

The changes of β -glucan content during beer production with unmalted pseudocereals

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INTRODUCTION

Unmalted cereals or pseudocereals, including amaranth and quinoa can partially replace malt in beer production. Cereals, such as barley as well as malted grains are rich in β -glucan. During brewing it comes to wort and then is detected in the final product. The β -glucan is known to cause problems during wort and beer filtration, as it increases viscosity. Moreover, high molecular β -glucan may generate turbidity in the final product [1]. On the other hand, it can be advantageous from the nutritional point of view [2]. Substitution of malt with unmalted cereals or pseudocereals may even increase β -glucan content in wort and then in beer. It is connected with: (1) lower amount of malt being used and consequently lower β -glucanase activity, synthesized in grains during malting, (2) higher amount of high molecular polysaccharides coming from grains, which weren't modified during malting [3]. The purpose of this study was to investigate the changes in β -glucan content during wort and beer production when 10 or 30 % malt was replaced with unmalted quinoa or amaranth.

EXPERIMENTAL METHODS

Unmalted quinoa or amaranth in the form of grains, flakes and popped were used in brewing. The content of β -glucan in worts and beers produced with the addition of unmalted quinoa or amaranth and in all-malt worts and beers was determined by enzymatic assay kit (Megazyme). Each sample was examined in three replicates. Mean values and standard deviations were calculated. Student's t-test was performed to determine statistical significance. A P-value below 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

The content of β -glucan in worts obtained with the addition of unmalted quinoa and amaranth was higher than in wort produced exclusively from malt ($P < 0.05$). Worts produced with 30% addition of unmalted quinoa and amaranth contained more β -glucan than worts obtained with 10% pseudocereals in the grits ($P < 0.05$). The use of exogenous enzyme preparations containing β -glucanase can limit potential technological problems connected with a high content of β -glucan in wort. After beer fermentation and maturation a significant decrease in the concentration of β -glucan was observed. However, a higher content of β -glucan in beers produced with the addition of unmalted quinoa and amaranth compared with all-malt beers was still observed ($P < 0.05$). The differences in the concentration of β -glucan among particular beers are much smaller than among respective worts.

CONCLUSIONS

The use of unmalted quinoa and amaranth results in the increase of β -glucan content in wort and beer. It may cause problems during filtration and contribute to haze formation in the final product. The use of enzyme preparation containing β -glucanase can be a solution to these problems. The content of β -glucan was significantly lower in beer than in wort. It may result from the precipitation of β -glucan during boiling with hops.

REFERENCES

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