

Vegetable quality in a conventional and three organic cropping systems

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Aim

Differences in nutrient availability and method of pest management may affect crop growth and product quality. The question is if conventional and organic cropping systems, which differ clearly in strategies for nutrient and pest management, influence the harvest and sensory quality of the products?

Materials and Methods

Lettuce and onion were grown in a conventional and three organic vegetable cropping systems with different levels of external inputs and use of cover- and inter-crops for nutrient re-cycling and natural pest management in the period of 2007-2009 (VegQure project, Tab. 1). The crop rotation consisted of 8 fields of vegetables and cereals. Onion was grown after a year of oat and iceberg lettuce after winter rye. There were 3 replicates of each cropping system each year. Bars show standard deviations for the average of 3 years. Sensory analysis of samples of iceberg lettuce was performed as quantitative descriptive analysis by a trained sensory panel of 10 assessors. The samples were shredded before serving. A sensory profile of 9 attributes was evaluated on a 15-cm non-structured continuous scale. The left side of the scale (= 0) corresponded to the lowest intensity and the right side of the scale (= 15) corresponded to the highest intensity of the attributes.

Tab. 1.

	Growing systems in VEGQURE			
	C	O1	O2	O3
Growing system	Conventional	Minimal organic	Organic	Very organic
External input	High	Medium	Low	Low
Re-cycling of nutrients	Low	Low	High	High
Winter cover	Bare soil	Bare soil	Catch crops Green manure	Catch crops Green manure
Pest management	Pesticides	None	None	Summer intercrops
Fertiliser (kg N ha ⁻¹ y ⁻¹)	NPK 170	Manure 120	Manure 0 (lett.) 75 (on.)	Manure 0 (lett.) 75 (on.)



Results and discussion

Yields per meter crop row were comparable in the three organic systems and amounted 71% for onion and 76% for lettuce of those in the conventional system. A total of 15% of onion and 9% of lettuce yields were discarded due to defects and did not differ between cropping systems (Fig. 1). There was no influence of cropping system on the reasons why products were discarded (Tab. 2). The lettuce heads were largest in the C and O1 systems (Fig. 2). The onions were of similar size irrespective of cropping system. Dry matter and mineral content did not differ between cropping systems (Fig. 3). Only small differences were detected in the sensory profile between the four cropping systems (Fig. 4). There were no difference in 2007, and the bitterness and sweetness were the only attributes that differed in 2008.

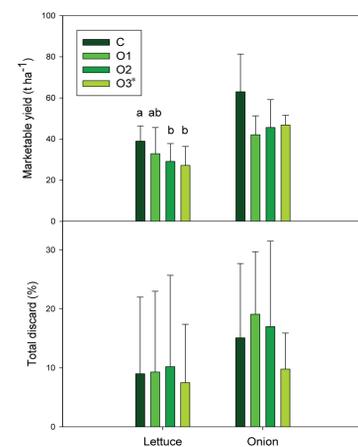


Fig. 1. The marketable yield and total discard due to pests and errors in the four cropping systems (average of 3 years). *The O3 system yield is calculated for the same number of plant rows as the other systems.

Tab. 2. The causes to discard due to pests, diseases and errors in the evaluation of harvest quality of lettuce and onion from the four cropping systems. No significant differences were found (average of 3 years).

Quality error (%)	C	O1	O2	O3
Lettuce				
Tipburn (inside)	1	0	0	3
Cracks in leaves	3	1	1	0
Rot (bottom)	4	4	5	3
Undeveloped	2	5	4	7
Ticks	33	33	29	32
Lice (severe)	5	14	25	9
Lice (total)	25	33	33	29
Slugs	0	1	0	2
Onion				
Decay	12	6	3	2
Watery scales	1	8	10	4
Dry scales	1	3	3	2

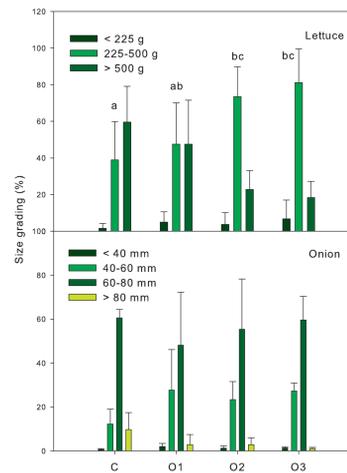


Fig. 2. The size grading of lettuces and onions from the four cropping systems (average of 3 years).

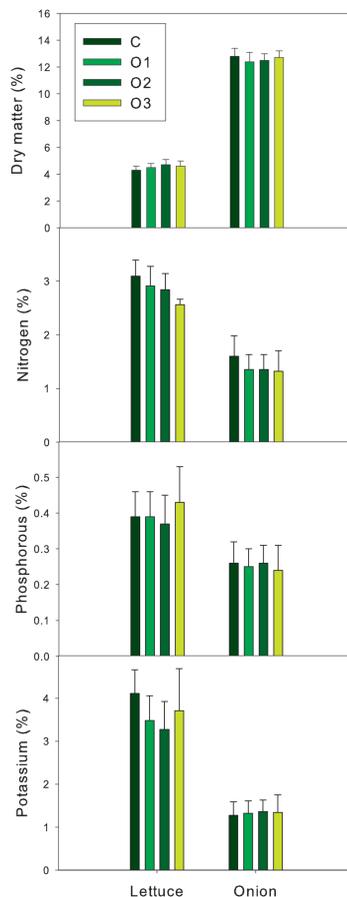


Fig. 3. The dry matter, nitrogen, phosphorous and potassium content of the lettuces and onions from the four cropping systems. No significant differences were found (average of 3 years).

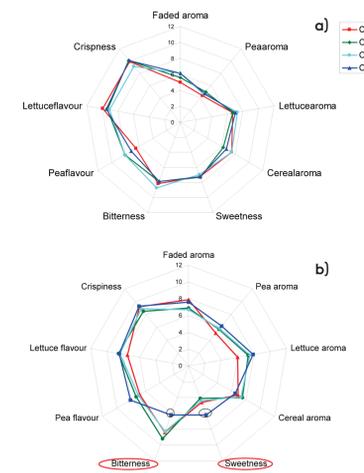


Fig. 4. The sensory profile for iceberg lettuce in a) 2007 and b) 2008. Red circles show significant differences.

Conclusion

Harvest and sensory quality were not affected by the clear differences in nutrient and pest management between the four cropping systems.



Acknowledgement: The study was funded by The Danish Agricultural Research Centre for Organic Farming (DARCOF III) as part of the VegQure project (Organic cropping Systems for Vegetable production - product quality, natural regulation mechanisms, and environmental effects).

