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Hot Water Extract and Diastatic Power Development during Malting of Acha (*Digitaria exilis*)

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ABSTRACT

Acha, an indigenous African cereal grain was malted for six days to check for hot water extract and diastatic power development. Hot water extract and diastatic power of acha malts increased with germination time and peaked (278°l/kg,19°L) on the fourth day of germination, respectively. The correlation value (R^2 = 0.991) obtained between the two parameters depicts a strong relationship between the two correlated parameters. Digitaria exilis, however has shown to posses the potential of producing its own enzymes for the breakdown of its starchy endosperm during malting and also, its malt can be used as a substitute grain in brewing industries.

Keywords: Diastatic power, Hot water extract, malting and enzymes.

INTRODUCTION

In commercial brewing, Barley has always been the principal cereal grain because of its endogenous enzymes, other cereal grains like millet, wheat and maize have been studied as well, but there is a scanty research on this indigenous African cereal grain known as Acha [1]. Hot water extract and Diastatic power are the major parameters for determining the potentiality of a cereal grain in producing its enzymes needed to convert the starchy endosperm into fermentable sugars for brewing purposes [2]. This research paper is aimed to assess the hot water extract and diastatic power potential of acha (*Digitaria exilis*).

Materials and methods

Acha species and source

The acha species used in this study is the white Acha (*Digitaria exilis*). They were bought from a local market in Onitsha, Anambra State and were identified by the Botany Department, Nnamdi Azikiwe University, Awka, Anambra state, Nigeria.

Grain sorting and cleaning

The grains were thoroughly cleaned and surface sterilized with 1% (v/v) sodium hypochlorite to check for microbial contamination. Afterwards, grains were subsequently washed and drained.

Steeping and Germination of grains

One kilogram of grains was steeped in water at room temperature for 12hours followed by 4 hours air rest and further 12hours wet- steep. Grains were germinated for 6days and were daily turned and sprayed with about 10ml of water to avoid matting and also ensure equal germination. Thereafter, grains were kilned at 45°C

for 24hours and samples were stored for analysis.

Determination of hot water extracts (HWE)

The hot water extract which is a measure of dissolved materials in wort was prepared by infusion mashing method [3]. Ten grams (10g) of the ground acha malt samples were weighed into mashing beakers containing 72ml of distilled water pre-heated in a water bath at temperature of 68^{0}C. The addition of the malt samples reduced the temperature to about 65^{0}C for 1 hr with stirring at 30mins interval for elimination of lumps. The mash was later cooled and transferred to a flask. The beaker was rinsed into the flask and made up to 103ml and was then mixed with inversion. Thereafter, the mash was filtered off and the specific gravity obtained with a specific gravity bottle. The extract yield was obtained from the relation:

HWE = G x 10.13

Where G =1000 (SG – 1).

Determination of diastatic power

Infusion extract of the malts were prepared and 3ml aliquots of the extracts were separately pipetted into 100ml of 2% 0.1M citrate phosphate buffer starch solution in 200ml flasks .The mixtures were shaken and maintained at room temperature for 1hr from the time the aliquots were added. At the end 30ml of 0.1M NaOH was added to stop the reaction and total volume raised to 200ml with distilled water. The diastatic power of the malts was then determined by titrating the starch digests against 5ml of Fehling's solution (i.e. equal volumes of solution A and B mixed together) contained in a 150ml conical boiling flask (solution A: 7g of copper sulphate and 2 drops of dilute sulphoric acid in 100ml of water, solution B: 35g of Potassium tartarate and 12g of sodium hydroxide in 100ml of water. The flask contents were boiled as titration continued until the blue colour of Fehlings solution discharged. Three drops of 1% (w/v) aqueous solution of methylene blue were added and the titration and boiling continued to the end point when the methylene blue was decolourized and the reaction mixture became bright red. The diastatic power (D.P) in degrees linter (^{0}L) was calculated from the relation:

D.P = 2000 – 200 / Xy -Xs

Where x = no of ml of malt extract used in digesting starch

Y = no of ml of starch digest used in titration

S = titre for starch blank. 200 and 2000 are constants [4].

RESULTS

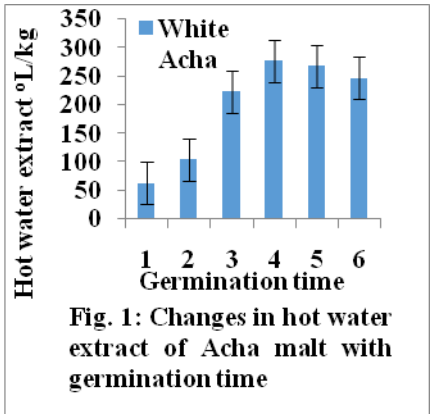

Fig. 1: Changes in hot water extract of Acha malt with germination time

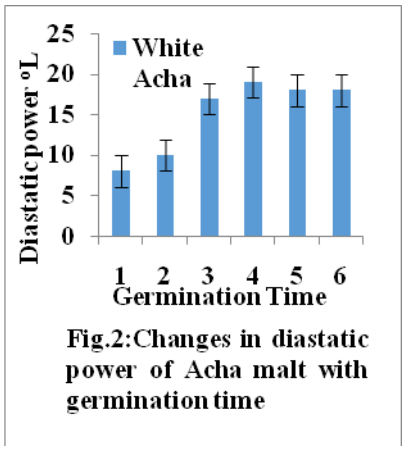

Fig.2:Changes in diastatic power of Acha malt with germination time

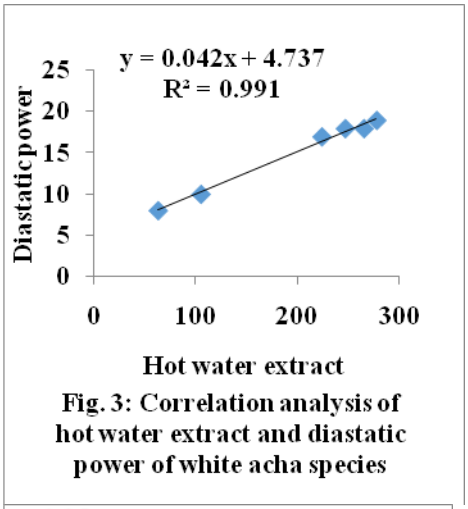

Fig. 3: Correlation analysis of hot water extract and diastatic power of white acha species

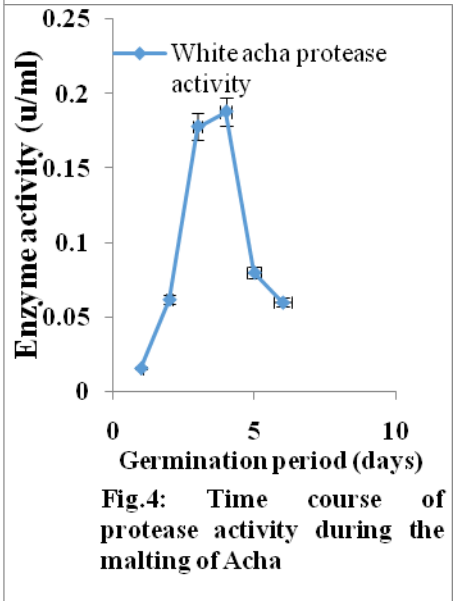

Fig.4: Time course of protease activity during the malting of Acha

DISCUSSION AND CONCLUSION

There was increase in the development of diastatic power which also led to increase in the extract yield during the malting process [5, 6, 7, 8].

The graph of correlation also depicts that there is a direct relationship between hot water extract and diastatic power and the R^2 value was positively significant showing that acha malts has the potential of producing quality malt.

However, other cereal grains like Acha can contribute in reducing the cost of principal grains and the cost of their importation. However, they can serve as adjuncts or substitute grains in brewing industries.

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