SORGHUM ADJUNCT BREWING WITH BARLEY MALT AND POTENTIALS FOR ALTERNATIVE COMMERCIAL BEER MAKING

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INTRODUCTION

- Beer is made of barley malt, water, yeast & hops. The malt is fermented to yield CO₂ and alcohol with a characteristic flavors & color [1]. Barley malt is preferred grain for beer making due to its higher capacity of extract development, enzymatic activity and yeast growth during fermentation [2].

- Replacing barley malt in beer making has become useful due to benefits of production cost, diversity, nutrition, governments’ policies in tax/ importing malt [3]. Ethiopia has been significantly deficient in meeting the demand for barley malt. As a result, the net import bill for barley malt increased [4]. Sorghum is highly produced and grown in Ethiopia. It is useful alternative for Ethiopian brewing industry [5].

- Sorghum adjunct in brewing should not negatively affect quality of beer and compromise sensory characteristics. Thus, the aim of this study was to evaluate the effect of partial substitution of barley malt with unmalted & malted sorghum adjuncts on physicochemical & sensory properties in beer.

EXPERIMENTAL

Phase 1: Unmalted sorghum adjunct - brewing

Sorghum lines (Regular & waxy-HD) → Milling → Adjunct + Barley Malt → Brewing [Lab + Pilot]

Phase 2: Malted sorghum adjunct - brewing

Sorghum lines (Regular & waxy-HD) → Malting → Milling → Adjunct + Barley Malt → Brewing [Lab + Pilot]

RESULTS & DISCUSSION

- The trained panelists generated and selected terms for evaluation of beer formulations. (See the Word Cloud below – Figure 2A)

Figure 2 Descriptive sensory attribute generation (A) and evaluation of the sorghum beers (B) – Spider plot of the Aroma and Appearance profiles

- Descriptive sensory analysis of the sorghum adjunct beers revealed that the barley malt substitution with regular sorghum up to 25% produced similar taste, mouthfeel and aftertaste profiles as standard beer (Fig. 3). This study on waxy sorghum resulted the same trend at higher proportions (35%).

- These beers also had similar aroma and appearance profiles as that of the commercial beers in the market. Product test at micro-brewery is underway.

Phase 1: Unmalted sorghum adjunct - brewing

Substitution of barley malt with malted or unmalted adjunct from Melkam, ESH4 & Waxy sorghum varieties (15-35%)

Phase 2: Malted sorghum adjunct - brewing

Figure 1: Sorghum beers developed: A & B (25 & 35% unmalted Melkam adjunct), C & D (25 & 35% unmalted ESH4 sorghum adjunct) and E (Control beer – 100% barley malt)

Figure 3: Sensory profiles of beers developed from partial replacement of barley malt with sorghums (malted and unmalted) – Taste, mouthfeel and aftertaste

Where per cent of M-MS/U-MS = malted/unmalted Melkam, M-ES/U-ES = malted/unmalted ESH sorghums.

CONCLUSION

The study reveals that optimized adjuncts could be considered for partial brewing with comparable desirability. Sorghum adjunct-barley malt beer formulations – depending on the type of sorghum are screened according to beer characteristics. More sorghum in beer making resulted in changes of haziness, alcohol, acidity, fermented aroma, bitterness, foaming, sourness and golden-brown colors. Regular sorghums up to 25% and waxy sorghum up to 35% as malted or unmalted adjunct in brewing demonstrated potential for small scale brewing and piloting.