

Preparation of a malt beverage from different rice varieties

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ABSTRACT: This research is an investigation of a malting rice beverage process using three different varieties of glutinous rice. The malted beverages produced in this study were made using rice cultivars RD6, Niaw Ubon2 and Hawm Sakon. The malting process can be divided into three steps, soaking, germination and kilning. The resulting beverages were analyzed to determine their physical, chemical and sensory properties. Colour and viscosity differences between these products were not significant ($p>0.05$). Their acidity ranged between pH 5.5 to 6.0. The total soluble solids content (TSS) values of beverages made from the three rice cultivars were similar (15-16 °Brix). Sensory evaluation of the quality attributes of the beverages (colour, order, flavor and the overall sensory) revealed that malted beverages made from the Niaw Ubon2 rice variety with 48 hours of soaking time and a kilning temperature of 50-56 °C enabled production of an acceptable malted beverage.

Keywords: rice varieties, malting process, malted beverage

Introduction

Rice (*Oryza sativa*) known as 'Queen of cereals' is a staple food for nearly 50% of the world population, particularly for the Asians. It is an importance economic crop of Thailand, the demand exporting is increasing year by year. Recently, the Thailand government has placed a high priority on developing rice for export. Data on importing rice products in Thailand for 2014 that Thai rice exports in year 2012 and 2013, Statistical data of rice production in Thailand was 6,734,426 tons and 6,611,616 tons respectively as well as the volume of export was also increased as 142,976 and 133,839 million Bath respectively (Office of Agricultural Economics, 2014). Rice is also an important raw material in processing. Most of them are used in beer industry, food manufacturing industry and several brands of beverages and chemicals as they are element of

microorganism feeding of the laboratory. Cereal grains constitute a major source of dietary nutrients all over the world. Cereals for use in beverage production are usually sprouted and dried in the process known as malting (Pylar and Thomas, 2000). From the feasibility study of Thai rice in preparation as malt. Malt is the product of the grain (cereal grain or rice grain) that have been soaked, germinated, and kilned under controlled conditions. Rice sprouts contain high levels of nutrients are easy to absorb, the amino acids, vitamins, minerals and fiber. There are only the reports of a few rice cultivars planted in Thailand which are suitable for the beverage manufacturing as malt milk beverage, malt extract and beer, but it is also the most widely grown varieties. The work is to gather characteristics of malt which are important and can lead to the use of rice that has a large volume, cheap and easily find within the country for optimal benefit. Promotion and expan-

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sion of plantation area can reduce raw materials imported from abroad in the future. The goal of this study is to investigate the quality of malt of each cultivar of rice. The condition of malt preparation must be adaptable for use, in practice to use in research and does not need high cost.

Material and Methods

Rough rice or paddy (three varieties of each of sticky rice) such as RD6, Niaw Ubon2 and Hawm Sakon having more than 95% germination ability, were obtained from Sakon Nakhon Rice Research Center, Sokon Nakhon Province were used for the studies.

Malting process of paddy rice.

Grains were cleaned and weighted for approx. 5 kg., the paddy of three rice cultivars RD6, Niaw Ubon2 and Hawm Sakon were soaked in water to sort out the floating seeds, changed water and soaked again every 12 hours and dried 1 hour. After completion of 1 hour air drying, changed water and repeated the processes and soaked for 48 hours. Random again 50 grains for 3 repeatedly times, placed in petri dish plate lining with whatman No. 1 of 90 mm diameter, cultivated in dark cabinet at 25°C for 80 hours and then took out to count the sprouting grains. After soaking the paddy for 48 hours for each variety, the paddy seeds were divided and weighed at approx. 50 grams and evenly spread on plastic perforated basket 35 cm. wide x 45 cm. long for the total of 20 baskets per 1 variety. The seeds then were germinated in dark cabinet at controlled temperature 25°C, relative humidity at 90% for 15 hours. The remaining malts were kilned by tray

dryer at 50-65°C for 15 hours as shown in **Figure 1** and derooted to keep for analyzing the quality of dried malt and wort. Remark: The temperature for steeping and germination of control malt was 25°C. (Trust et al., 1995)



Figure 1 Malting process were kilned by tray dryer at 50-65°C

Malt extracts process

The first, whole grain of three rice cultivars RD6, Niaw Ubon2 and Hawm Sakon are crushed by blender. The malt was boiled a ratio 1:4 (1 liter of water per 250 g of the malt), then boiled and mix together at 55 °C with stirring at intervals for 5 min. Then boiled the temperature is 65 °C for 15 min and stirring all the time until the temperature increase to 78 °C as shown in **Figure 2**, after then cooled down and filter with cloth then be sterilized.

Quality measurement of malt extract

Malt extracts by adjusting the temperature were examined for physical, chemical and consumer acceptability of the quality attributes of the beverages as below.

Physical properties

The colour of malt extracts were measured using a Hunter Lab (color flex). The instrument was standardized each time with white and black standards. The samples were scanned to determine lightness (L^*), red/green (a^*) and yellow/blue (b^*) color components. The samples was equilibrated in a water bath at 20°C and then dipped into the Brookfield Digital Viscometer and showed the unit value of viscosity (cP) after measurement.

Chemical properties

The malt extracts was determined with pH-meter (Satorius, Germany) and total soluble solid (TSS) was measured with handheld refractometer. (Atago, Japan). The reported values are the mean of values obtained from three measurements.

Consumer acceptability test

Panels of forty consumers were selected randomly from Udon Thani Rajabhat University in major of food science and technology and trained panelists for sensory evaluation. Then they prepared beverage and evaluated of the quality attributes of the beverages (colour, ordure, flavour and the overall sensory) for degree of liking of beverage using a 9-point hedonic scale where 1 = “dislike extremely” and 9 = “like extremely”. Samples were coded with three digit random numbers and presented in random order.

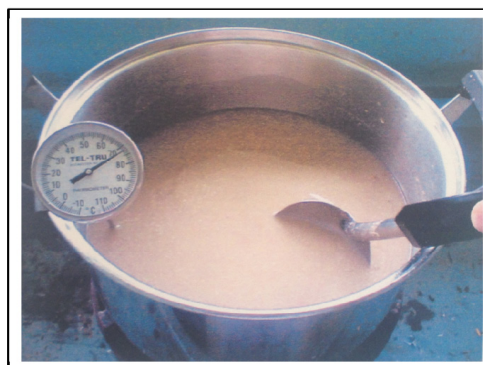


Figure 2 Boiling malt extract process (temperature at 78°C)

Statistical analysis

This project was replicated and triplicate sample were analyzed by Statistical Package for the Social Science for Windows (SPSS version 8.6). Experimental data were subjected to analysis of variance (ANOVA) and where there were significantly different ($P < 0.05$), Duncan's New Multiple Rang Tests (DMRT) was used to separate the means.

Result and Discussion

The grains of three sticky rice cultivars, namely RD6, Niaw Ubon2 and Hawm Sakon commonly used in Northeast of Thailand were prepared for malting process follow by Puangwerakul (2007), that to examine for physical, chemical and consumer acceptability was presented in **Table 1** and **Table 2**, respectively.

Results in **Table 1** show the Physical and chemical properties of 3 varieties of sticky rice. It is obvious from the results shown in **Table 1** that when the mashing at optimum temperature (78°C) was used to extract cereal (rice) malt, mashing time is importance because the complete conversion of starch into relative high maltose. It can be observing that from the sample is good. The samples were all generally creamy-white in colour were not significant ($P>0.05$). This is demon-

strated in the L^* , a^* and b^* value. As the difference rice cultivar effected to colour of malt extract. In additional, the viscosity and total soluble solids (TSS) were not significant ($P>0.05$), that the three rice varieties are chemical composition that are similar. Then, pH of samples showed that they were all slightly acidic ranging from 5.81 to 6.04, they are significantly different and which pH ranges are considered optimal.

Table 1 Physical and chemical properties of 3 varieties of sticky rice

Physical /Chemical properties	Varieties of sticky rice		
	RD6	Niaw Ubon2	Hawm Sakon
Colour ^{ns}			
L^*	32.15±0.62	32.94±0.19	33.16±0.93
a^*	-0.92±0.17	-0.92±0.06	-0.85±0.16
b^*	3.97±0.36	3.99±0.01	4.27±0.24
Viscosity (cP) ^{ns}	3.80±0.15	4.06±0.10	3.93±0.09
pH	5.83±0.23 ^b	6.04±0.41 ^a	5.81±0.32 ^b
%TSS ^{ns}	15.86±0.63	15.66±0.57	15.93±0.84

ns = non significantly different

L (100-lightness,0-darkness); +a to -a, increasing red to increasing green; +b to -b, increasing yellow to increasing blue

* Mean value in the same row with different subscripts are significantly different ($P<0.05$)

Table 2 Sensory evaluation for the quality attributes of malt extract from three rice cultivar

Varieties of sticky rice	colour	ordour ^{ns}	flavour	overall sensory
RD6	6.45±0.05 ^b	6.02±0.57	6.12±0.03 ^a	6.35±0.63 ^a
Niaw Ubon2	7.15±0.03 ^a	6.35±0.34	6.10±0.02 ^a	6.42±0.49 ^a
Hawm Sakon	5.27±0.18 ^c	6.12±0.73	4.75±0.28 ^b	5.40±0.72 ^b

ns = non significantly different

* Mean value in the same column with different subscripts are significantly different ($P<0.05$)

Table 2 show hedonic scores of sensory evaluation for the quality attributes ranged from 4-7. (colour, order, flavour and the overall

sensory). The score of colour for Niaw Ubon2 was higher than RD6 and Hawm Sakon (7.15, 6.45 and 5.27 respectively) and difference significantly. The

ordour was not significant ($P>0.05$). Furthermore, the overall sensory of Niaw Ubon2 better than RD6 were not significant ($P>0.05$) and Hawm Sakon as well as the score of colour. The overall acceptance of panelists corresponds to the sensory evaluation test for colour and ordour, which found that beverages get the highest score. In addition, the adoption of the panelists to consider the physical and chemical properties, which found that the malt beverage which using Niaw Ubon2 sticky rice is the color components (lightness (L^*), yellow/blue (b^*)) and acidity, which is similar to the standard sample.

Conclusion

The result of this study, the physical and chemical analysis of malt extract from three sticky rice cultivars (RD6, Niaw Ubon2 and Hawm Sakon) found that colour, viscosity and total soluble solid had similar value. Although the acidic are significantly different but the pH ranges are considered optimal, most of consumers accepted the malt beverage which using Niaw Ubon2 sticky rice.

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