growing	Stage of	Fresh				Mean for	Mean for				Mean for	Mean for
medium	maturity	fruits	Control	0.5 1-MCP	1.0 1-MCP	growing medium	stage of maturity	Control	0.5 1-MCP	1.0 1-MCP	growing medium	stage of maturity
Coconut	3rd stage	7.32	7.35	7.20	7.20	7.60 ns	3rd stage	7.68	7.25	7.70	7.70 *	3rd stage
fibre	5th stage	8.75	7.92	8.10	7.82	7.00 115	7.33	7.82	7.81	7.95	7.70	7.39
Mineral	3rd stage	7.37	7.23	7.68	7.32	7.61 ns	5th stage	7.03	7.26	7.43	7.51	5th stage
wool	5th stage	8.05	7.83	7.85	7.77	7.01 115	7.88 *	7.63	7.69	7.98	7.51	7.81 *
	Mean	7.87	7.58 b	7.71 a	7.44 c			7.54 b	7.50 b	7.77 a		_

Table 10. Juice pH of fruits of 'Pareso' cultivar

	Storage	0 days		21 days		_			28 days		_	
	duration		cond	entration of	1-MCP	_		conce	entration of	1-MCP	_	
Growing	Stage of	Fresh		0.5.4.8460	4.0.4.1460	Mean for	Mean for	6	0.5.4.8465	4.0.4.1460	Mean for	Mean for
medium	maturity	fruits	Control	0.5 1-MCP	1.0 1-MCP	growing medium	stage of maturity	Control	0.5 1-MCP	1.0 1-MCP	growing medium	stage of maturity
Coconut	3rd stage	4.22	4.23	4.18	4.20	4.27 ns	3rd stage	4.36	4.25	4.24	4.34	3rd stage
fibre	5th stage	4.44	4.37	4.35	4.30	4.27 113	4.19	4.48	4.35	4.39	4.54	4.29
Mineral	3rd stage	4.22	4.21	4.15	4.15	4.26 ns	5th stage	4.37	4.26	4.25	4.38 *	5th stage
wool	5th stage	4.36	4.39	4.33	4.34	4.20 113	4.35 *	4.54	4.42	4.44	4.30	4.44 *
	Mean	4.31	4.30 a	4.25 b	4.22 c			4.44 a	4.32 b	4.33 b		

Table 11. Titrable acidity expressed as citric acid equivalents of fruits of 'Pareso' cultivar (%)

	Storage	0 days		21 days					28 days			
	duration		concentra	ation of 1-MC	:P	_		conc	entration of	1-MCP	-	
Growing	Stage of	Fresh				Mean for	Mean for	_			Mean for	Mean for
medium	maturity	fruits	Control	0.5 1-MCP	1.0 1-MCP	growing	stage of	Control	0.5 1-MCP	1.0 1-MCP	growing 	stage of
mediam	matarity	Truits				medium	maturity				medium	maturity
Coconut	3rd stage	6.10	5.99	7.61	6.58	6 27 ns	3rd stage	5.03	5.95	5.68	F 27 ps	3rd stage
fibre	5th stage	5.10	5.62	6.33	6.09	6.37 ns	6.93 *	4.44	5.63	4.91	5.27 ns	5.62 *
Mineral	3rd stage	6.43	6.53	7.20	7.69	6 F.1 p.c	5th stage	5.08	5.95	6.04	F 26 ns	5th stage
wool	5th stage	5.69	6.01	5.91	5.89	6.54 ns	5.98	4.35	5.02	5.12	5.26 ns	4.91
	Mean	5.83	6.04 b	6.76 a	6.79 a			4.72 c	5.64 a	5.44 b		

Table 12. Total phenolic acids expressed as caffeic acid equivalents in fruits of 'Pareso' cultivar (%)

	Storage	0 days		21 days					28 days			
	duration		conc	entration of	1-MCP	_		conce	entration of	1-MCP	_	
Growing medium	Stage of maturity	Fresh fruits	Control	0.5 1-MCP	1.0 1-MCP	Mean for growing medium	Mean for stage of maturity	Control	0.5 1-MCP	1.0 1-MCP	Mean for growing medium	Mean for stage of maturity
Coconut fibre	3rd stage 5th stage	0.0186 0.0231	0.0179 0.0240	0.0216 0.0515	0.0201 0.0182	0.0255 ns	3rd stage 0.0239 ns	0.0230 0.0190	0.0221 0.0222	0.0445 0.0135	0.0240 ns	3rd stage 0.0243 ns
Mineral wool	3rd stage 5th stage	0.0280 0.0265	0.0288 0.0232	0.0268 0.0218	0.0281 0.0647	0.0322 ns	5th stage 0.0339 ns	0.0236 0.0198	0.0148 0.0133	0.0179 0.0141	0.0172 ns	5th stage 0.0170 ns
	Mean	0.0240	0.0235 ns	0.0304 ns	0.0221 ns			0.0213 ns	0.0181 ns	0.0225 ns		

CONCLUSIONS

- 1. 1-MCP treatment may contribute to extend storage duration.
- 2. The study showed that both growing mediums used in the experiment allowed to obtain a comparable yield, of similar fruit quality. Therefore, the coconut fibre could be used as a good, environmental friendly growing medium, an alternative to rockwool as a medium for greenhouse cultivation of 'cherry' tomatoes.
- 3. Fruits harvested at 3rd stage of maturity can be stored longer than fruits harvested at 5th stage.

