The Improvement of Coffee Beans to Simulate Kopi Luwak

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Background

Seventy percent of Americans drink coffee. Kopi Luwak, a rare, very expensive (up to $500.00/lb.) and unusual coffee from Indonesia is produced by the Asian palm civet (Paradoxurus *hermaphroditus*), that eats coffee berries as part of its diet. The coffee beans are collected by sifting civet cat's excrement and washing and roasting the digested beans to produce the sought after flavor. It is believed that the digestive conditions of the cat impart a unique flavor and aroma to the coffee. The increasing demand for Kopi Luwak has led to Civet abuse and malnutrition, resulting in low quality beans. Our research attempts to produce drinkable coffee by exposing beans to the enzymatic conditions similar to those of the civet.

Table I

	Acid treatment				Enzyme treatment			
	Chemical reagents	Initial pH	Second pH	Time(h)	Chemical reagents	Initial pH	Second pH	Time(h)
Group A	HCL	1.81	4.72	6	pancreatin	6.5	4.89	12
Group B	HCL+pepsin	1.84	4.81	12	pancreatin	6.76	5.28	4
Group C	HCL+pepsin	1.82	4.34	3	pancreatin	6.66	4.41	15
Group D	dH2O	5.95	5.69	6	dH2O	5.69	4.34	12
Group E	None	---	---	---	----	---	---	---

Groups A-E refer to the treatment of green coffee beans from Indonesia. PH concentrations were noted and beans were rinsed, dried and roasted after enzymatic treatment. The concentration of the HCl was 0.01% and the Pepsin and Porcine Pancreatin were at a 1.4% concentration.

Table 2

Store in refrigerator

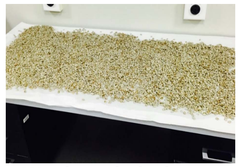
Acid treatment

Incubate and shake at 100RPM, 38.6℃

Wash

Enzyme treatment

Incubate and shake at 100RPM, 38.6℃



Wash and air dry

Roasting beans

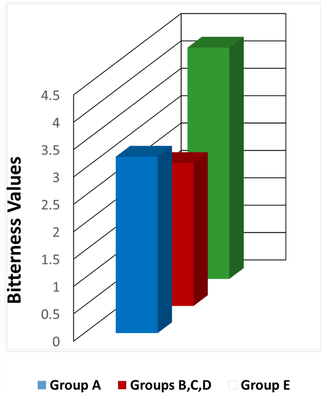
Abstract

The Civet Cat of family Vivverridae is used to produce a rare coffee product called Kopi Luwak. As a result of Kopi Luwak's increasing popularity, Civet Cat abuse is prevalent. Our research aims to recreate Kopi Luwak by artificially replicating the conditions of the Civet Cat's digestive system. Proteolytic enzymes, acid treatment, and varying incubation conditions will be used to simulate the process.

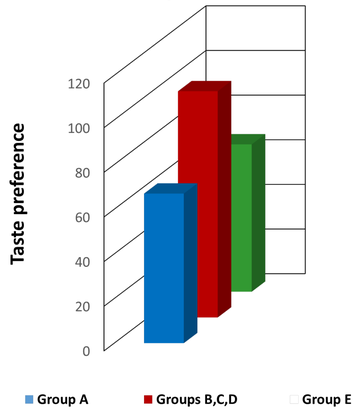
Treatment Protocol

Dry green coffee beans from Bali were separated into five groups of five pounds. Group A was treated with HCl Acid and Pancreatin. Groups B and C were treated with HCl, Pepsin, and Pancreatin. Group D was soaked in deionized water and Group E was untreated. Each group was incubated for varying time periods in a 37˚C shaking incubator. (Table I). These values were determined to best represent the pH, enzyme and acid concentrations of the civet's digestive system. Beans were rinsed, dried, and roasted and taste testing was performed. Coffee was brewed by using 6 ozs. ground coffee/72 ozs. hot water. Volunteers performed a blind taste test of all samples and coffees were ranked on bitterness level and overall taste. Treated beans were analyzed using S.E. M. (smallest possible beans were desiccated and selected to provide for good carbon coverage before vacuum evaporation). Coffee samples were analyzed for chlorogenic acid by High Performance Liquid Chromatography (Mobile Phase: 90% HPLC grade water, 10% Acetonitrile, 1% Phosphoric Acid).

Graph I



Graph II



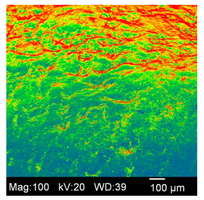
Results

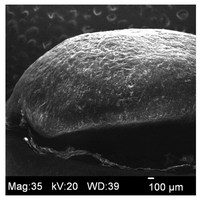
Sixty volunteers participated in two taste tests quantifying the samples on bitterness (Graph 1) and taste (Graph 2). The data was analyzed and it was found that coffees B, C and D were 38% less bitter than the untreated coffee. While coffee A was 24% less bitter than the control, it did not have an improved taste over coffees B, C and D. Coffees B,C and D were rated 35% better in taste than the control. These results show that treatment of coffee beans with HCl, Pepsin and Pancreatin decreases the bitterness and improves the taste of the coffee.

S.E.M. Results

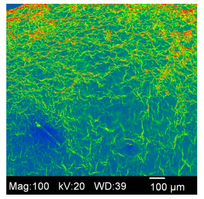
Untreated coffee beans (Group E) show a smooth exterior surface upon analysis with S.E.M. in comparison to treated coffee beans (Group B) which have a rough appearance with numerous micro-pits. Further analysis at higher magnification could possibly reveal a greater amount of pitting which could influence the composition of the beans during roasting.

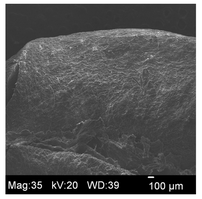
Group E



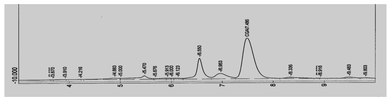


Group B

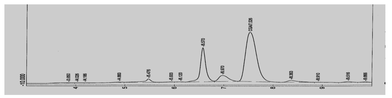




Group B Treated



Group E **Control**



Chlorogenic acid, the compound responsible in part for coffee's bitterness, showed a significant decrease in beans treated with the acids and enzymes (Group B) when compared to untreated beans (Group E).This observation was confirmed by the more pleasing taste of group B.

Summary

Coffee made from beans treated with HCl acid and enzymes had less bitterness, better taste and chlorogenic acid levels were lower. Scanning electron micrographs showed morphological changes on the bean surface with enzymatic treatment. Further studies will attempt to reproduce results, improve treatment times and taste in an effort to produce a quality product similar to Kopi Luwak. Plans to compare chemically produced coffee to the rare, high quality Kopi Luwak coffee is underway.

We would like to thank John Guarino from
IN THE GARDEN
COFFEE™
for helping us roast the beans.

References

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