Phyisochemical & functional properties of organic green tea

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ABSTRACT

Organically cultivated agricultural products including rice, potato, or green tea receives the increased attention since people are aware of personal health and environment. However, little scientific data have been given to benefits of agricultural products by organic cultivation. In this study, green tea was cultivated conventionally or organically and their qualities were evaluated with respect to physiochemical properties and physiological functions. Organic green tea showed 13% and 17% higher amounts of total amino acids and chlorophyll, compared to those of conventional one. For functional characterization, organic green tea had a 27% higher amount of ECG and EGCG (2.1 and 6.75 mg/g DW) but lower amounts of C, EC or EGC (0.28, 0.85 or 2.54 mg/g DW) compared to conventional green tea. Especially, theanine and GABA ((γ-aminobutyric acid) of organic green tea was 20-30% higher than conventional one. In addition, organic green tea showed higher antioxidant and nitric oxide scavenging activities with167 μM of vit C eq. and a 35%, compared to those of conventional green tea with 149 μM of vit C eq. and a 25%, respectively. Overall, those results indicate that organic green tea exhibited better product quality and physiological functions than conventiona lgreen tea.

MATERIALS & METHOD

Green tea varieties were cultivated at fields of Bosung areaorganically or conventionally at early May 5th (first time harvesting). **Functional properties** **The nitrogen content** was determined by the Kjeldahl method (Kjeltec Auto 1030 Analyzer, Foss North America Inc., MN). **The total amino acid** content was quantified ninhydrin derivatization and UV detection at 570nm. **Total phenolic compounds** were measured according to the Folin-Denis method with a UV-visible spectrophotometer (UV-1601, Shimadzu, Kyoto, Japan) at 700nm using gallic acid as a standard (Park et al. 2004). **Total flavonoids** were determined using the aluminum chloride colorimetric method using quercetin standard. **The tannin content** was quantified according to the method of Sarni-Manchado et al., (2000) using ethyl gallate as a standard. **Ascorbic acid content** was measured by HPL using Luna C18 column at 245nm. **Antioxidant activity** was measured by DPPH assay according to Blois (1958). Vitamin C was used as standard. **NO scavenging activity** was determined using Gress reagents by the method of Sreejayan and Rao (1997). **Nutritional composition** Sample (1g) was mixed with 100 mL water or methanol and soxhlet extracted at 200ºC for 3 hr. Supernatant was applied to measure the their physiological function. **Inorganic compounds** was detected by ICP(Ion Coupled Plasma, Spectro Plame, Germany). **Free amino acid composition** was quantified using HPLC(Jasco LC-900, Japan) and sample was derivatized using Ortho Phthalaldehyde (OPA) columm and separated by NH3 column (AECpakII, Tokyo, Japan). **Tea catechins** was measured using C18 Reverse HPLC using 6 standard kit from Sigma-Aldrich. Free amino acid was quantified using **Sensory evaluation and Statistical analysis** 10 trained panelists panelists scored each sample for appearance, color, tea flavor, tea taste, and overall acceptability on 5-point scales (5=extremely good to 1=extremely bad). Data were expressed as mean and performed using an SAS program (SAS Institute, Inc., Cary, NC, USA).& ANOVA and Duncan's multiple test.

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RESULTS & CONCLUSIONS

Table 1. Functional properties

	Total Nitrogen (%)	Total Aminoacid (mg 100g^{-1})	Tannin (%)	Caffeine (%)	Chlorophyll (mg 100g^{-1})	Acsorbic acid (mg 100g^{-1})	Antioxidant (%)	Phenolics (mg 100g^{-1})
Organic	5.00a	2,657a	13.7	2.97	405a	198a	96.9a	11,258a
Conventional	4.83b	2,301b	13.2	2.94	345b	185b	85.1b	10,592b

Table 2. Nutrition Composition (Inorganic)

	K_2O	CaO	MgO	N_2O	B	Cr	Al	Mn	Fe	Cu	Zn
	(%)				(ppm)						
Organic	2.6	0.11	0.39	0.1	17.7a	1.3	409a	801b	93	10.6	37.4b
Conventional	2.7	0.14	0.34	0.1	13.8b	2.3	379b	937a	96	11.7	42.1a

Table 3. Nutrition Composition (Free amino acids)

	Free amino acids (mg 100g^{-1})								
	Asp	Thea	Glu	Val	Phe	GABA	Lys	His	Arg
Organic	96a	1268a	355a	31	35a	30	29	26	472a
Conventional	85b	1130b	328b	25	22b	28	24	20	435b

* Amino acid is abbreviated as Asp : Aspartic acid, Thea : Theanine, Glu : Glutamic acid, Val : Valine, Phe : Phenylalanine, GABA : γ-aminobutyric acid, Lys : Lysine, His : Histidine, Arg : Arginine

Table 4. Tea Catechin Profiles

	Catechin content (%)					
	ECg	C	EC	EGCg	EGC	Total
Organic	2.01	0.28	0.85a	6.75a	2.54	12.43a
Conventional	1.97	0.26	0.72b	6.28b	2.48	11.21b

* ECg:Epicatechin gallate, C:Catechin, EC: Epicatechin, EGCg: Epigallocatechingallate, EGC: Epigallocatechin

Table 5. Sensory Evaluation

	Appearance (20)	Tea color (20)	Tea flavor (25)	Tea taste (25)	Aftermouth (10)	Total (100)
Organic	15.8	16.9	20.8	20.8	8.4	82.7a
Conventional	15.3	16.4	20.2	20.0	8.0	72.9b

- **Organic green tea showed 13% and 17% higher amounts of total amino acids and chlorophyll, compared to those of conventional one**
- **For functional characterization, organic green tea had a 27% higher amount of ECG and EGCG (2.1 and 6.75 mg/g DW) but lower amounts of C, EC or EGC (0.28, 0.85 or 2.54 mg/g DW) compared to conventional green tea.**
- **Theanine and GABA ((γ-aminobutyric acid) of organic green tea was 20-30% higher than conventional one.**
- **Organic green tea showed higher antioxidant activity with 35% (167 μM of vit Ceq.) compared to conventional green tea with 25% (149 μM of vit C eq.).**

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