

Production of cassava wine by biotechnological method

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Abstract

The production of cassava wine, an alcoholic beverage from cassava was developed from the current process of making traditional rice alcoholic beverage (Figure 1) by collecting the effective microbes from 3 sources of Look-pang, the herb-containing rice cake inoculum (Figure 2) and from the application of biotechnology by using the commercial starch-degrading enzymes. Initially, the starch in cassava roots, after peeled, washed and ground, was hydrolyzed by α -amylase enzyme (Termamyl[®] 120L, Novo Nordisk, 95°C for 2 hrs) and the liquefied starch was further hydrolyzed to glucose by glucoamylase enzyme (AMG 300L, Novo Nordisk, 60°C for 6 hrs). The syrup was then fermented by mixed pure culture isolated from Look-pang A, B and C for 4 weeks. The mash was clarified by sedimentation process and kept for quality evaluation. All isolated mixed culture provided the products with good alcohol content (10 to 11%v/v) comparable to commercial yeast (11%v/v) (Figure 4). The sensory attributes, when evaluated by 25 trained panels, of cassava wine produced by mixed culture isolated from Look-pang A and B, were favorable (Table 1). The wine did not contain any harmful chemicals and hazardous metals. By using the commercial enzymes and pure culture, the process of making cassava wine could be readily controlled and the products had more consistent quality.

Materials and methods

Preparation of pure culture from rice inoculum

Look-Pang, the herb-containing rice cake inoculum collected from three famous Sato manufacturers (Manufacturer A, B and C) were used for isolating pure yeast by spread plate and streak plate technique on MY agar plate at 30°C.

Production of cassava syrup

Fresh cassava roots after peeled, washed and ground into piece were mixed with water and liquefied by α -amylase enzyme (Termamyl 120L, Novo Nordisk Co., Bagsvaerd, Denmark, 1 ml enzyme/1 kg sample, pH 6.0, Ca²⁺ 100 ppm) at 95°C for 2 hrs. After liquefaction, the mixture was saccharified by glucoamylase enzyme (AMG 300L, 1 ml enzyme/1 kg sample, pH 4.5) at 60°C for 6 to 12 hrs (Figure 3).

Production of cassava wine

The syrup obtained from enzyme hydrolysis was mixed with pure culture isolated from 3 Look-Pang and compared with commercial yeast (*Saccharomyces cerevisiae* Burgandy). The samples were collected periodically and analyzed for

- pH by pH meter
- Total soluble solid by refractometer
- Ethanol and glucose content by High Performance Liquid Chromatography (ORH-801 Organic acid column, Interaction Chromatography, California, USA with Refractive Index Detector)
- Hazardous chemicals: methyl alcohol, ethyl carbamate, sulfur dioxide, copper, iron, lead, arsenic and ferrocyanide (AOAC, 1995)
- Sensory evaluation by 25 trained panel

Results



(a)

(b)

Figure 2 Preparation of Look-pang, the herb-containing rice cake inoculum

(a) Making sphere-shaped rice cake after mixing rice flour with herb extracts and old rice cake inoculum
(b) rice cake inoculum for wine making.

Table 1 Sensory attributes of cassava wine products obtained from different sources of microorganism as evaluated by twenty-five trained panels.

Sensory attributes	Score	Source of microorganism			
		Look-Pang A	Look-Pang B	Look-Pang C	Commercial Yeast
Clarity*	2	1.13 ^b	1.50 ^a	0.23 ^c	1.67 ^a
Color*	2	1.29 ^b	1.42 ^{ab}	0.38 ^c	1.63 ^a
Aroma*	4	2.67 ^a	2.58 ^a	1.83 ^b	2.04 ^{ab}
Acetic flavor*	2	1.42 ^b	1.58 ^{ab}	1.67 ^{ab}	1.46 ^b
Sourness ^{ns}	2	0.79	1.17	1.04	1.17
Sweetness ^{ns}	2	0.75	1.08	0.79	0.92
Astringency ^{ns}	2	0.96	1.13	0.88	1.13
Body ^{ns}	1	0.69	0.81	0.56	0.77
Mellow*	2	0.71 ^{ab}	1.04 ^a	0.58 ^b	0.92 ^{ab}
General quality*	1	0.46 ^{bc}	0.75 ^a	0.35 ^c	0.67 ^{ab}
Overall*	20	10.85 ^a	13.06 ^a	8.31 ^b	12.35 ^a

* significantly different at 95% confidence level, ** not significantly different at 95% confidence level, Different letters in each row indicate significantly different (p < 0.05)



(a)



(b)



(c)



Figure 1 Process of making Sato, tradition Thai rice alcoholic beverage (a) Steaming of rice grains (b) Cooling of cooked rice (c) Mixing of cooked rice with Look-Pang, rice cake inoculum (d) Incubating of the mash (e) Filtering and pasteurizing of rice wine and (f) Packing of rice wine.



(a)



(b)



(c)



(d)



(e)



(f)



(g)



(h)

Figure 3 Process of making cassava wine, an alcoholic beverage made from cassava

(a) Peeled and washed cassava roots (b) Enzyme hydrolysis of ground and cooked cassava roots (c) Cassava syrup (d) Removal of solid pulp (e) Addition of pure culture (f) Fermentation of cassava syrup (g) Clarification and pasteurization of cassava wine and (h) Packing of cassava wine in clean containers.

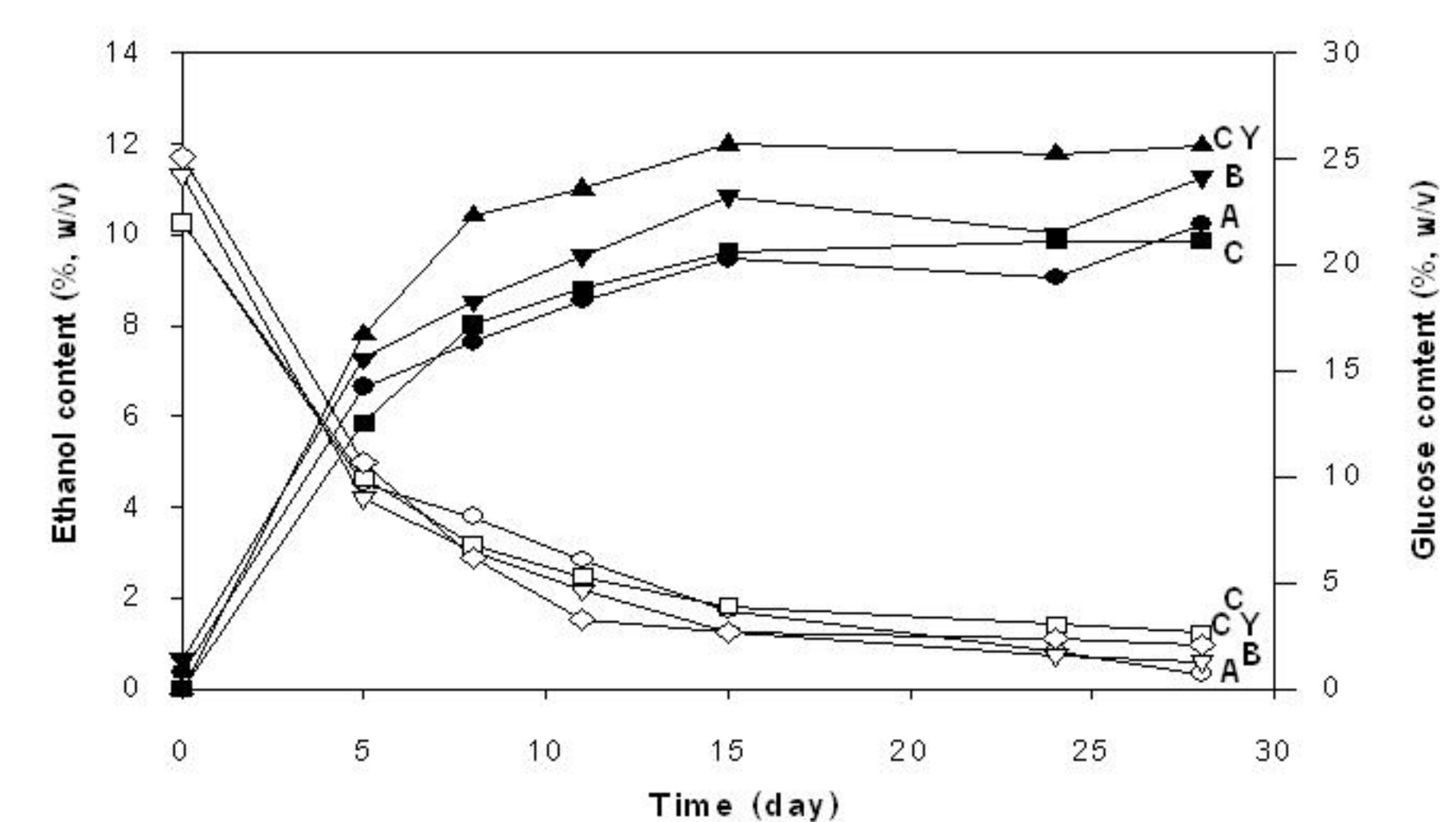


Figure 4 Alcohol and glucose content during yeast fermentation of cassava wine by pure culture isolated from Look-Pang A, B and C and commercial yeast (CY).

References

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