HUNTER COLOUR DETERMINATION OF BLUEBERRY CULTIVARS

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ABSTRACT

Colour has been shown of primary importance in the judgment of food, ultimately influencing the acceptance or rejection of food. Colour is one of the important quality attributes on food. The measurements were done with 10 cultivars of blueberries. The colour was measured by determining Hunter L^* (lightness), a^* (redness/greenness) and b^* (yellowness/blueness) values of blueberries cultivars. Treatment differences were tested using Duncan's Multiple Range test, $\alpha = 0.05$.

INTRODUCTION

Blueberries have become increasingly popular because of their health-promoting (nutraceutical) properties. Blueberry fruits contain an array of phenolics, including anthocyanins, quercetin, kaempferol, myricetin, chlorogenic acid and procyanidins, that contribute to antioxidant capacity (Kalt et al., 1999; Prior et al., 2001.).
Colour has been shown of primary importance in the judgment of food, ultimately influencing the acceptance or rejection of food. Colour is one of the important quality attributes on food. Although it does not necessarily reflect nutritional, flavour or functional values it determines the acceptability of a product by consumers.
A Lab colour space is a colour-opponent space with dimension L for lightness and a^* and b^* for the chromaticity coordinates. The coordinates of the Hunter Lab colour space are L^*, a^* and b^* (1948). However, Lab is now more often used as an informal abbreviation for the CIE L^*, a^*, b^* colour space, also called CIELab (1976).

MATERIALS AND METHODS

The measurements were done with 10 cultivars of blueberries (*Vaccinium corymbosum* L.). The samples were from Research Institute of Grassed Growth

and the Mountain Agriculture in Krivá on Orava. Samples were stored in the fridge in laboratory at the temperature 8 C. The colour was measured by determining Hunter L^*, a^* and b^* values of blueberries cultivars. Lightness axis (L^*) – 0 is black, 100 is white. Red – green axis (a^*) – positive values are red and negative ones are green, 0 is neutral. Yellow – blues (b^*) – positive values are yellow; negative ones are blue, 0 is neutral. For measuring a Spectrophotometer Minolta CM - 2500d reflectance colorimeter was used and all measurements were done at 20°C. Treatment differences were tested using Duncan´s Multiple Range test, $\alpha = 0.05$.

Objective numerical values which express the colour of product show the formula:

$$E^*ab = \sqrt{\left[\left(\Delta L^*\right)^2 + \left(\Delta a^*\right)^2 + \left(\Delta b^*\right)^2\right]} \qquad (1)$$

RESULTS AND DISCUSSION

Lightness (L^*), red/ greenness (a^*), and yellow/ blueness (b^*) values of the blueberries are shown in Table 1. 'Sierra' and 'Bluejay' had the lowest L^* values of SCI and also of SCE (i.e., were darker) than the other cultivars. Cultivar´s, colour values of Lightness (L^*), did change significantly differenced only for cultivars: Patriot and Polaris. The lightness dependent on exposure to sun rays of growing (Chen, 1996). 'Blueray' had the most blue chroma (i.e., most negative b^*) and 'Polaris' the least (Table 1).

Table 1: Colour determination of blueberry cultivars. (b) - were not significantly different and (a) were significantly differenced.

Blueberries cultivars		SCI			SCE	
	L*	***a****	***b****	***L****	***a****	***b****
Goldtraube23	28.90^b	1.60^a	-3.01^a	26.77^b	1.60^a	-2.90^a
Sierra	26.11^b	5.02^b	-2.55^a	26.11^b	5.02^b	-1.78^a
Spartan	30.85^b	2.73^a	-1.82^a	28.59^b	2.73^a	-2.01^a
Blueray	29.64^b	4.08^b	-0.96^b	26.89^b	4.00^b	-0.90^b
Nelson	28.98^b	3.40^b	-0.99^b	26.10^b	3.40^b	-0.96^b
Bluejay	28.38^b	2.33^a	-2.34^a	21.27^b	3.18^a	-2.81^a
Patriot	31.56^a	3.51^b	-1.86^a	28.96^a	4.01^b	-1.91^a
Duke	26.78^b	2.05^a	-1.90^a	21.49^b	2.68^a	-1.72^a
Polaris	32.46^a	3.45^b	-3.41^a	29.99^a	3.90^b	-3.61^a
Chippewa	27.30^b	3.58^b	-1.62^a	25.77^b	3.87^b	-1.58^a

The significant differences were cultivars: Goldtraube 23, Sierra, Bluejay, Patriot, Duke, Polaris and Chippewa. All cultivars had negative values of (*b**) it means that they have their typical purple colour. Variations in green (negative *a**) and red (positive *a**) chromas among cultivars was not as large as that for blue chroma. Only the cultivar 'Sierra' had higher values of red (positive *a**) chroma than other cultivars. For redness the lowest score had cultivar 'Goldtraube 23'. The cultivars Goldtraube 23, Spartan, Bluejay and Duke did change significantly differenced. However the chromaticity coordinated *a** is the most important factor of maturity appearance describing colour of the fruit. The intensity of red colour normally indicates full maturity and ripeness (Delwiche et al., 1994).

Table 2: Total colour determination of blueberry cultivars.

Blueberries cultivars	**SCI**	**SCE**
	E*_ab_	**E*_ab_**
Goldtraube23	29.10	26.97
Sierra	26.71	26.65
Spartan	31.02	28.79
Blueray	29.85	27.20
Nelson	29.20	26.34
Bluejay	28.57	21.69
Patriot	31.81	29.29
Duke	26.93	21.72
Polaris	32.82	30.92
Chippewa	27.58	25.72

The evaluation of objective numerical value (1), which expresses the colour of blueberries depicted that the higher value had cultivar 'Polaris' for both of Specular Component (Tab. 2). At the second place was cultivar 'Patriot' and on third place was cultivar 'Spartan'. The lowest values of total colour determination had cultivars 'Sierra' and 'Duke'.

CONCLUSIONS

Estimation of fruit quality based on the system describing colour should be useful for marketing and allowing checking consumer preferences and access

maturity, quality of products after storage and at the self – life. The low values of parameter L^* (Tab.1), indicated darkness for cultivars: 'Polaris' and 'Patriot'. The most negative values of parameter b^*, had the cultivar 'Polaris', showed darkness of the skin, which results in the purple colour, and similar values had also the other cultivars. The positive values of parameter a^*, showed the saturation of red for each other cultivars. The cultivars 'Polaris', 'Patriot' and 'Spartan' (Table 2), for both of Specular Component, had the higher value evaluated with the formula (1).

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