

## Relationship between Tocopherol and Fatty Acids in Various Rice Varieties

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### Objectives

The objective of the present study was to evaluate the relationship of fatty acid and tocopherol in comparison with a various rice varieties and may provided plant breeders with information for selecting rice varieties that contain high contents of tocopherol and fatty acids.

### Materials and methods

Eleven rice varieties including Ilpumbyeo, were harvested in 2004 at experiment field of National Institutional of Crop Science, Suwon, Korea.

**Analysis of fatty acid** : Rice flour (500mg) was heated with a reagent containing methanol:heptane:benzene:2,2-dimethoxypropane:H<sub>2</sub>SO<sub>4</sub>=37:36:20:5;2 (v/v). Simultaneous digestion and lipid transmethylation took place in a single phase at 80°C. the fatty acid methyl ester (FAME) were prepared on an Agilent 6890 system (HP Co., Wilmington, DE, USA) equipped with a FID using a HP-Innowax capillary (30cm×0.25mm×0.25µm) column. Initial temperature of 150°C was increased to the final temperature of 280°C at 4°C/min. Carrier gas was nitrogen at the flow rate of 10 ml/min. During the analysis, the temperature of inlet and detector were maintained at 250 and 300°C, respectively.

**Analysis of tocopherols** : 400 mg of rice flour was measured into the test tube. Hexane (10ml) was added, mixed with vortes, and then sonicated for 30 min. For HPLC analysis, the column was Supelcosil LC-NH<sub>2</sub> (25 cm× 4.6mm, 5µm) and operated at a temperature of 30°C. The mixture of hexane : ethyl acetate (80:20, v/v) was used as a mobile phase at a flow rate of 0.8 ml/min, and detection was made at 292 nm.

### Results and Discussion

The composition rate of saturated fatty acid ranged from 22. 1 to 29.5. Most of the rice varieties contained predominantly stearic acid in saturated fatty acids. The range of stearic acid was from 19.5 to 25.5. 'Goami 2' (29.5), a mutant of 'Ilpumbyeo', showed the highest saturated fatty acid composition among tested rice varieties. In 'Goami 2', myristic (14:0) and stearic (16:0) acids showed the highest composition rate among saturated fatty acids. Oleic acid (18:1) and linoleic acid (18:2) were observed as an major unsaturated fatty acid in tested rice varieties. The α- and γ-tocopherol contents in ten brown rice were ranged 0.76-7.08 mg/100g and 0.38-2.98mg/100g, respectively (Table 2). 'Dawdam' displayed the lowest tocopherol content, but the highest tocopherol content was observed in 'Suwon 492' (7.08mg/100g). Saturated fatty acids and total tocopherol content showed the positive correlation ( $r= 0.272^*$ ), however, unsaturated fatty acids were not signigicant difference ( $r=-0.057^{ns}$ )

**Table 1. The fatty acid composition, saturated fatty acids, and unsaturated fatty acids profiles of rice varieties.**

Varieties	Composition of fatty acids						SFA <sup>†</sup>	USFA <sup>‡</sup>
	14:0	16:0	18:0	18:1	18:2	18:3		
Ilpumbyeo	0.8	22.0	2.1	37.6	34.8	2.8	24.8	75.2
Hwasungbyeo	0.8	22.7	2.6	33.8	38.2	1.8	26.2	73.8
Goami 2	1.0	25.5	3.1	36.0	32.8	1.6	29.5	70.5
Suwon 504	0.5	24.3	3.0	40.6	30.0	1.5	27.8	72.2
Baekjinjubyeo	0.6	19.5	2.6	41.6	33.7	2.1	22.6	77.4
Suwon 491	0.5	22.5	1.3	36.5	37.4	1.9	24.3	75.7
Suwon 492	0.6	20.0	1.5	44.7	32.3	0.9	22.1	77.9
Seonong 8	0.5	20.9	2.9	40.5	33.9	1.3	24.3	75.7
Dawdam	0.6	23.2	2.6	39.6	32.3	1.6	26.5	73.5
LGC-1	0.8	23.1	4.7	32.5	37.0	1.9	28.6	71.4

Value was expressed as % of total fatty acids.

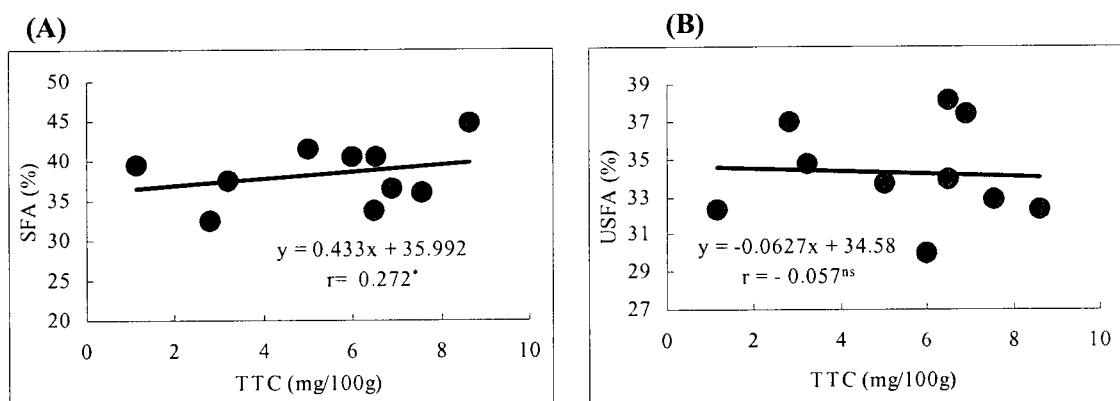
<sup>†</sup>SFA: saturated fatty acid, <sup>‡</sup>USFA: unsaturated fatty acid

**Table 2. Contents of  $\alpha$ - and  $\gamma$ - tocopherol in brown rice among rice varieties (mg/100g).**

Varieties	$\alpha$ -T <sup>†</sup>	$\gamma$ -T <sup>‡</sup>	TTC <sup>b</sup>
Ilpumbyeo	1.71	1.50	3.21
Hwasungbyeo	3.29	2.56	6.48
Goami 2	4.60	2.98	7.57
Suwon 504	3.32	2.65	5.98
Baekjinjubyeo	2.99	2.00	5.00
Suwon 491	5.30	1.60	6.90
Suwon 492	7.08	1.55	8.63
Seonong 8	4.85	1.66	6.51
Dawdam	0.76	0.38	1.14
LGC-1	1.49	1.31	2.80

<sup>†</sup> $\alpha$ -T : alphah-tocopherol, <sup>‡</sup> $\gamma$ -T : gamma-tocopherol

<sup>b</sup>TTC : total tocopherol content ( $\alpha$ -tocopherol +  $\gamma$ -tocopherol)



**Fig 1. Linear regression of saturated(A) and unsaturated(B) fatty acids vs. total tocopherol content.**

SFA: saturated fatty acid, USFA: unsaturated fatty acid

TTC : total tocopherol content ( $\alpha$ -tocopherol +  $\gamma$ -tocopherol)