Malting Barley Methods

This section describes methods used at the Grain Research Laboratory. Unless otherwise specified, analytical results for barley and malt are reported on a dry weight basis. The ASBC methods cited are those of the American Society of Brewing Chemists, Ninth Edition, (2004).

Dockage and assortment —Dockage - Dockage-free barley is obtained by passing an uncleaned sample through a Carter Dockage Tester arranged as described in the Canadian Grain Commission's Official Grain Grading Guide for dockage determination. This involves passing the barley over a #6 riddle, #6 and #5 Buckwheat sieves, and a #4.5 round hole sieve. Material retained above the #4.5 round hole sieve is considered to be dockage-free. Assortment - All samples are passed through a Carter Dockage Tester equipped with a No. 6 riddle to remove foreign material and two slotted sieves to sort the barley. Heavy Grade barley is the material retained on a 6/64" (2.38 mm) x 3/4" slotted sieve. Intermediate Grade is barley that passes through the 6/64" x 3/4" sieve but is retained on a 5/64" (1.98 mm) x 3/4" slotted sieve.

Weight per thousand kernels — A 500 gram sample of dockage-free barley is divided several times in a mechanical divider to obtain two equal portions of 40 grams. All foreign material and broken kernels are removed from one 40 gram portion and the net weight determined. The number of kernels is then counted with a mechanical counter and thousand kernel weight is calculated (as is basis) (Institute of Brewing's Recommended Methods of Analysis, Barley 1.3 (1997)).

Moisture content of barley — Moisture content of barley is predicted using NIR equipment that has been calibrated by the standard ASBC method (ASBC Barley 5C).

Moisture content of malt — Moisture content of malt is determined on a ground sample at 104°C for 3 hours in a convection oven (ASBC Malt-3).

Protein content (N x 6.25) — Protein content is predicted on dockage-free barley using NIR equipment that has been calibrated by Combustion Nitrogen Analysis (CNA). CNA is determined on a LECO Model FP-428 CNA analyser calibrated by EDTA. Samples are ground on a UDY Cyclone Sample Mill fitted with a 1.0-mm screen. A 200-mg sample is analysed as received (it is not dried prior to analysis). A moisture analysis is also performed and results are reported on a dry matter basis (ASBC Barley 7C).

Germination energy — Germination energy is determined by placing 100 kernels of barley on two layers of Whatman #1 filter paper, in a 9.0 cm diameter petri dish, and adding 4.0 ml of purified water. Samples are controlled at 20 degrees Celcius and 90% relative humidity in a germination chamber. Germinated kernels are removed after 24 and 48 hours and a final count is made at 72 hours (ASBC Barley 3C, IOB, and EBC procedure).

Water sensitivity — Water sensitivity is determined exactly as described for germination energy, except that 8.0 ml of purified water is added to each petri dish (ASBC 3C, IOB and EBC procedure). The actual water sensitivity value is

the numerical difference between the 4ml and 8ml tests. (Note: the water sensitivity value is not reported in the data tables but is inferred by inclusion of the result of the 8 ml test).

Malting conditions — Malts are prepared using an Automatic Phoenix Micromalting System designed to handle twenty-four 500 g samples of barley per run. Samples were steeped at 13°C using the following regime; 10 h wet steep, 18 h air rest, 8 h wet steep, 12 h air rest. Samples were germinated for 96 hours at 15°C, with 100% relative humidity. Kilning was carried out over 24 h as follows:12 hours at 55°C; 6 hours at 65°C; 2 hours at 75°C; 4 hours at 85°C.

Malt mills — Fine-grind malt is prepared with a Buhler-Miag disc mill set to fine-grind. Coarse-grind malt is prepared with the same mill set to coarse-grind. The settings for fine- and coarse-grinds are calibrated quarterly, based on the screening of a ground ASBC standard check malt (ASBC Malt-4).

Fine-grind and coarse-grind extracts — Extracts are prepared using an Industrial Equipment Corporation (IEC) mash bath and the Congress mashing procedure from 45°C to 70°C. Specific gravities are determined at 20°C with an Anton Paar DMA 5000 digital density meter (ASBC Malt-4).

Wort-soluble protein — Wort-soluble protein is determined spectrophotometrically using the method of Haslemore and Gill (1995), *Journal of the Institute of Brewing* 101:469 (ASBC Wort-17).

Kolbach index (ratio S/T) — Kolbach index is calculated from the formula, (% Soluble protein/% Malt protein) x 100.

Free Amino Nitrogen (FAN) — Free amino nitrogen is determined on the fine extract according to the official ASBC method Wort-12, automated to run on a Skalar segmented flow analyzer.

Diastatic power — Diastatic power is determined on a Skalar segemented flow analyzer, using an automated neocuproin assay for reducing sugars, which is calibrated using malt standards analysed using the official ferricyanide reducing sugar method, (ASBC Malt 6A).

α-Amylase activity — α-Amylase activity is determined using ASBC method MALT 7B automated to run on a Skalar segmented flow analyser, using ASBC dextrinized starch as the substrate, and calibrated with standards that have been determined by method ASBC Malt 7A.

ß-Glucan content — ß-Glucan content is determined in malt extract by flow injection analysis using Calcofluor staining of soluble, high molecular weight ß-glucan (Jorgensen (1988) *Carlsberg Res. Commun.* 53:277) (ASBC Wort-18).

Viscosity — Viscosity is measured on fine grind Congress wort using an automated Schott AVS 500 Micro-Ubbelodhe glass capillary viscometer, which has been calibrated according to ASTM method D-445 (ASBC Wort-13).