last valuations that means it can be only applied up to the end of January for roughly assumed storage. However it is not possible for longer storage. To similar result inferred Drake and Elfving (1999), Drake (1991) and Cliff et al. (1998), who demonstrated that Gala apples are not well adapted long term storage because they rapidly lose firmness and aromatic constituents of flavour during storage. Therefore Meheriuk (1993) suggested a storage life of 5-6 months in 1-5% CO_2 + 1-2,5% O_2 at 0-2 °C. Second variety (Idared) maintained excellent quality up to the the 7th measurement.
The polarity test of profiled methods proves justness to its texture applications mainly because of that texture plays a determining role in a total quality of apples. High texture values in a scale method and in both profile tests can prove it.. Soft, floury or hyaline meshes are immediately noticed and cared of low valuation. In this respect the worst variant is B from variants, even though it did not appear during the first valuations and that the results were oscillated.
Relationships among some already achieved results of sensorial, chemical and physical analyse have been examined in terms of research quality of monitored apples. Obtained results were determined to parametric t-test. If the calculated t-values were higher than table ones correlation coefficient r_{xy} was noticeable. And there existed dependence on a chosen level of significance between variable quantities x and y. Tightness of monitoring relations was closer, the more the value of a correlation relation approached to 1. In Gala variety statistically demonstrated dependencies have been proved ($\alpha = 0,05$) between smell and taste, taste and texture (physically measure) and fibre and hardness, whereas fibre was stated chemically. Dependence has not been found between chemical sweet and sensorial taste. There has been shown a relation between smell and taste, hardness and fibre, texture and fibre in Idared variety. The reliance has not been unconfirmed between taste and texture, hardness and texture and between taste and content sugar. Contrasts are caused by another characteristic variety, which is slow ripping during storage. Results indicate that texture evaluated by sensorial analyse is not identical with hardness measured by instrumental engineering.

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THE INFLUENCE OF VARIETY AND NITROGEN FERTILIZATION ON YIELD AND QUALITY OF MALTING BARLEY

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Summary

Work evaluates an influence of variety (Kompakt, Garant, Atribut and Expres) and nitrogen fertilization during vegetation season (based on mineral nitrogen content in soil) on yield and crude protein content in barley grain. Variability of yields was most affected by varieties. Garant had significantly higher average yield (7,60 t . ha^{-1}) than varieties Kompakt (6,92 t . ha^{-1}) and Atribut (7,27 t . ha^{-1}). Crude protein content in grain of variety Garant (10,39 %) was significantly lower compared to varieties Expres (10,79 %) and Atribut (11,15 %). Nitrogen fertilization significantly influenced number of ears per 1 m^2, thousand grains weight and yield of spring barley. The highest yield (7,59 t . ha^{-1}) was found out after rate 20 kg of nitrogen per hectare (fertilizer DAM-390) at the end of tillering. Crude protein content in spring barley grain was not significantly influenced by any way of nitrogen fertilization during vegetation.

Key words: spring barley, variety, nitrogen fertilization, yield, quality

Introduction

The achievement of good barley yield and its high malting quality requires growing technology on high level and also favourable weather conditions during vegetation season. Appropriate growing technologies enable us to minimize the unfavourable effects of weather conditions on barley yields and quality. According to Kulík (1995) production of any crop, especially economically important, is not possible without respecting of intensification factors, which ensure adequate yield and its qualitative parameters. There is contemporaneously necessary to take into account adequacy of intensification factors in relation to economy and environment. The most important intensification measures in growing technology of spring barley are use of fertilizers and pesticides, also varieties and forecrops.
Our work was focused on evaluation of two important agrotechnical factors – variety and nitrogen fertilizaton in interaction with conditions of year on barley yields and its malting quality. Close relationships between variety, nitrogen fertilization and malting quality of barley are well known from works of many authors (Conry 1995, Fecenko, Bízik, Ložek 1989 etc.).

Material and methods

The small–plot experiments were performed under conditions of beet growing region in 1997 – 1999. Experiments were established by block method with randomly arranged plots in three repetitions. Varieties Kompakt, Garant, Atribut and Expres were used. The seed rate was 4,5 millions of germinable grains per hectare, forecrop of barley was sugar beet.
Variants of fertilization: **A** - unfertilized control, **B1** – 20 kg of nitrogen per hectare (ammonium nitrate) applied at the beginning of tillering, **B2** - rate of nitrogen calculated for 5 tons yield per hectare applied at the beginning of tillering (ammonium nitrate), **C1** – 20 kg of nitrogen per hectare (DAM - 390) at the end of tillering, **C2** - rate of nitrogen calculated for 5 tons yield per hectare applied at the end of tillering (DAM - 390), **D1** – 20 kg of nitrogen per hectare (Fostim) at the end of tillering, **D2** - rate of nitrogen calculated for five tons yield per hectare applied at the end of tillering (Fostim)
The nitrogen rate on variants B2, C2 and D2 was based on agrochemical analysis of soil on mineral nitrogen content. The need of nitrogen for production 5 tons of grains and appropriate amount of straw was calculated for 125 kg of nitrogen per hectare.

Table 1 Mineral nitrogen content in soil at beginning of tillering and really used rates of nitrogen on variants B2, C2 and D2

Year	Depth of sampling	Mineral nitrogen content in soil				Rate of nitrogen ($kg \cdot ha^{-1}$)
		$N - NH_4^+$	$N - NO_3^-$	N_{min} ($mg \cdot kg^{-1}$)	N_{min} ($kg \cdot ha^{-1}$)	
1997	0,00 – 0,30	1,73	8,79	10,53	88,56	36,46
	0,30 – 0,60	1,00	7,64	9,15		
1998	0,00 – 0,30	2,42	11,58	14,00	116,15	8,86
	0,30 – 0,60	2,49	9,32	11,81		
1999	0,00 – 0,30	2,40	9,30	11,80	84,60	40,40
	0,30 – 0,60	1,20	5,80	7,00		

$N - NH_4^+$ - ammonium nitrogen; $N - NO_3^-$ - nitrate nitrogen; N_{min} - mineral nitrogen

The yield was harvested by smallplot combine-harvester. Crude protein content in grain was determined according to Kjeldahl. The influence of experimental factors on observed characteristics was evaluated by multifactor analysis of variance. Statistical significance of differences between averages was examined by Tukey test on 95 % significance level.

Results

The highest values of thousand grains weight was found out in 1997 (49,36 g). Also the highest average yield (7,48 $t \cdot ha^{-1}$) and the most favourable crude protein content in grain (9,76 %) was in 1997. The lowest yields (7,16 $t \cdot ha^{-1}$) and the highest crude protein content was achieved in 1999.
Variety Garant had significantly higher ears density per m^2 before harvest than other varieties. Garant had the highest average grain yield (7,60 $t \cdot ha^{-1}$), significantly higher than varieties Kompakt and Atribut. Crude protein content in grain of variety Garant was significantly lower compared to varieties Atribut and Expres, average values of crude protein at variety Garant was the lowest in all three experimental years. Variety Atribut was characteristic by the greatest thousand grains weight in all three years and also the highest crude protein content was found out at this variety in all experimental years. Variety Kompakt achieved the lowest thousand grain weight (46,62 g). This variety had the smallest yield potential within all evaluated varieties, it produced the lowest yield in all years. Average yield of variety Kompakt for three years period (6,92 $t \cdot ha^{-1}$) was significantly lower compared to other varieties. Variety Expres had the lowest density of ears per m^2 (749,97 ears).
Nitrogen fertilization significantly influenced number of ears per 1 m^2, thousand grains weight and yield of spring barley. Thousand grains weight decreased on all fertilized variants compare to variant A, the most on variants B2 and C2 – significantly. Decrease was minor on variants B1, C1, where nitrogen was applicated in rate only 20 kg per hectare and on

variants D1, D2, where Fostim was used (Fostim contains not only nitrogen, but also phosphorus). The lowest average yield was achieved on control variant (7,15 t . ha^{-1}), the greatest yield was on variant C1 (7,59 t . ha^{-1}), where nitrogen was used in rate 20 kg per hectare (fertilizer DAM-390) at the end of tillering. The difference was statistically significant. Yield on other variants was non-significantly higher compare to variant A. Crude protein content in spring barley grain was not statistically significantly influenced by fertilization.

Discussion

Year conditions and varieties highly significantly influenced all evaluated characteristics. The year had the greatest proportion on total variability of yield forming components and crude protein content. Variability of yields was most affected by varieties.
Results confirmed earlier findings of Frančáková (1985), the more nitrogen is used for yield formation, the less nitrogen deteriorates protein content in grain and malting quality of barley. There is interesting finding, that variety Garant achieved the most favourable crude protein content in grain compared to other varieties. Garant belongs on the base of malting quality into group „B" (standard varieties) and another varieties into group „A" (malting varieties). Decrease of thousand grains weight as a consequence of higher nitrogen rates was observed also by Frančáková (1985). Results showed, that when nitrogen rate for spring barley is determined on the base of soil analysis (on mineral nitrogen content in soil), risks of harmful effects of foliar nitrogen aplication on malting quality of barley can be eliminated.

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Table 2 Average values of yield forming components, yields and crude protein content of spring barley

Factor	Levels of factor	n	Number of ears per m^2		Thousand grains weight		Yield		Crude protein content	
Year	1997	84	725,00	a	49,36	c	7,48	b	9,76	a
	1998	84	831,62	b	46,28	a	7,34	ab	11,12	b
	1999	84	859,05	b	46,87	b	7,16	a	11,26	b
Variety	Kompakt	63	803,05	b	46,62	a	6,92	a	10,52	ab
	Garant	63	878,10	c	46,86	a	7,60	c	10,39	a
	Atribut	63	789,78	ab	48,63	c	7,27	b	11,15	c
	Expres	63	749,97	a	47,90	b	7,52	bc	10,79	b
Fertilization	A	36	787,33	ab	47,82	c	7,15	a	10,59	a
	B1	36	812,11	ab	47,55	bc	7,36	ab	10,85	a
	B2	36	815,00	ab	47,16	ab	7,26	ab	10,77	a
	C1	36	770,00	a	47,68	c	7,59	b	10,70	a
	C2	36	847,33	b	47,02	a	7,35	ab	10,82	a
	D1	36	819,89	ab	47,70	c	7,29	ab	10,79	a
	D2	36	784,89	ab	47,60	bc	7,28	ab	10,47	a

Averages with different letters are statistically significant at $P \leq 0,05$

SOME INDICATORS OF SOIL QUALITY IN SEVERAL CROP PRODUCTION SYSTEMS

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Summary

In 1999-2000 the microbial soil activity (presented by CO_2 release, ammonification and nitrification activities) has been evaluated in four crop production systems (ecological and conventional I, integrated and conventional II). The ammonification and nitrification activities have been observed between the ecological and integrated production systems only. In the integrated system, there were detected the statistically significantly highest microbial activity. The differences among the