

# The Study on Brewing Sorghum Spirits by Amylo Process

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## ABSTRACT

Amylo is a method used to liquefy grains with water and hydrochloric acid by cooking in high temperature and high pressure, and after cooling of the cooked grains, fungus and yeasts are inoculating to make koji cultivated, starch liquefied and saccharified, yeasts inoculating and fermentation performed at the same time in a large fermentation tank, that saved the skill to cultivate separately and production space. In this thesis, the amylo method was used to prepare sorghum spirits. This thesis can be divided into five parts: In the first part of this thesis, the best condition for the hydrolysis and the fermentation of sorghum grains were investigated. In the second part of this thesis, the optimum addition concentration and time of hexanoic acid into sorghum paste during fermentation to get better acceptance of the sorghum spirits were investigated, and to compare the difference of components analysis between before and after storage. In the third part of this thesis, the changes of volatile compounds during storage in the sorghum spirits with or without hexanoic acid added during fermentation were investigated. In the fourth part of this thesis, the optimum addition ratio and time of mixed acid that the chosen concentration of hexanoic acid confection with acetate and butyric acid in the same concentration into sorghum paste during fermentation to get better acceptance of the sorghum spirits were investigated, and also to compare the difference of components analysis between before and after storage. In the fifth part of this thesis, the changes of volatile compounds during storage in the sorghum spirits with different ratio of mixed acid added during fermentation were investigated. The results showed that the most acceptable fermentation condition to prepare spirits is that each kilogram red sorghum milled with 3L water, then adjusting pH to 4.5 with citric acid, followed by adding 2mL liquefaction enzyme (SpezymeR Fred -amylase) and reacted for 90 minutes at 95 , then after cooling to 50 of the sorghum paste, 3mL saccharification enzyme (OptimaxR HP7525) was added and reacted for another 72 hrs. Finally, 10 grams of commercial yeast (Red Star Distiller 's Active Dry Yeast) was added in the paste fermented 72 hrs at  $26 \pm 2$  . The sorghum spirits obtained from the fermented paste with 4mL of 2.5% hexanoic acid ethanol solution added at 36 hrs ' fermentation duration was found to be more acceptable. The yield of sorghum spirits was found to decrease with the increasing of the concentrantion of hexanoic acid added. During storage, the content of total acid and total ester were found to increase with the increasing of the storage time. The major volatile compounds found in the sorghum spirits with or without hexanoic acid added during fermentation were n-propanol, butanol, isobutanol, 2-butanol, pentanol, isoamyl alcohol, 2-phenyl ethanol, acetal, acetaldehyde, acetic acid, propanoic acid, butyric acid, isobutyric acid, valeric acid, caproic acid, ethyl acetate, ethyl propionate, ethyl butyrate, ethyl pentanoate, ethyl caproate, ethyl myristate, ethyl palmitate, ethyl stearate, ethyl oleate, ethyl linoleate, ethyl linolenate, and ethyl lactate. After storage the content of alcohols, aldehydes and acids in the sorghum spirits with or without hexanoic acid added during fermentation were found to increase with the increasing of the storage time, whereas that of esters were found to decrease with the increasing of the storage time. The sorghum spirits obtained from the fermented paste with 4mL of 2.5% mixed acid (acetic acid: butyric acid: hexanoic acid= 2:1:5) ethanol solution added at 36 hrs ' fermentation duration was also found to be more acceptable. The yield of sorghum spirits was found to decrease with the decreasing of the ratio of hexanoic acid added. During storage, the content of total acid, total ester and total volatile compounds in the sorghum with mixed acid added during fermentation were found to increase with the increasing of the storage time.

Keywords : sorghum spirit ; amylo ; hexanoic acid ; mixed acid ; volatile compounds

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