EFFECT OF DRYING TEMPERATURE ON GLUCOMANNAN AVAILABILITY IN *Amorphophallus borneensis* FROM SABAH

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INTRODUCTION

Glucomannan is obtained from the *Amorphophallus* species (Chen, 2008), of which there are more than 170 species (Hetterscheid and Ittenbach, 1996). The four main exploited *Amorphophallus* species are *Amorphophallus konjac*, *A. muelleri*, *A. paeoniifolius* and *A. variabilis* (Hetterscheid, 1994). The most widely used corm for the production of glucomannan is from *A. konjac*. This raw material is mainly produced in the temperate Asian countries of China and Japan, and in the mountainous regions of Thailand, Indonesia, Sabah and Sarawak (Ipor *et al.*, 2004). According to Ipor *et al.* (2006), nine species of *Amorphophallus* are found in Sarawak, and one of them is *A. borneensis* which is widely distributed in Kuching and Miri, as well as in Tenom, Sabah. *A. borneensis* has globolose and big corms which can grow up to 7-10 kg each. Praquin and Miche (1971) reported that postharvest factors such as storage length, temperature and processing of corms affect glucomannan availability. However, glucomannan availability in *Amorphophallus* corms also varies with the species (Chandra, 1984). According to Chan (2007), drying slices of corms to chips is necessary for storing the product. Evaporation through high drying temperature causes loss of moisture that leads to reduction in glucomannan availability.

Braeckelaer *et al.* (2002) reported that Asian farmers grow small quantities of *Amorphophallus* for the local markets or they collect corms from *Amorphophallus* in the wild. They have no consistent science-based knowledge on how to improve their method of production or the quality of the produce. According to McCleary and Kennedy (2004), the only industrially exploited glucomannan source is from *A. konjac*, but the content is still insufficient for commercial production. They suggested that suitable *Amorphophallus* species showing great potential for glucomannan production have to be identified. Therefore, there is a need to determine the potential of our local available species, such as *A. borneensis* with its big corm size. The objectives of this research were to determine the effect of drying temperature on glucomannan availability in *A. borneensis* corms.

MATERIALS AND METHODS

The corms were randomly collected from its natural habitat under a rubber estate in Tenom, Sabah. Twenty corm samples of various ages were collected and stored under ambient conditions for three days before being processed. The corms were peeled and sliced before being soaked in 40 % salt solution for 24 hours. One-hundred-gram samples of sliced corm were then oven-dried for 24 hours at five different temperatures: 40, 50, 60, 70, and 80°C.

Dried samples were crushed using a mortar and pestle and ground with a grinder to produce fine flour of 0.5 mm. Subsequently, the extraction and determination of glucomannan followed the Glucomannan Assay Kits procedure (McCleary and Kenedy, 2004). The data were subjected to analysis of variance by using the SAS Version 9.1 software. Means were separated by Duncan's Multiple Range Test (DMRT).

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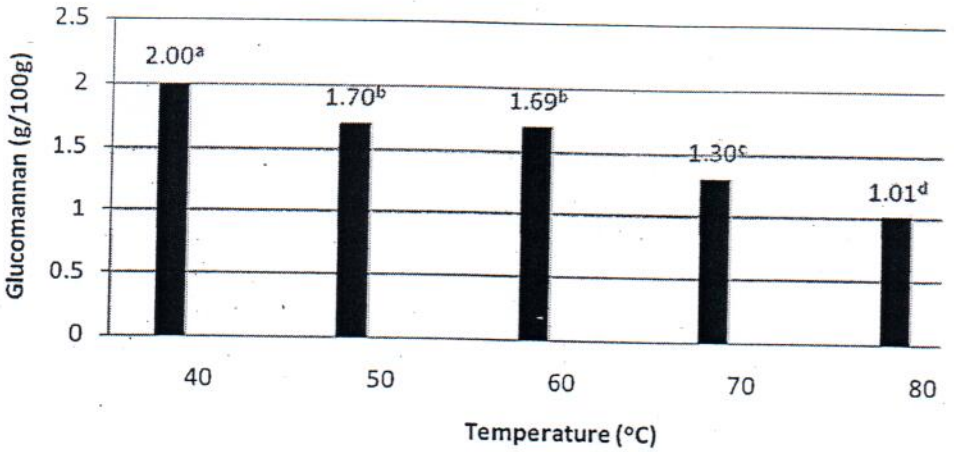
RESULTS AND DISCUSSION

The effect of drying temperature on glucomannan availability in *A. borneensis* corms showed significant differences at 40, 70 and 80°C. However, glucomannan availability at the drying temperatures of 50 and 60°C was not significantly different, with mean values of 1.70 g and 1.69 g, respectively. Drying corm slices at 40°C showed the highest mean glucomannan availability compared to drying at 50, 60, 70 and 80°C. Meanwhile, drying at 80°C showed the lowest mean glucomannan availability compared to other temperatures tested. Glucomannan availability in fresh *A. borneensis* corms, sliced and oven-dried at 40°C was 2.00 g/100 g. O'Hair and Asokan (1986) had found that glucomannan availability in *A. paeoniifolius* was approximately 0-9 g/100 g edible portion. According to Chandra (1984), glucomannan availability in *A. konjac* was more than 50 % of the 19 g carbohydrate content in the corms. Glucomannan availability in *A. muelleri* was higher than in *A. variabilis* (Liu, 1995). Chandra (1984) reported glucomannan availability was affected by processing or the method of preparation of the corms, depending on region and species.

In this trial, glucomannan availability in corms decreased as drying temperature increased (*Figure 1*). Kay (1973) stated corms separated from the plants can best be stored under dry, dark and cool (10°C) conditions. Frost or temperatures above 40°C may destroy the material in the corms. Njintang (2003) found that increasing the drying temperature of corm slices affected the properties of the flour, such as its water solubility index, water absorption capacity as well as its performance in gel formation.



Means with the same superscript are not significantly different from one another at P ≤0.05 according to DMRT

Figure 1. Glucomannan availability in corms at different drying temperatures

Milling or grinding of the corms flour creates high temperatures which destroy its content, similar to dry heat degradation, contributes to its dark colour, and results in reduced glucomannan availability. Kurihara (1979) suggested that the sliced corms of *A. konjac* or *A. muelleri* be dried immediately within 24 hours to avoid enzymatic glucomannan breakdown in the presence of moisture. Dried parts are pulverized carefully to avoid damage to the glucomannan particles in the cells. Zhang *et al.* (1991) found the optimum drying temperature for corms differs with the species, thus resulting in different glucomannan availability.

CONCLUSION

This study indicated that glucomannan is available in the corms of *A. borneensis*. Appropriate drying temperature is necessary to extract the maximum amount of glucomannan from the corms. This study showed that a higher drying temperature decreased the availability of the glucomannan, and that a drying temperature of 40°C gave the optimum result.

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