

Antioxidant activity of beers produced with unmalted quinoa and amaranth

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INTRODUCTION

Quinoa and amaranth are pseudocereals, which recently have received increased interest, as they are a good source of different nutrients, including proteins, vitamins and other biologically active compounds. They are also rich in antioxidants such as polyphenols, known to inhibit oxidation reactions in foods and beverages, and vitamin E[1]. Due to a high starch content quinoa and amaranth can be a potential substitute of barley malt in brewing. During beer storage there is a deterioration of beer quality since many undesirable flavours occur. [2]. Since quinoa and amaranth are an excellent source of antioxidants, their use in beer production might extend the shelf life of final products. The aim of this study was to investigate the antiradical and reducing potential of beers produced with 10 and 30% addition of unmalted amaranth and quinoa. Moreover, a relationship between the antioxidant capacity and total polyphenol content in beer was evaluated.

EXPERIMENTAL METHODS

All-malt beers and beers produced with 10 and 30% addition of unmalted quinoa (seeds or flakes) or amaranth (seeds or flakes or popped), used as partial substitutes of malt, were analysed by FRAP and DPPH assays. Total polyphenol content was determined according to EBC Analytica. 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

Beer has endogenous antioxidant activity due to the presence of compounds with strong antioxidant or antiradical properties. All of them could act as potential protective agents and retard beer flavour deterioration. Beers in which 10% malt was replaced by amaranth or quinoa flakes showed a higher reducing potential than all-malt beer ($P < 0.05$). Reducing potential of beers produced with 30% addition of pseudocereals decreased ($P < 0.05$). The use of 10% pseudocereals in the form of seeds, flakes or popped amaranth didn't reduce antiradical ability of beers when determined by DPPH. Beers produced with 30% addition of quinoa or amaranth exhibited lower antiradical ability than beers produced with 10% pseudocereals by 10-20%. The highest polyphenol content was measured in all-malt beer and beers with 10% addition of amaranth flakes or 10 and 30% quinoa flakes (on average 117 mg/L). The polyphenol content in the other beers obtained with pseudocereals was in the range from 82 to 91 mg/L and fell within the ambit of polyphenol content in lager beer.

CONCLUSIONS

It is difficult to determine whether unmalted quinoa and amaranth as partial substitutes of barley malt have a positive effect on oxidative stability of beers. On the one hand 10% addition of quinoa or amaranth flakes increased antioxidant potential, but 30% addition of pseudocereals caused a reduction in the antiradical and reducing ability compared to all-malt beers. Despite, quinoa and amaranth being rich in polyphenols, their use do not cause the increase of polyphenol content in beers produced with amaranth and quinoa.

REFERENCES

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