

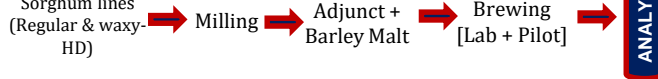
INTRODUCTION

- ❖ Beer is made of barley malt, water, yeast & hops. The malt is fermented to yield CO₂ and alcohol with a characteristic flavor, aroma & 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].
- ❖ Other grains (rice, maize and sorghum) has been introduced to brewing in African countries. Replacing barley malt in beer making has become useful due to production cost, diversity, nutrition, governments' policies in tax/importing malt [3].
- ❖ Ethiopia has been significantly deficient in meeting the ever-increasing malt barley demand of the breweries from domestic production. As a result, the net import bill for malt barley increased [4]. Sorghum is highly produced and grown in Ethiopia - its climate resilient properties make it useful in traditional beverages and beers [5].

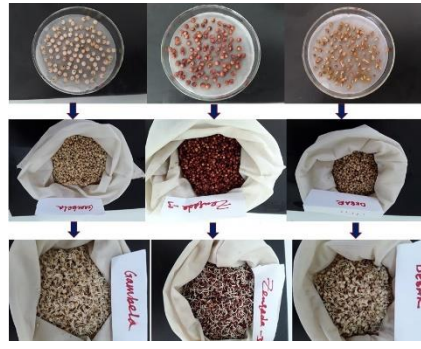
- ❖ Sorghum adjunct used in brewing should not negatively affect important beer quality and should not be highly compromised sensory characteristics. Thus, the aim of the study is to evaluate effect partly adding sorghum adjuncts (malted unmalted) on quality of beer in respect of physicochemical and sensory properties .

EXPERIMENTAL

1) Unmalted sorghum adjunct - brewing



2) Malted sorghum adjunct - brewing



- ❖ Optimization of malted sorghum adjunct - conditions suitable for brewing quality
- ❖ Small scale and piloting the malting
- ❖ Unmalted sorghum for immediate use in brewing

CONCLUSIONS

The study reveals that optimized adjuncts could be considered for partial brewing with comparable desirability. Sorghum-barley malt beer formulations - depending on the type of sorghum be screened according to the common characteristics of beers. Adding more sorghum in beer making result in changes - haze, alcohol, acidity, fermented aroma, bitterness, foaming, sourness and golden-brown colors. This study will generate more information during small scale brewing test in the lab and piloting microbrewer- using these preliminary study findings.

RESULTS AND DISCUSSION

- ❖ Sensory panel trained (Figure 1) - to screen beers discussed quality descriptors of different beers - under material and process changes
- ❖ The trained panelists generated and selected terms for evaluation of beer formulations. (Word cloud - Figure 3)



Figure 1. Sensory panel screening three different beers



Figure 2. Commercial Beers - for attribute generation

- ❖ The large font and centered words are attributes that change when adding more sorghum into barley malt beer formulations.
- ❖ Definitions, standard and reference was then generated based on their categories - appearance, aroma, taste, mouthfeel and aftertaste .



Figure 3. Wordcloud of the sensory attributes generated to describe and evaluate types of beers

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