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Optimization of cereal malt processing for Gowe production

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Sorgum malt

Cooked sorghum Gowe

Ready-to-drink Gowe

GOWE is a traditional Beninese beverage made from zmalted and non-malted sorghum or maize. Traditionally, malting is achieved at high moisture (48-55% wb) and temperature (30°C) for long time (6 days). In such conditions, the development of moulds is observed and the production of mycotoxins is suspected while malt overall quality could not be optimum. The objective of this study was to assess the sanitary and physico-chemical quality of traditional malt and to improve it through experimental design and grain pre-treatment.

Methodology

Thirteen (13) traditional samples were collected and characterized. Nine (9) malt samples were produced at 30°C using an Doehlert experimental design : 4 levels for soaking time (8 to 24h) and 3 levels for germination time (24 to 72h) were tested. The effect of washing sorghum grains (with 5g/l NaCl) before malting on mould growth was tested.

Results

Characterization of traditional malts

Traditional malts displayed low amylase activities with sometimes a high mycotoxin level (Table I); sorghum malt appeared to be potentially richer in amylases and poorer in chemical hazard.

Table I. Biochemical characterization and chemical hazard of traditional malts.

	Sorghum malt	Maize malt
α-amylase activity (CU/g DM)	14.8± 59.6	7.4± 33.5
β-amylase activity (BU/g DM)	0.03± 97.1	Nd
Cyanide content (mg/kg DM)	12.8± 9.9	9.9± 22.8
Tannin content (% DM)	0.03± 44.9	0.03± 29.3
Phytate content (g/100g DM)	0.5± 0.1	0.4± 1.0
Aflatoxin B1 (µg/kg)	0.3/0.9/1.8	0.6/1.5/28.6
Aflatoxins B1+B2+G2+G1 (µg/kg)	0.6/1.4/2.4	1.0/2.3/34.5
Fumonisin (µg/kg)	6/9/44	37/142/204

Mean ± standard deviation ; XX/YY/ZZ = value for frist / second / third samples ;
DM = Dry matter ; Nd = Not detected

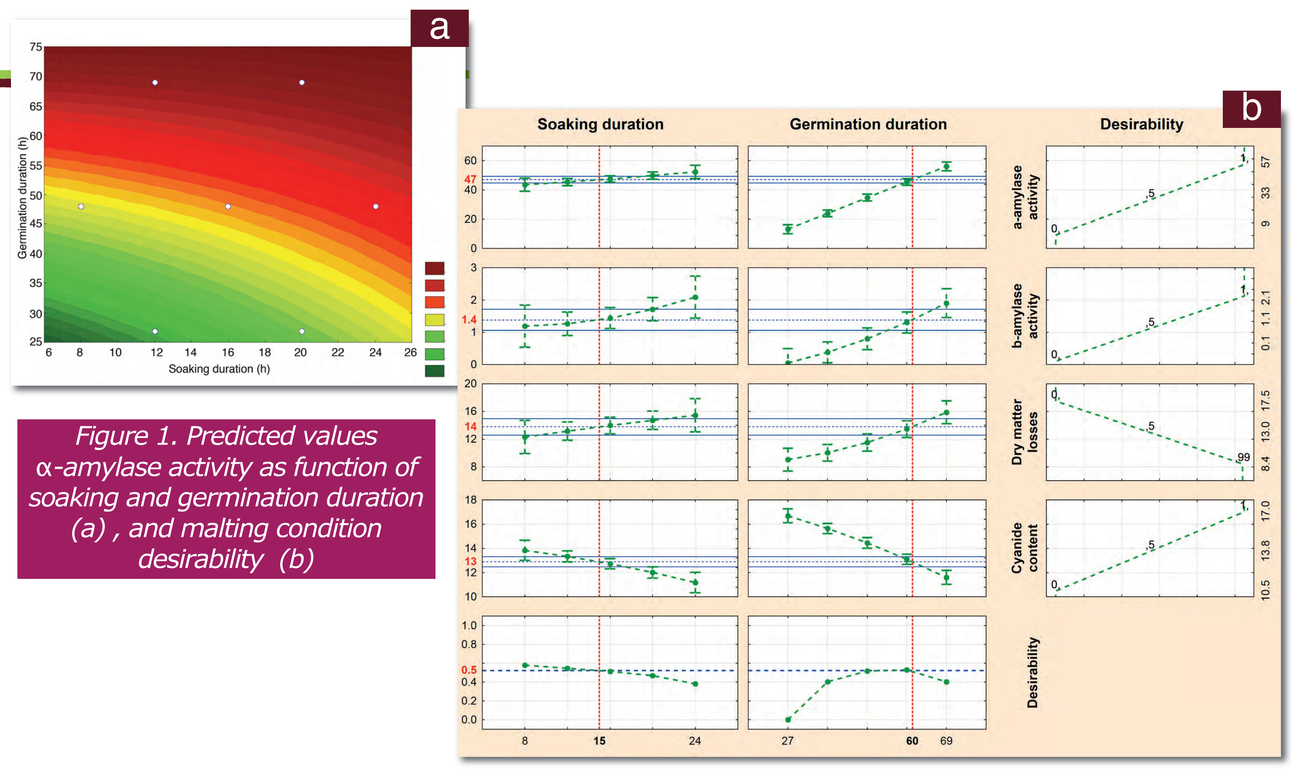

Figure 1. Predicted values α-amylase activity as function of soaking and germination duration (a) , and malting condition desirability (b)

Sodium chloride washing reduced the growth of moulds during germination

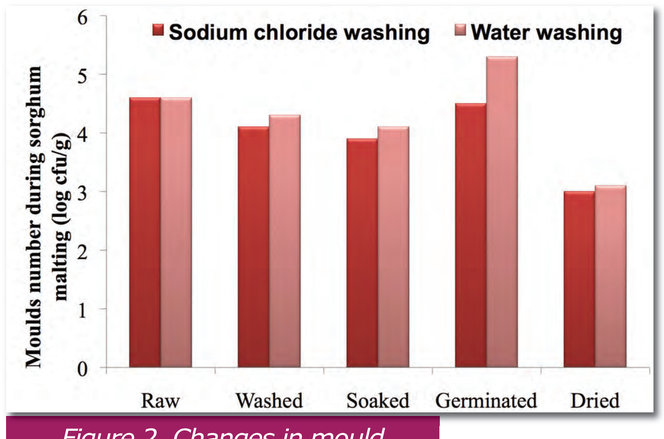

Figure 2. Changes in mould population during sorghum malting.

Washing sorghum grains with sodium chloride solution (5 g/l) did not directly lower mould population (P>0.05) but significantly decreased growth mould during germination (Fig. 2). An increase of salt concentration could improve this result.

Optimal sorghum malt processing

α-amylase activity (Z) was positively related to soaking time (X1) and germination time (X2) while the quadratic terms had no significant influence (Z= 35.6 + 3.52X1 + 20.9X2 - 2.32X1X2; Fig.1a). Similar conclusions were drew up for β-amylase activity (Fig 1.b). Dry matter losses were positively affected by only the germination time while cyanide content decreased when duration of soaking and germination increased (degerming was performed after drying). As indicated by the desirability function, the optimum conditions for malting are soaking for 15h and germination for 60h, resulting in α-amylase activity of 47 CU/g, β-amylase activity of 1.4 BU/g, cyanide content of 13 mg/kg and dry matter losses of 14%. Moisture content (40% wb) and duration were limited during optimum germination resulting in low mould development.

Conclusion

TRADITIONAL malts show a low amylase activity and risk of mycotoxin contamination. This can be improved by using optimum malting condition (reduced moisture content and duration) and/or salt washing.

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