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**Insights into the Betalain Pathway Using Artificial and Natural Plant Models**

Calcott KE1,2, Gould KS2, Davies KM1, Harris NN3 and Schwinn KE1

1 The New Zealand Institute for Plant & Food Research, Private Bag 11 600, Palmerston North 4442, New Zealand

2 Victoria University of Wellington, PO Box 600, Wellington, New Zealand

3 Commonwealth Scientific and Industrial Research Organization, Urrbrea, SA 5064, Australia

Email: kate.calcott@plantandfood.co.nz

**Key Words** Betalain Pigments, Anthocyanin Pigments

Betalain and anthocyanin pigments appear very similar, in terms of colour and *in* *planta* distribution, yet no plant contains both pigment types. Based on their mutual exclusivity, it is thought that betalain pigments replace anthocyanins in many Caryophyllales. While much is known about the anthocyanin pathway and its regulation, there are many biochemical, physiological and regulatory aspects of the betalain pathway that are not understood. In addition, it is unknown whether there are physiological reasons for the mutual exclusivity of these pigments. To address some of these knowledge gaps, we developed lines of the non-betalain species *Arabidopsis thaliana* that are capable of ectopically producing anthocyanins, betalains or both. Accumulation of pigments in these lines was studied using microscopy. Furthermore, these plants were fed transporter inhibitors or crossed with known anthocyanin transport mutants, allowing possible transport mechanisms of betalains from site of synthesis to storage in the vacuole to be examined. We also investigated stress induced betalain formation in Swiss chard (*Beta vulgaris* var. *cicla* cv. Bright lights) by comparing expression levels of betalain and anthocyanin/flavonoid biosynthetic genes using quantitative PCR. Our results and insights into the betalain pathway will be discussed.

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