

Materials/Methods

Three experimental plots were selected in Taiwan (NU-A, NU-B and NU-C) and divided each into a test group and a control group. Each test group was calibrate-fertilized according to the result of soil and plant element analysis. The fertilizer was prepared with soybean pomace, phosphate guano, and pearl ash. Element analysis of soil nutrients, plant tissues (in terms of nitrogen, phosphor, potassium), and the chlorogenic acid within green coffee is recorded. The coffee quality was also evaluated through SCA's cupping protocols.

Results/Discussion

Before the experiment, data shows that the nitrogen (N) levels within green coffee from NU-A, NU-B and NU-C were 1.61%, 1.56% and 1.83% respectively. The phosphor (P) levels were 0.01, 1.20 and 0.02 g/ kg, respectively. The potassium (K) levels were 0.87, 8.51 and 0.83 g/kg, respectively. Comparison with the reference value (2.07% N, 1.61 g/ kg P, 9.60 g/ kg K) shows green coffee produced from NU-A was 20% less N, 99% less P, and 90% less K. Green coffee from NU-B and NU-C were also 25%, 25%, 11% and 12%, 99%, 90% less N, P, K, respectively. After experiment, all three test groups produce green coffee with lower chlorogenic acid levels than their respective control groups. The green coffee N levels found at NU-A, NU-B, and NU-C were 1.90%, 1.68%, and 1.63% respectively. Phosphor levels were 0.66, 1.36, and 0.02g/ kg and potassium levels were 4.63, 9.27, and 0.87 g/ kg, respectively. Except for NU-C, green coffee of both test groups from NU-A and NU-B produce higher levels of N, P, K than the control groups. Higher sensory evaluation scores were also recorded from test groups of NU-A and NU-B.

Conclusion/Perspectives

In Taiwan, nutrient content within coffee varies greatly by region. Quality is severely affected if the insufficient nutrient is applied. The project therefore recommends combining sensory evaluation with soil and plant element analysis to establish a scientific dataset for the management of coffee farms. A well-calibrated fertilization system can greatly increase coffee production and coffee quality.

Introduction

Coffee has become one of Taiwan's most important beverage crops and its production is at an all-time high of 1,100 ha. Since majority farmers in Taiwan are small holders who suffer from higher costs of productions, most coffee tend to be higher-quality and suitable for domestic specialty market. This project aims to combine sensory evaluation with soil element analysis, plant tissue element analysis to create a scientific basis for farm management to increase the quality and production of Taiwan-grown coffee.

Table 1. Soil element analysis of three experimental plots before and after the experiment.

Plot	Time ^z	Treatment ^y	pH	EC	O.M	P	K	Ca	Mg
			(1:1)	(1:1, dS/m)	(%)	----- (mg/kg) -----			
NU-A	Before exp.		5.1	0.07	5.19	291.78	43.01	461.01	49.92
	After exp.	Test group	4.36	0.12	4.38	225.42	26.73	283.7	51.98
	After exp.	Control group	4.8	0.24	4.7	344.59	35.48	720.68	131.37
NU-B	Before exp.		4.9	0.12	6.27	398.39	220.87	866.88	55.74
	After exp.	Test group	5.03	0.18	4.87	438.74	242.1	1433.7	149.73
	After exp.	Control group	5.15	0.12	4.95	353.57	189.22	1362.2	84.06
NU-C	Before exp.		4.9	0.1	5.55	250.27	152.47	538.5	71.02
	After exp.	Test group	5.07	0.13	4.19	125.09	79.79	675.76	127.56
	After exp.	Control group	4.15	0.09	2.73	314.43	42.52	166.09	27.25

z: Before exp.-Before the experiment started. After exp. -After the experiment completed.
 y: Test group -calibrate-fertilized. Control group- no fertilizer applied.

Table 2. Plant tissue element analysis of green coffee at three experimental plots before and after the experiment.

Plot	Time ^z	Treatment ^y	N	P	K	Ca	Mg
			----- (g/kg) -----				
NU-A	Before exp.		1.61	0.01	0.87	1.24	8.02
	After exp.	Test group	1.90	0.66	4.63	1.11	5.12
	After exp.	Control group	1.59	0.05	0.97	1.04	8.42
NU-B	Before exp.		1.56	1.20	8.51	0.85	1.34
	After exp.	Test group	1.68	1.36	9.27	0.96	1.50
	After exp.	Control group	1.58	1.15	7.51	0.75	1.14
NU-C	Before exp.		1.83	0.02	0.83	1.36	10.02
	After exp.	Test group	1.63	0.02	0.87	1.21	8.44
	After exp.	Control group	1.81	0.06	1.83	1.06	9.02

z: Before exp.-Before the experiment started. After exp. -After the experiment completed.
 y: Test group -calibrate-fertilized. Control group- no fertilizer applied.

Table 3. Effect of treatment on green coffee chlorogenic acid concentration at three experimental plots.

Plot	Time ^z	Treatment ^y	3-CQA	4-CQA	5-CQA	3,4-dicQA	3,5-dicQA	Total CQA
			----- (mg/g) -----					
NU-A	After exp.	Test group	2.31	3.27	14.23	0.59	3.07	23.48
	After exp.	Control group	2.70	3.65	15.45	0.71	3.10	25.61
NU-B	After exp.	Test group	3.06	4.04	16.07	0.72	2.83	26.72
	After exp.	Control group	3.85	4.92	20.27	1.09	3.93	34.05
NU-C	After exp.	Test group	2.02	3.49	24.71	0.63	4.65	35.50
	After exp.	Control group	2.32	3.96	27.54	0.70	4.60	39.12

z: Before exp.-Before the experiment started. After exp. -After the experiment completed.
 y: Test group -calibrate-fertilized. Control group- no fertilizer applied.

References:

Farah *et al.*, Food Chemistry, 2006, 98:373-380