INFLUENCE OF STORAGE CONDITIONS ON QUALITY OF COMMON ONION AND SHALLOT

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Introduction

Shallot (*Allium cepa* L. var. *ascalonicum* Backer) and onion (*Allium cepa* L.) used to be considered as different species, but in 1950s Atkin refuted this thesis [1]. Le Thierry D'Equinne et al. [2], using analysis of morphological traits and RAPD markers, found out that cultivars of shallot propagated by seeds are closer to common onion, compared to those propagated vegetatively. Both types, however closely related, differ in some morphological and chemical characteristics. The main visible difference is ability of creating several apexes inside the bulb, and consequent development of few bulbs conncected by common base plate, observed often in shallot and rarely in common onion [3]. Cultivars of shallot and onion differ in their storability and length of storage period. Few papers about shallot storage has been published, most of them concern vegetatively propagated shallot from tropical regions [4,5,6]. Shallot has shown better storability compared to onion [7]. Onion storage performance and demands are more extensively described. In controlled atmosphere experiments various proportions of CO_2 and O_2 and its effect on dry matter, total soluble solids, firmness, pyruvate, fructans and other traits were examined [8,9]. The aim of the study was to compare hybrid shallot cultivar and hybrid onion cultivar in respect of changes in some quality traits of hybrid cultivars of shallot grown in temperate climate during storage in normal and controlled atmosphere.

Materials and methods

The experiment was carried out in years 2008 – 2010. For the investigation hybrid cultivar of shallot ('Bonilla F_1') and onion ('Hyduro F_1') were chosen. The plants were cultivated in the experimental field on a medium-loam soil. In 2008 bulbs of shallot were harvested in the second week of August, onion bulbs in the second week of September. In 2009 shallot bulbs were harvested in the first and onion bulbs in the last week of August. Bulbs were cured in a shed, at ambient temperature, for one month. Bulbs were stored for 7 months in CA cold storage at 0 – 1ºC, 65% RH. Five atmosphere compositions were tested: (1) 5% CO_2 + 5% O_2, (2) 5% CO_2 + 2% O_2, (3) 2% CO_2 + 5% O_2, (4) 2% CO_2 + 2% O_2 and (5) normal atmosphere. For each cultivar and atmosphere composition dry matter, sugars (Luff-Schoorl method [10]), total soluble solids content, firmness (HPE II durometer from 0 to 100 units), ethylene and CO_2 production were examined. Numerical data were subjected to analysis of variance with Statgraphics Plus 4.1 software. Mean values were compared with Tukey's HSD test at the p = 0.05 level of significance.

Results

Table 1. Dry matter of shallot and onion bulbs after harvest and after 7 months of storage in normal and controlled atmosphere (%).

Cultivar (B)	Storage (A)						Mean (B)
	After harvest	After storage					
		1	2	3	4	5	
Bonilla F_1	13,85	13,66	15,18	13,85	13,76	17,14	14,57b
Hyduro F_1	9,78	9,57	10,13	9,66	10,19	13,06	10,40a
Mean (A)	11,82ab	11,62a	12,66ab	11,76ab	11,98ab	15,10b	
LSD AxB p = 0,05	n. s.						

Table 2. Total sugars content of shallot and onion bulbs after harvest and after 7 months of storage in normal and controlled atmosphere (g/100g f. w.).

Cultivar (B)	Storage (A)						Mean (B)
	After harvest	After storage					
		1	2	3	4	5	
Bonilla F_1	7,87	6,98	8,75	7,78	7,76	10,06	8,20b
Hyduro F_1	5,21	5,21	5,21	5,47	5,58	4,11	5,13a
Mean (A)	6,54ab	6,10a	6,98b	6,63ab	6,67ab	7,09b	
LSD AxB p = 0.05	0,77						

Table 3. Content of total soluble solids in shallot and onion bulbs after harvest and after 7 months of storage in normal and controlled atmosphere (°B).

Cultivar (B)	Storage (A)						Mean (B)
	After harvest	After storage					
		1	2	3	4	5	
Bonilla F_1	12,13	12,77	14,67	12,67	13,17	16,47	13,64b
Hyduro F_1	9,27	8,57	8,90	8,77	8,90	8,37	8,79a
Mean (A)	10,70a	10,67a	11,79b	10,72a	11,04a	12,42c	
LSD AxB p = 0.05	0,50						

Table 4. Firmness of shallot and onion bulbs after harvest and after 7 months of storage in normal and controlled atmosphere (HPE 0-100).

Cultivar (B)	Storage (A)						Mean (B)
	After harvest	After storage					
		1	2	3	4	5	
Bonilla F_1	78,37	76,25	74,90	74,47	73,35	69,85	74,53a
Hyduro F_1	81,23	82,75	82,17	78,60	74,90	77,80	79,58b
Mean (A)	79,8c	79,5bc	78,54abc	76,54abc	74,13ab	73,83a	
LSD AxB p = 0.05	n. s.						

Table 5. Ethylene production of shallot and onion bulbs after harvest and after 7 months of storage in normal and controlled atmosphere ($\mu l*h^{-1}*kg^{-1}$).

Cultivar (B)	Storage (A)						Mean (B)
	After harvest	After storage					
		1	2	3	4	5	
Bonilla F_1	2,49	1,64	1,95	3,12	2,32	2,41	2,32a
Hyduro F_1	9,29	1,63	1,13	1,62	1,83	2,49	2,99a
Mean (A)	5,89b	1,64a	1,54a	2,37a	2,08a	2,45a	
LSD AxB p = 0.05	1,82						

Table 6. CO_2 production of shallot and onion bulbs after harvest and after 7 months of storage in normal and controlled atmosphere ($mg*h^{-1}*kg^{-1}$).

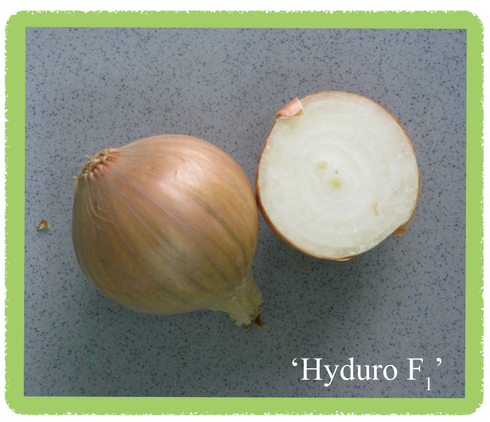
Cultivar (B)	Storage (A)						Mean (B)
	After harvest	After storage					
		1	2	3	4	5	
Bonilla F_1	10,81	12,36	14,91	16,51	14,63	18,26	14,58b
Hyduro F_1	14,83	8,27	8,07	7,92	8,32	15,06	10,41a
Mean (A)	12,82ab	10,32a	11,49a	12,22ab	11,48a	16,66b	
LSD AxB p = 0.05	4,47						

1: 5% CO_2 + 5% O_2, **2:** 5% CO_2 + 2% O_2, **3:** 2% CO_2 + 5% O_2, **4:** 2% CO_2 + 2% O_2, **5:** 0% CO_2 + 21% O_2 (normal atmosphere - control)

Conclusions

1. Examined cultivars differed significantly in most of analyzed attributes.
2. 'Bonilla F_1' was characterized by visibly higher content of dry matter, total sugars and total soluble solids as well as respiration intensity, however the firmness of 'Hyduro F_1' was higher.
3. Significant increase of dry matter, total sugars and total soluble solids was observed in control combination, what may be connected with higher respiration.


'Bonilla F_1'


'Hyduro F_1'

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