

# Antioxidant and Whitening Activities of Fruit Development Stages in Several Pear Cultivars.

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## Abstract

This study was carried out to investigate the biological activities, that total polyphenolic contents, antioxidant activities, and melanin synthesis inhibition of several pears cultivars (*Pyrus pyrifolia*). The total polyphenolic contents of five pear cultivars were present in high quantities in unripe development stage. Total polyphenolic content of Chuwhangbae extract was higher than those of other pear cultivars regardless of development stages. But total flavonoid contents did not differ between cultivars or development stage. Arbutin, a type of phenolic compounds, has an inhibitory effect of melanogenesis. Arbutin in pear cultivars was declined as fruit matured. The radical scavenging activity of the extract was also decreased that fruit gets ripe. In B16F10 mouse melanoma cells, most of the cultivars extract inhibited melanin synthesis about 50% at 100 $\mu$ g·mL<sup>-1</sup> concentration of extracts except Gamcheonbae until 90 days after full bloom. We confirmed that the extract of pear have antioxidant activity and skin-whitening effects.

## Material & Methods

### Plant material

- Five cultivars of Asian pear (*Pyrus pyrifolia*)
  - Gamcheonbae, Manpungbae, Chuwhangbae, Hanareum, and Niitaka

### Total phenolics, flavonoids contents, DPPH or ABTS radical scavenging activity

- Total phenolics content; Folin-Ciocalteu's reagent as described, CUI et al. (2005).
- The flavonoid content; aluminum chloride colorimetric method, BOO et al. (2009).
- DPPH (2, 2-Diphenyl-1-picrylhydrazyl) radical scavenging activity; method of BLIOS (1958).
- ABTS radical scavenging activity; ABTS cation decolorization assay, RE et al. (1999).

### Quantification of arbutin by HPLC analysis

- ACE C18 column, solvent; water and formic acid(19:1, v/v) and methanol, flow rate; 1 mL/min,

### In vitro Tyrosinase inhibition assay, Cell viability assay, Cellular melanin synthesis inhibition

- Tyrosinase inhibition activity; spectrophotometry, MASAMOTO et al. (1980)
- Cell viability; MTT assay, (SHIBATA et al., 2006)
- The release of extra-cellular melanin; MAKPOL et al. (2009).

## Results

Table 1. Content of total phenolics and flavonoids of 80% EtOH extracts from different development stages of pear cultivars.

Cultivar	Days after full bloom	Total polyphenol (mg-tannic acid/100 g <sup>-1</sup> , FW)	Total flavonoid (mg-quercetin/100 g <sup>-1</sup> , FW)
Hanareum	60	180.8±2.91 aB2)	26.8±0.9 bB
	90	97.5±1.7 bE	25.2±0.6 bB
	114	82.7±1.7 cA	39.1±1.6 aB
Manpungbae	60	181.0±3.1 aB	25.9±0.7 cC
	90	112.8±2.4 bC	23.1±0.7 cD
	120	95.5±2.7 cA	40.2±1.6 aA
	150	69.3±1.6 dB	31.8±1.4 bA
Niitaka	60	239.0±2.8 aA	26.2±1.1 bC
	90	163.3±2.5 bB	25.0±1.1 bB
	120	75.7±2.6 cB	30.0±0.0 aC
	150	63.5±1.8 dC	29.5±1.6 aA
	165	69.3±0.7 dB	25.0±0.7 bC
Gamcheonbae	60	247.2±2.6 aA	27.9±0.7 cA
	90	105.2±2.2 bD	26.2±0.0 cA
	120	93.7±3.5 cA	33.8±1.3 aC
	150	73.3±1.8 dB	31.0±2.1 bA
	169	65.5±1.2 eB	37.6±2.1 aA
Chuwhangbae	60	245.2±3.0 aA	27.1±0.7 bB
	90	179.7±2.6 bA	24.1±1.2 cC
	120	94.5±3.6 cA	36.7±1.5 aB
	150	85.7±1.1 dA	30.7±1.6 bA
	174	115.2±1.7 cA	29.0±1.9 bB

<sup>1)</sup> Data are expressed as mean ± standard deviations (n=3).

<sup>2)</sup> Means with the small letter(a,b) separation within columns by Duncan's multiple range test at P = 0.05. Capital letter(A,B) represent significant difference when compared between same development stages

Table 2. DPPH and ABTS radical scavenging activity of 80% EtOH extracts from different development stages of pear cultivars.

Cultivar	Days after full bloom	DPPH (%)	ABTS (%)
Hanareum	60	67.5±1.11 aB2)	71.7±3.0 aA
	90	37.0±0.9 bC	54.4±1.3 bB
	114	17.4±0.5 cC	64.0±1.6 bA
Manpungbae	60	64.2±1.3 aB	65.7±2.1 aC
	90	49.9±0.8 bB	62.7±3.8 aA
	120	23.2±0.6 cB	53.3±3.6 bB
	150	19.8±0.7 dC	48.1±1.2 bA
Niitaka	60	67.8±1.3 aB	71.3±2.5 aA
	90	61.7±1.2 bA	67.1±5.3 aA
	120	23.0±0.9 cB	53.5±2.2 bA
	150	20.1±0.7 cBC	49.4±1.2 bA
	165	7.9±0.4 dC	46.9±2.7 bA
Gamcheonbae	60	72.2±1.4 aAB	68.1±2.2 aB
	90	45.0±1.0 bB	54.9±2.8 bB
	120	28.9±0.7 cA	52.6±3.6 bB
	150	24.6±1.0 cAB	45.7±1.2 cB
	169	14.1±0.5 dB	44.8±6.9 cA
Chuwhangbae	60	77.5±1.0 aA	72.6±1.7 aA
	90	59.9±1.5 bA	68.3±5.2 aA
	120	28.7±0.7 cA	56.8±3.6 bB
	150	25.5±1.1 cA	46.4±1.2 cB
	174	18.3±0.7 dA	48.6±2.0 cA

<sup>1)</sup> Data are expressed as mean ± standard deviations (n=3).

<sup>2)</sup> Means with the small letter(a,b) separation within columns by Duncan's multiple range test at P = 0.05. Capital letter(A,B) represent significant difference when compared between same development stages

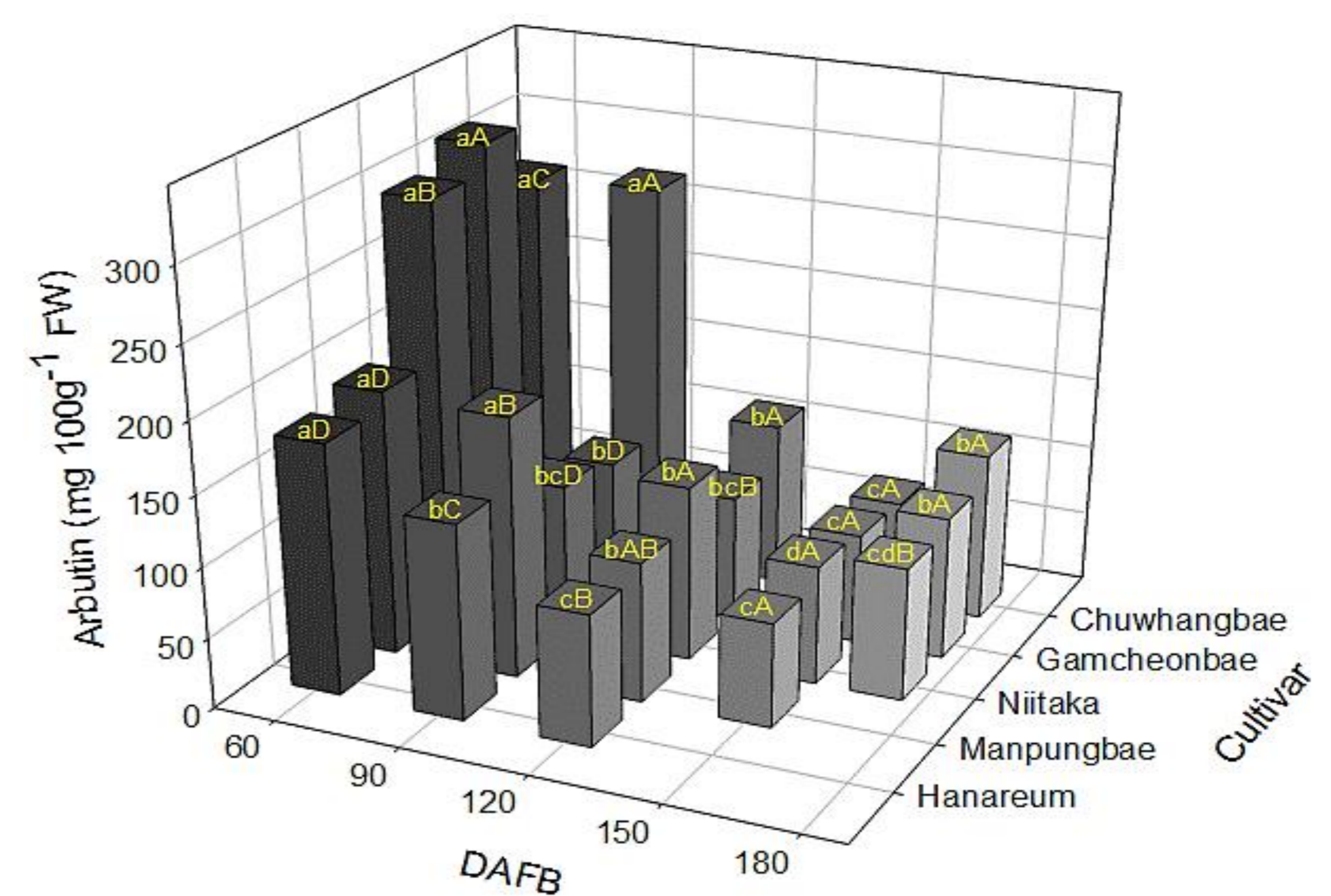


Fig. 1. Changes of arbutin content of 80% EtOH extracts from different development stages of pear cultivars. Each bar is the means with the small letter separation within cultivar columns by DMRT at P = 0.05. Capital letter represent significant difference when compared between development stages (DAFB).

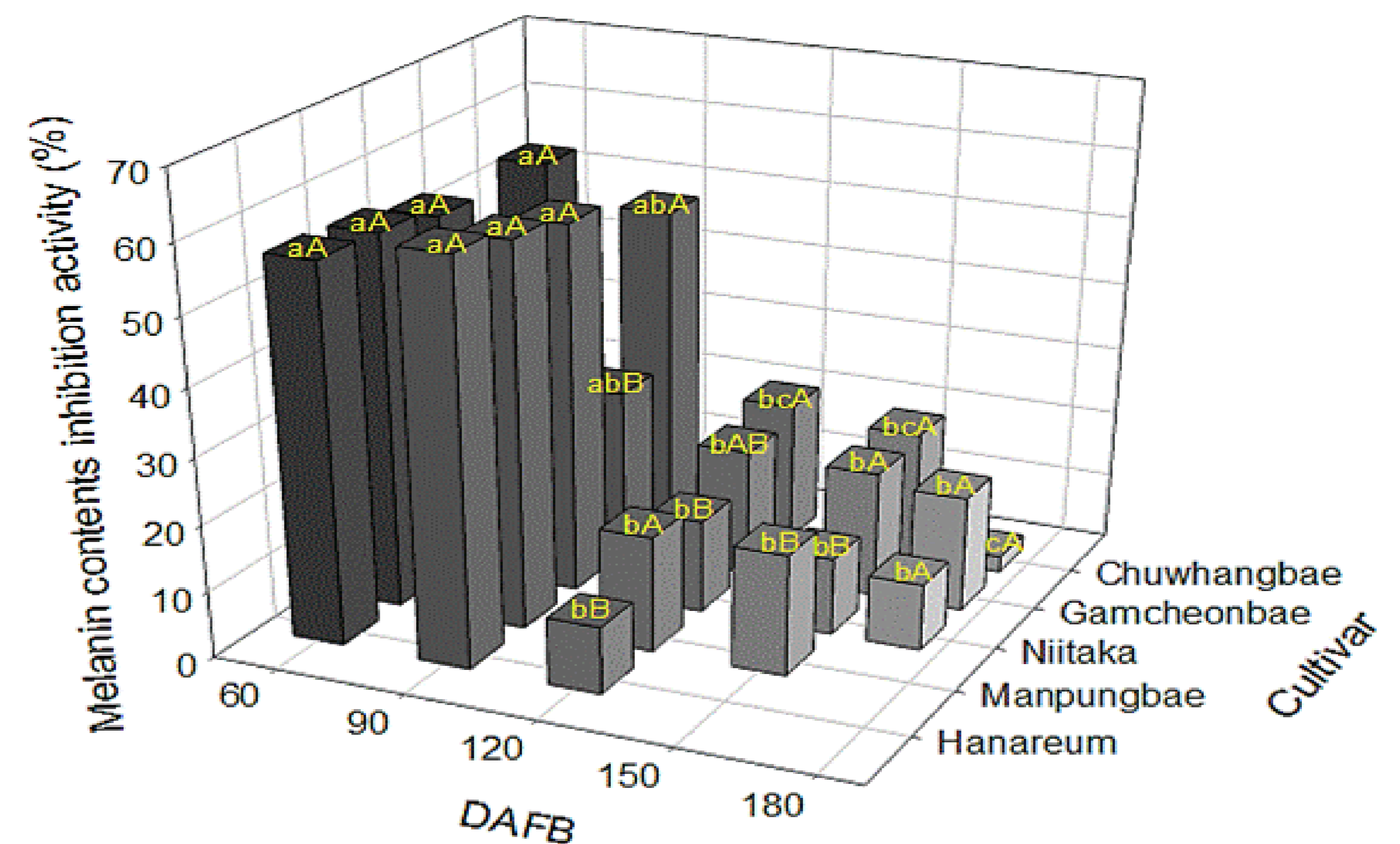


Fig. 2. Melanin contents inhibition activity in B16F10 cells of 80% EtOH extracts from different development stages of pear cultivars. Each bar is the means with the small letter separation within cultivar columns by DMRT at P = 0.05. Capital letter represent significant difference when compared between development stages (DAFB).

## References

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