HACCP in brewing production chain: mycotoxins, nitrosamines and biogenic amines

The aim of this research was to identify the Critical Control Points (CCPs) for mycotoxins, N-nitrosamines and biogenic amines in malting and brewing production chain to establish specific hygiene rules to ensure a high level of consumer protection with regard to food safety. This study reported the preliminary results obtained in the TRUEFOOD (Traditional United Europe Food) EU integrated project improving quality and safety, and introduce innovation into traditional European food production systems through research, demonstration, dissemination and training activities.

**CCP 1 Mycotoxins: Intake and Storage (Malting & Brewing)**
- It is necessary to inspect cereal grains for any possible mould infections and analyze for any mycotoxins already formed (V Lab. 2004).
- Breweries perform careful control of barley and other cereal grains before acceptance for malting and purpose, because mouldy grains will spoil the flavour and other aspects of beer quality (Krogh et al., 1974).
- Analytical control is requested.

**CCP 2 Nitrosamines: Kilning (Malting)**
- Do not use direct-fired heat sources, but only indirect malt drying techniques;
- Do not use oil but natural gas as the kiln fuel source;
- Use sulphur dioxide in the kiln air stream seems to reduce, or prevent, the formation of undesirable nitrosamines in malt;
- High application of bromates at the start of malting, or spraying or steeping green malt with dilute nitric acid before kilning (Izquierdo-Pulido, 1996).

**Management Control Point for Nitrosamines: Brewing**
To reduce the potential contamination from bacteria formalized management system are requested with defined working procedures for GHP.

**Management Control Point for Biogenic Amines: Malting**
- Good Agricultural Practices (GAP): No malt coming from barley grown in soils with low potassium or sodium or with high ammonia levels (Izquierdo-Pulido et al., 1994).
- Good Manufacture Practices (GMP): barley variety, storage, germinating intensity and kiln temperature affect the final amine levels in malt (Halasz et al. 1999; Kalac and Krizek, 2003).

**Management Control Point for Biogenic Amines: Brewing**
- To reduce potential contamination from bacteria are request formalized management system with defined working procedures for GHP.
- Washing the pitching yeasts with phosphoric acid lead to the reduction of Pedicocci and consequently reduce the tyramine content in beer (Kalac and Krizek, 2003).

**Conclusions**
Preliminary information is now available to keep under control mycotoxins, nitrosamines and biogenic amines along the malting and brewing process. Three Critical Control Points were efficaciously identified and included with this research in the HACCP management program for beer brewers. Moreover, the integration of these CCPs in quality systems, and tracking and tracing procedures in brewers’ quality control schemes is possible. The definition of a specific management system (guide-lines) for SMEs brewers will be the aim for the next part of the research.

**References**


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