

Characterization of Anthocyanins Composition in Colored Barley Germplasms

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Objectives

This study was carried out to identify the types of anthocyanins composition of colored barley germplasms, and to provide the basic information to barley breeding and food and brewery processing.

Materials and Methods

- Thirty-one colored barley germplasms : 21 purple-colored lines, 8 brown-colored lines and 2 blue-colored lines
- Anthocyanins Extract : 0.2 g samples of powdered grain were added 2 mL of 80 % methanol containing 0.1 % hydrochloric acid, stirred for 24 h at 4 °C. The mixture was filtered through a 0.45 μm membrane filter and transferred into the amber glass vial.
- HPLC analysis :
 - Shimadzu HPLC system (SPD-M10A diode array detector)
 - Column : YMC-Pack ODS AM-303 (5 μm , 250 mm \times 4.6 mm I.D.)
 - Solvent A : 10 % formic acid in distilled water, B : MeOH
 - Flow rate : 0.8 mL/min, Wave length : 520nm

Results and Discussion

- The total concentration of anthocyanins in the colored barley germplasms varied from 5.37 to 153.93 $\mu\text{g}\cdot\text{g}^{-1}$. The total average concentration of anthocyanins in the purple-colored lines (60.22 $\mu\text{g}\cdot\text{g}^{-1}$) was significantly different at 0.05 probability level with that of the brown-colored lines (18.56 $\mu\text{g}\cdot\text{g}^{-1}$).
- Purple and blue-colored lines contained very low concentrations of petunidin. Also brown-colored lines were not quantified malvinidin-3-glucoside and petunidin. In all barley groups, peonidin and malvinidin were detected but not quantified because of poor resolution or low levels of those compounds.
- The most common anthocyanins in purple-colored lines was delphinidin (19.06 $\mu\text{g}\cdot\text{g}^{-1}$) and followed by peonidin-3-glucoside, cyanidin-3-glucoside, pelargonidin-3-glucoside in a decreasing order. On the other hand, peonidin-3-glucoside was detected in blue (8.91 $\mu\text{g}\cdot\text{g}^{-1}$) and brown-colored lines (8.12 $\mu\text{g}\cdot\text{g}^{-1}$) as the major component.

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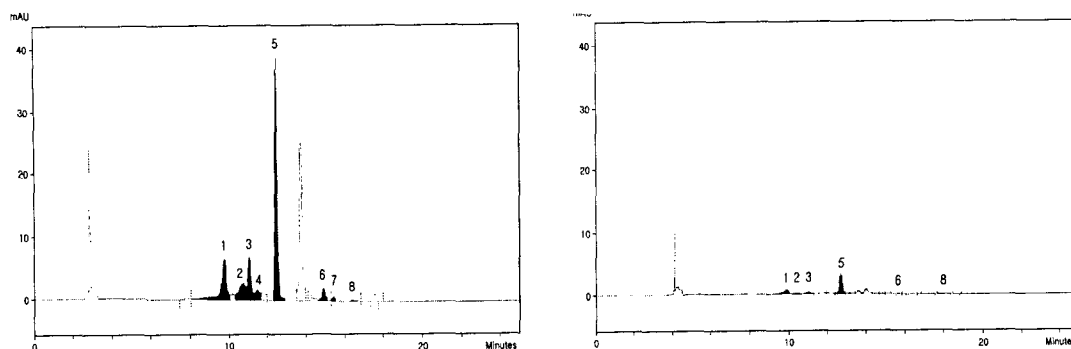


Fig. 1. HPLC profiles of anthocyanins in purple (left) and brown-colored barley (right).
 (1: cyanidin-3-glucoside, 2: pelargonidin-3-glucoside, 3: peonidin-3-glucoside, 4: malvidin-3-glucoside, 5: delphinidin, 6: cyanidin, 7: petunidin, 8: pelargonidin)

Table 1. Composition of anthocyanins ($\mu\text{g} \cdot \text{g}^{-1}$) in different color groups of barley.

Lines	Cyanidin	Cyanidin-3-glucoside	Delphinidin	Malvidin-3-glucoside	Pelargonidin	Pelargonidin-3-glucoside	Peonidin-3-glucoside	Petunidin	Total
B ¹⁾ -01	3.76	0.22	2.52	nd ²⁾	2.56	3.15	7.92	nd	20.12
B-02	3.72	0.18	2.51	nd	2.57	3.09	7.98	nd	20.05
B-03	3.71	nd	1.67	nd	nd	nd	nd	nd	5.37
B-04	3.84	0.60	3.43	nd	nd	3.20	8.12	nd	19.19
B-05	3.82	0.94	4.28	nd	2.57	3.71	8.26	nd	23.58
B-06	3.69	nd	1.64	nd	2.60	nd	7.92	nd	15.84
B-07	3.75	0.25	2.47	nd	nd	3.16	8.08	nd	17.70
B-08	3.92	1.84	5.89	nd	2.66	3.78	8.55	nd	26.64
P-01	8.12	25.46	55.36	7.49	2.79	22.02	22.04	2.18	145.46
P-02	3.83	2.63	7.39	nd	2.55	5.37	8.57	nd	30.34
P-03	4.35	2.26	8.29	nd	nd	4.26	8.25	nd	27.42
P-04	5.39	9.54	25.79	nd	2.97	6.98	10.71	nd	61.39
P-05	5.84	8.91	18.41	1.05	2.63	9.51	11.16	nd	57.52
P-06	4.08	2.52	6.88	nd	nd	5.45	8.98	nd	27.91
P-07	6.51	8.30	20.71	1.60	2.69	7.44	10.47	nd	57.71
P-08	11.50	24.58	46.38	6.59	3.70	21.67	12.52	0.24	127.19
P-09	4.62	1.94	6.41	nd	2.61	4.30	8.41	nd	28.28
P-10	7.28	13.29	22.63	3.65	3.03	10.12	10.57	nd	70.58
P-11	5.64	6.37	16.38	0.40	2.68	7.11	10.56	nd	49.14
P-12	4.29	2.81	6.91	nd	2.55	5.08	11.22	nd	32.86
P-13	4.49	3.73	6.82	nd	nd	6.88	12.50	nd	34.43
P-14	4.64	2.80	7.91	nd	2.56	4.92	8.54	nd	31.39
P-15	4.36	1.92	5.79	nd	2.57	4.33	8.42	nd	27.39
P-16	4.85	6.24	12.35	1.62	nd	6.69	9.16	nd	40.90
P-17	11.55	36.54	53.18	12.35	3.49	21.13	15.12	0.59	153.93
P-18	10.17	22.25	36.82	6.59	3.42	14.93	13.14	0.21	107.54
P-19	8.29	20.38	23.09	8.10	3.39	17.56	11.71	0.19	92.72
P-20	5.42	4.10	8.64	0.25	2.87	6.38	8.93	nd	36.58
P-21	4.23	1.20	4.02	nd	2.59	3.42	8.39	nd	23.86
S-01	3.83	1.14	4.62	nd	2.57	4.56	8.30	nd	25.03
S-02	4.85	4.45	11.59	0.85	3.06	4.45	9.51	0.77	39.53

¹⁾ B: brown-colored lines, P: purple-colored lines, S: blue-colored lines

²⁾ nd: not detected, value below the limit of quantification ($0.01 \mu\text{g} \cdot \text{g}^{-1}$)