

## Colour and stability of pure anthocyanins in aqueous solutions at high pH values.

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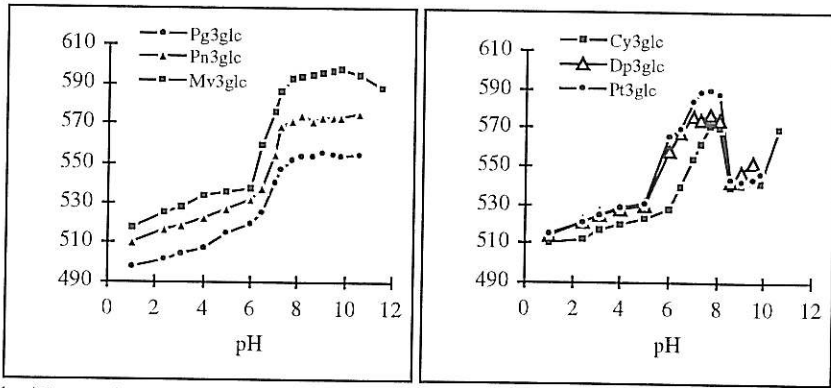
The interest in the use of anthocyanins as food colorants has increased in recent years (Bridle and Timberlake, 1997), however, these colours are affected by a number of factors (Francis, 1989). Nearly all reports treating colour and stability of pure anthocyanins under pH influence deal with acid or neutral solutions (Brouillard, 1988).

This paper describes how the colour ( $\lambda_{\max}$ ,  $\epsilon$ ) and colour stability of the six common anthocyanidin 3-*O*- $\beta$ -D-glucosides and a monoacylated anthocyanin, petunidin 3-[6-*O*-(4-*O*-*E*-*p*-coumaroyl-*O*- $\alpha$ -rhamnopyranosyl)- $\beta$ -glucopyranoside]-5-*O*- $\beta$ -glucopyranoside (petanin) varies over the pH range 1.0–11.5 during 60 days of storage at 10° and 23°C.

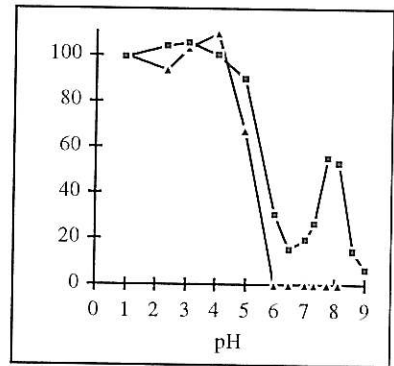
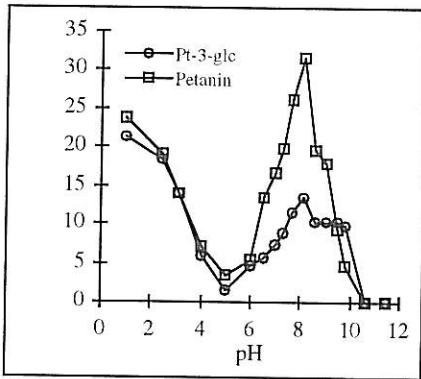
By plotting the  $\lambda_{\max}$ -values obtained at different pH values, the six common anthocyanidin 3-glucosides were divided into two groups based on their curve shapes. Group 1 (Figure left) involves anthocyanins with different number of methoxyl groups, however, with only one OH-group on the B-ring. Group 2 (Figure 1 right), which shows dramatic hypsochromic shifts going from pH 8.0 to 9.0, includes anthocyanins with two or more OH-groups in *ortho*-position to each other on the anthocyanidin B-ring. Thus, the substituent pattern of the anthocyanidin B-rings seems to have profound influence on the type of anthocyanidin equilibrium forms occurring in the alkaline region.

A comparison between the colour intensity and stability of petanin and the anthocyanidin 3-monoglucosides revealed rather extensive differences. For instance at pH 8.1 the absorptivity of petanin was even higher than at the lowest pH values where the anthocyanins exist in their flavylium ion forms (Figure 2). After 5 days at this pH the visible  $\lambda_{\max}$  absorption of petanin was similar or higher than for instance the corresponding absorption of fresh cyanidin-3-glucoside solutions at any pH (Figure 3) (Fossen *et al.*, 1998). Thus, the use of anthocyanins like petanin as food colorants in slightly alkaline products (bakery, milk, egg, etc.) should therefore be considered, at least in products with limited storage time which are kept in a refrigerator.

### Topic 3 : Polyphenols in Food and Consumer Preference



**Figure 1.** Absorption maxima for the six common anthocyanidin 3-glucosides ( $1.0 \times 10^{-4}$  M) recorded 1 hour after dissolution in aqueous buffered solutions at room temperature. Pg = pelargonidin, Cy = cyanidin, Pn = peonidin, Dp = delphinidin, Pt = petunidin, Mv = malvidin.



**Figure 2.** Absorptivity of petanin and petunidin 3-glucoside ( $1.0 \times 10^{-4}$  M) recorded 1 hour after dissolution in aqueous buffered solutions at 23°C.

**Figure 3.** The percentage of intact petanin (squares) and cyanidin 3-glucoside (triangles) at different pH-values after 5 days storage at 10°C measured as absorbance at  $\lambda_{max}$ .

### References

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