BREWING SUMMIT SAN DIEGO 2018

A - 079

Levels of glycosidic nitrile in North American malting barley cultivars

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Introduction

Cyanogenic glycosides in malt have been identified as precursors of ethyl carbamate in whisky production. Malting conditions and more importantly the variety of barley used, greatly influence the level of ethyl carbamate precursors in malt and thus the potential level in the final whisky

Levels of glycosidic nitrile (GN) have been successfully lowered in UK barley varieties through selective breeding, however little is known about the levels in North American barley varieties.

Barley varieties are typically categorized according to their propensity to produce GN as follows:

Non-producer: < 0.5 g/tonne

Low-Producer: 0.5 – 1.5 g/tonne

High-Producer: > 1.5 g/tonne

The purpose of this study was to determine the levels of GN in North American barley varieties and impact of processing conditions.

Methodology

Seventy eight samples of malt representing different varieties of barley (Table 1) were collected from commercial and craft malthouses in North America and assessed for GN level.

Additionally, micromalting trials were conducted on both low and high GN producing varieties to investigate the effect of germination moisture content, temperature and time on the level on the subsequent level of glycosidic nitrile in the resulting malts and potential interaction effects.

Glycosidic nitrile content of malt was determined according to EBC Method 4.21 by enzymatic incubation with beta-glucosidase followed by distillation and spetrophotometric assay of measurable cyanide by reaction with chloramine-T.

Table 1. Malting barley varieties grown commercially in North America

Variety Name	Head Type	Planting Type	Breeder
AAC Synergy	Two	Spring	Agriculture & Agrifood Canada
AC Metcalfe	Two	Spring	Agriculture & Agrifood Canada
Newdale	Two	Spring	Agriculture & Agrifood Canada
CDC Copeland	Two	Spring	University of Saskatchewan
Conlon	Two	Spring	North Dakota State University
Pinnacle	Two	Spring	North Dakota State University
LCS Genie	Two	Spring	Limagrain Cereal Seeds
LCS Odyssey	Two	Spring	Limagrain Cereal Seeds
Full Pint	Two	Spring	Oregon State University
Endeavor	Two	Winter	USDA - ARS (Aberdeen, ID)
LCS Calypso	Two	Winter	Limagrain Cereal Seeds
LCS Violetta	Two	Winter	Limagrain Cereal Seeds
Thoroughbred	Six	Winter	Virginia Tech

Results

Figure 1. Levels of GN in North American commercial and craft malts surveyed.

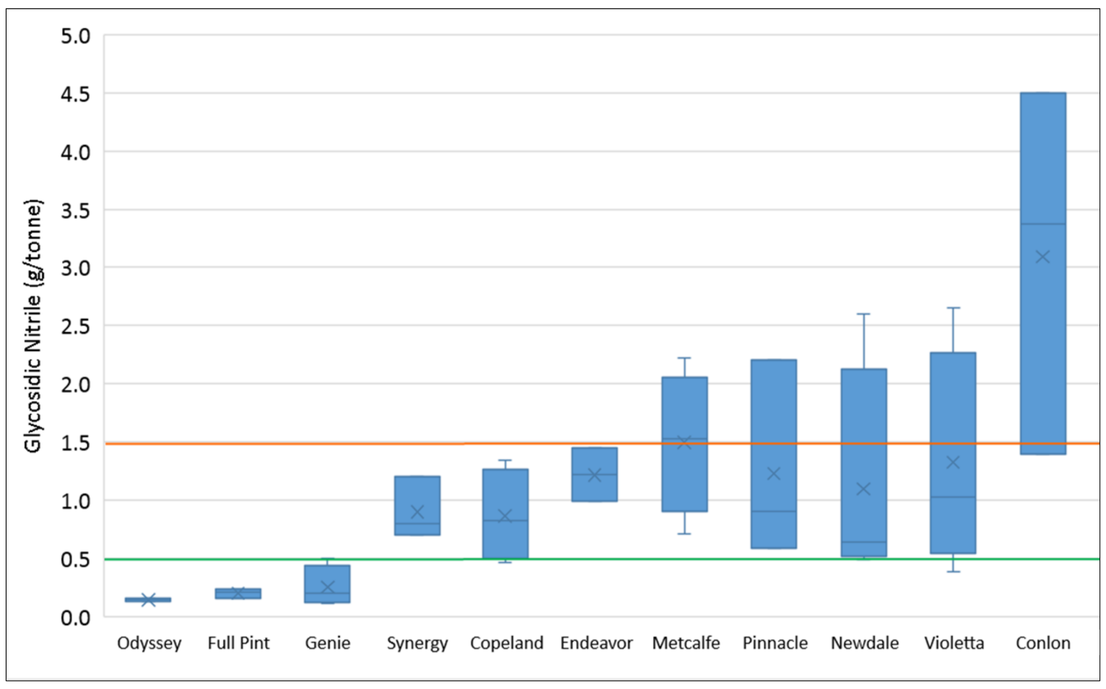


Figure 2. Effect of germination time on GN levels in malt for six different barley varieties.

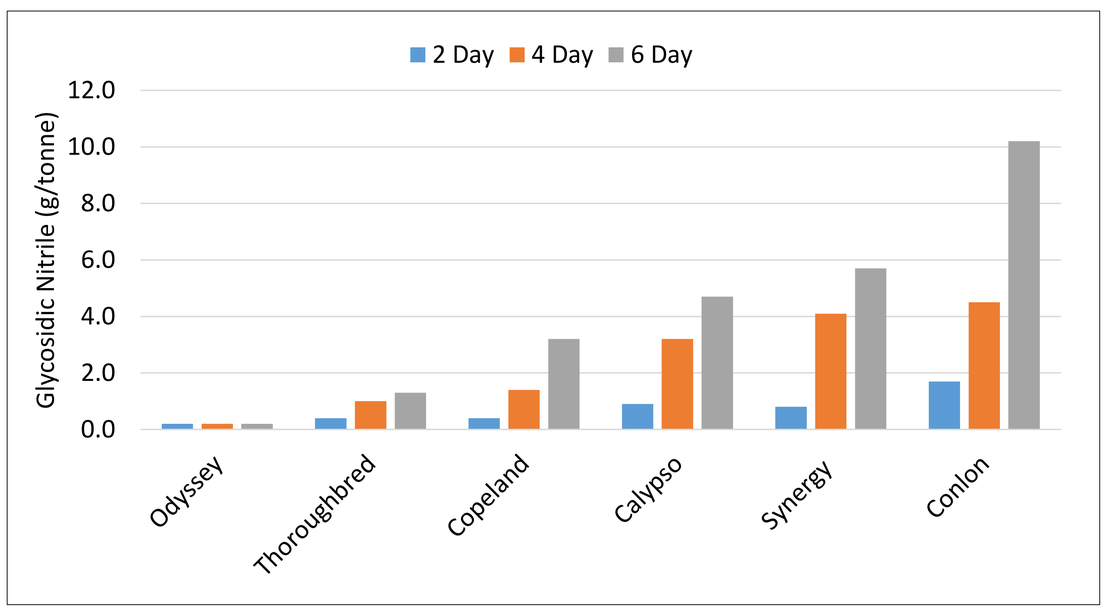
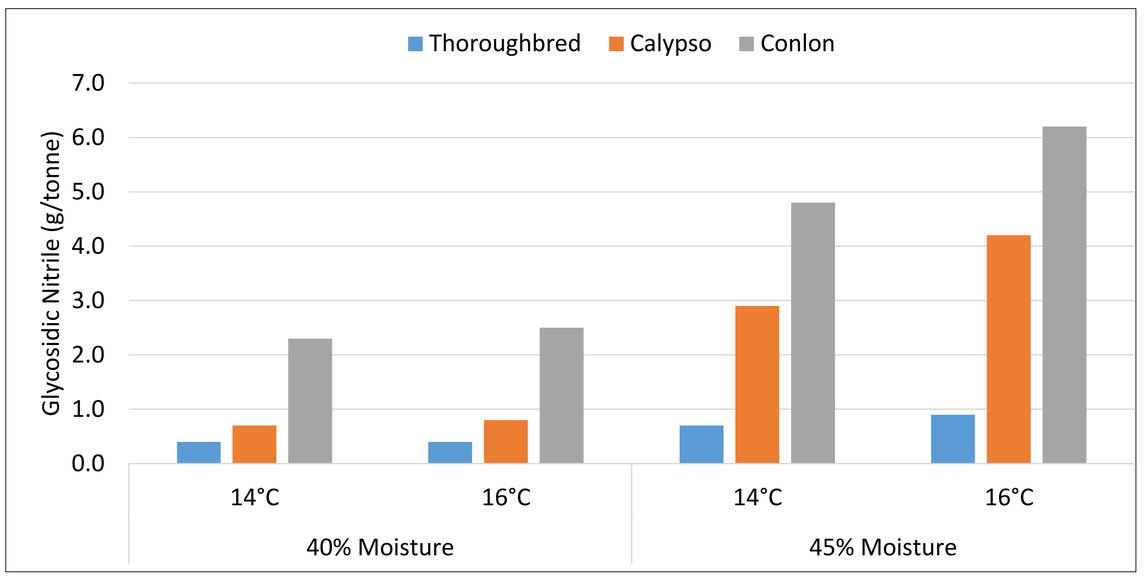


Figure 3. Effect of germination moisture and temperature on GN levels in malt for three different barley varieties



Conclusions

Varieties of malting barley grown in North America exhibit a range of GN levels. There are examples of both non-, low, and high producing varieties.

The following conditions can increase levels of GN in malt:

- longer germination time
- higher germination moisture
- higher germination temperature

Varieties responded differently to the changes in processing conditions suggesting a genotype by process interaction effect.

Both variety choice and malting conditions can reduce the levels of GN in malt and subsequent potential for ethyl carbamate formation in spirits production.

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