

Does Leaf Anthocyanin Content Differ Between White, Pink, or Violet *Hesperis matronalis*?

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Introduction

- Flower colour is one of the most diverse traits within nature. It is integral for plant reproduction as it helps to attract pollinators such as bees, butterflies and hummingbirds [1].
- Anthocyanins are one of the most common pigments found within plant tissues. In addition to producing beautiful colours, they also help to protect plants from UV rays, herbivory and abiotic stresses [2].

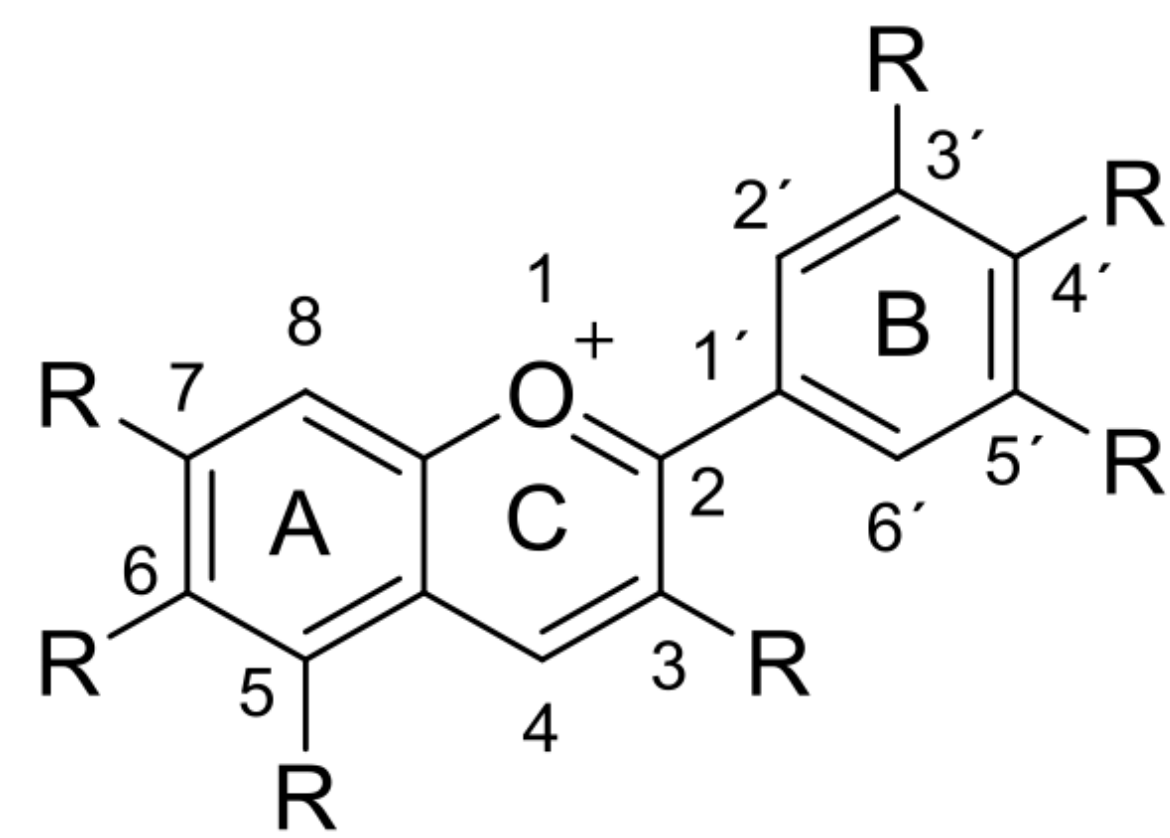
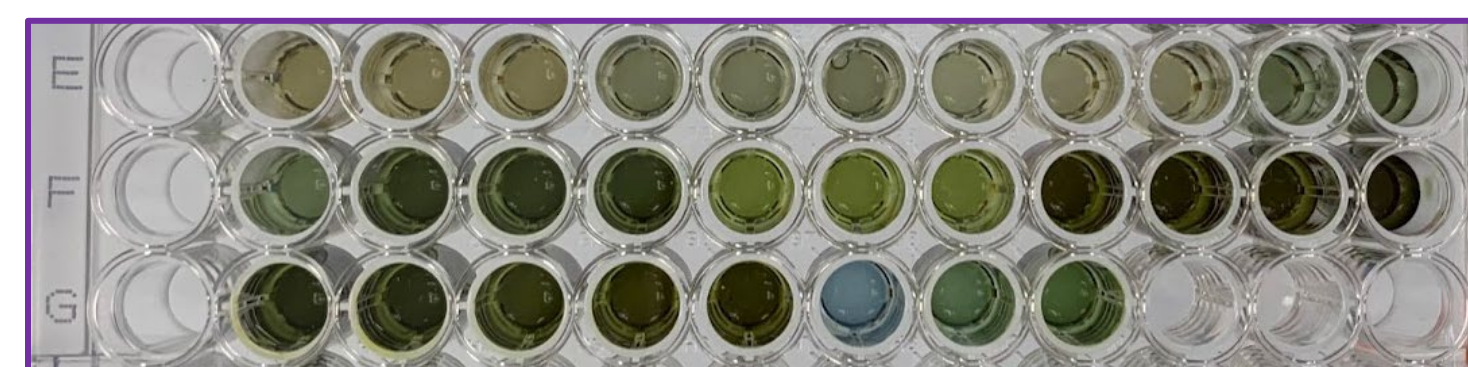


Figure 1. General chemical structure of anthocyanidin (glycosylation will result in specific anthocyanin). R groups = H or OH. [3]

- Within *Hesperis matronalis* (Dame's Rocket), anthocyanins are responsible for the vibrant pink and violet petals of the flower. The white variety occurs due to a reduction in the synthesis of anthocyanin [4].
- Hesperis matronalis* is native to Eurasia but was introduced to North America around the 1600's for decorative purposes. It escaped into surrounding natural areas and is now found all over North America [5].
- It is categorized as an **invasive species** since it impedes on native vegetation and is a viral host for various agricultural crops [5].

Methods

- Samples were collected from rural and urban populations within Kingston, Ontario and at the Koffler Scientific Reserve.
- Dried and fresh *Hesperis matronalis* leaves were selected and ground into a powder. Anthocyanins were extracted using a solution of HCl and methanol [6].
- After centrifuging, the supernatant was pipetted into a well plate and measured for absorbance at 530 nm and 657 nm.



- The equation $Q = A_{530} - (0.25 \times A_{657}) \times 1/M$ was used to determine the amount of anthocyanin in A530/gDW [6].

(Q= Anthocyanin Content, M = mass of plant, A530 = absorbance for anthocyanin, A657 = absorbance for chlorophyll)

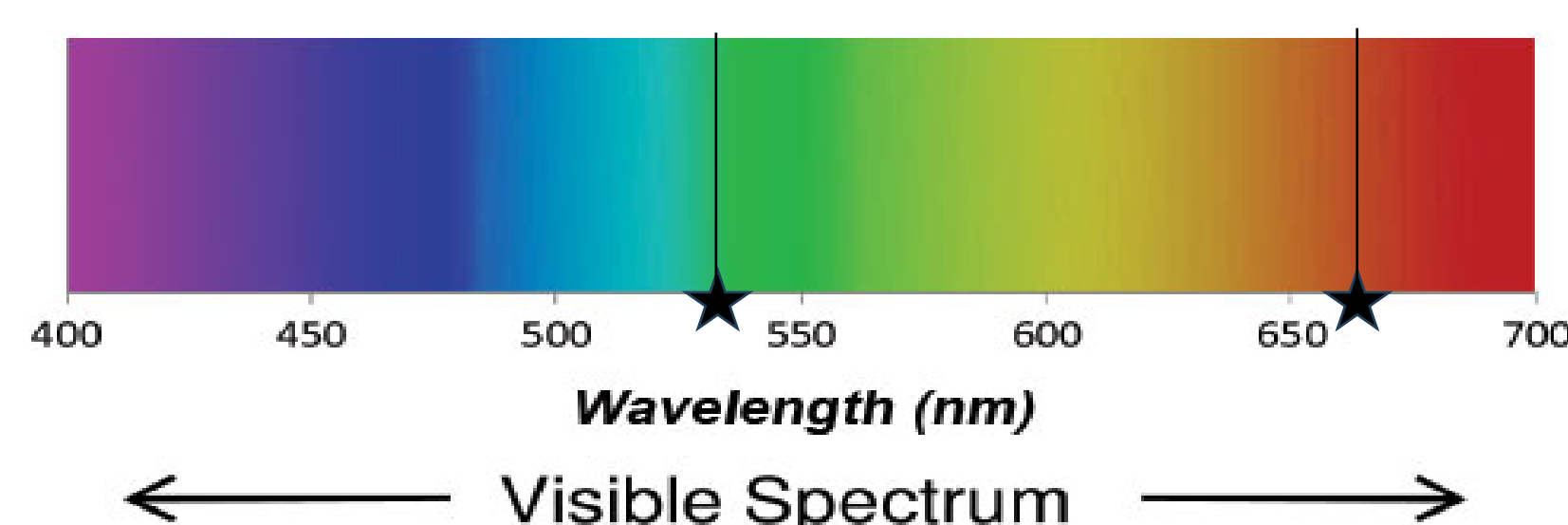


Figure 2. Visible light spectrum [7]. Absorbance was measured at 530 nm and 657 nm.

Objective

A previous survey within Kingston, Ontario determined that urban populations of *Hesperis matronalis* had a mix of all three flower colours. However, in rural areas they were predominantly violet. Therefore, as anthocyanin has many positive effects on plant fitness, we wanted to determine if flower colour influenced the amount of anthocyanin within *Hesperis matronalis* leaves.

Results



Figure 3. Anthocyanin content within the leaves of white, pink and violet *Hesperis matronalis* (n=27).

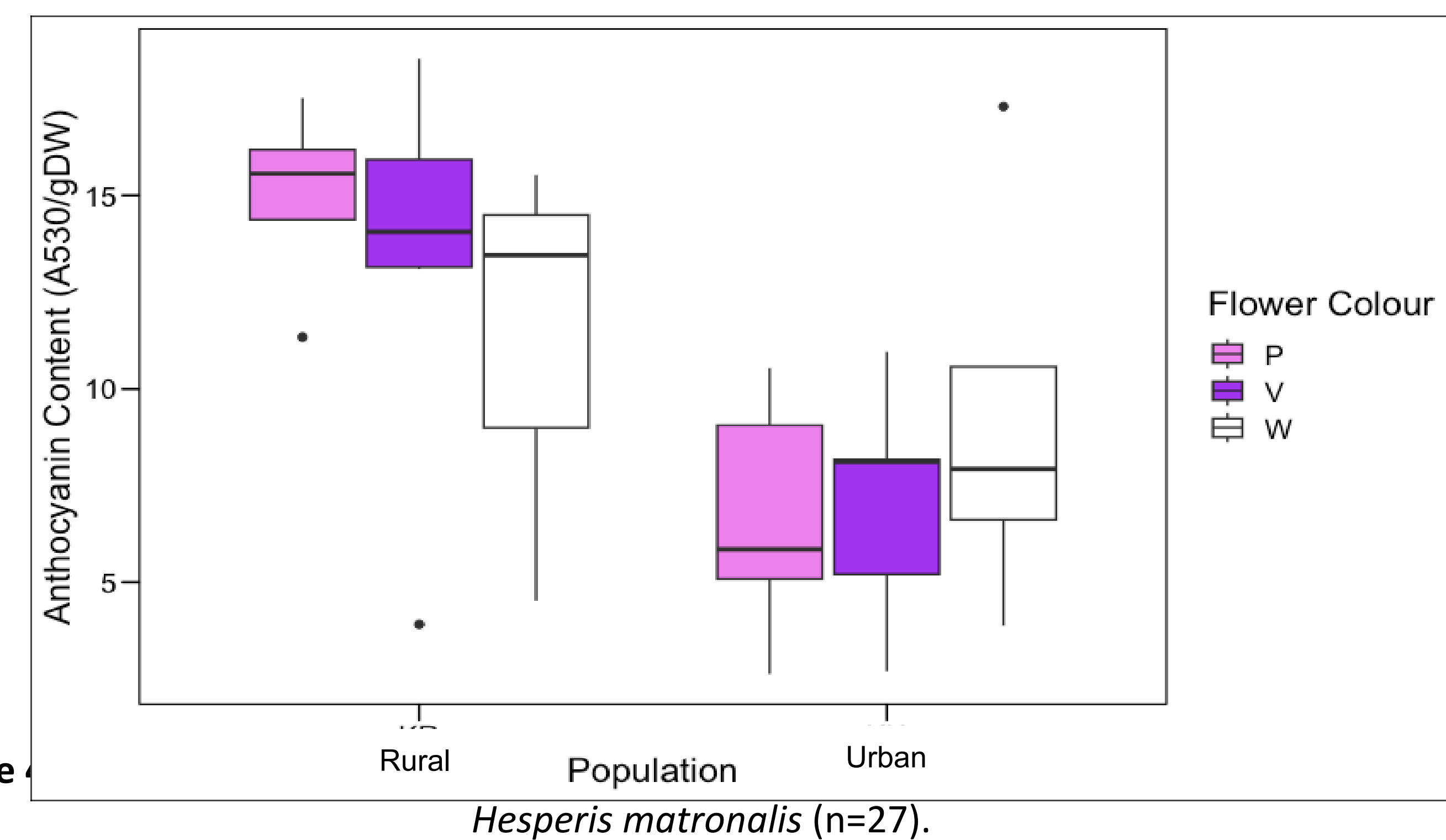


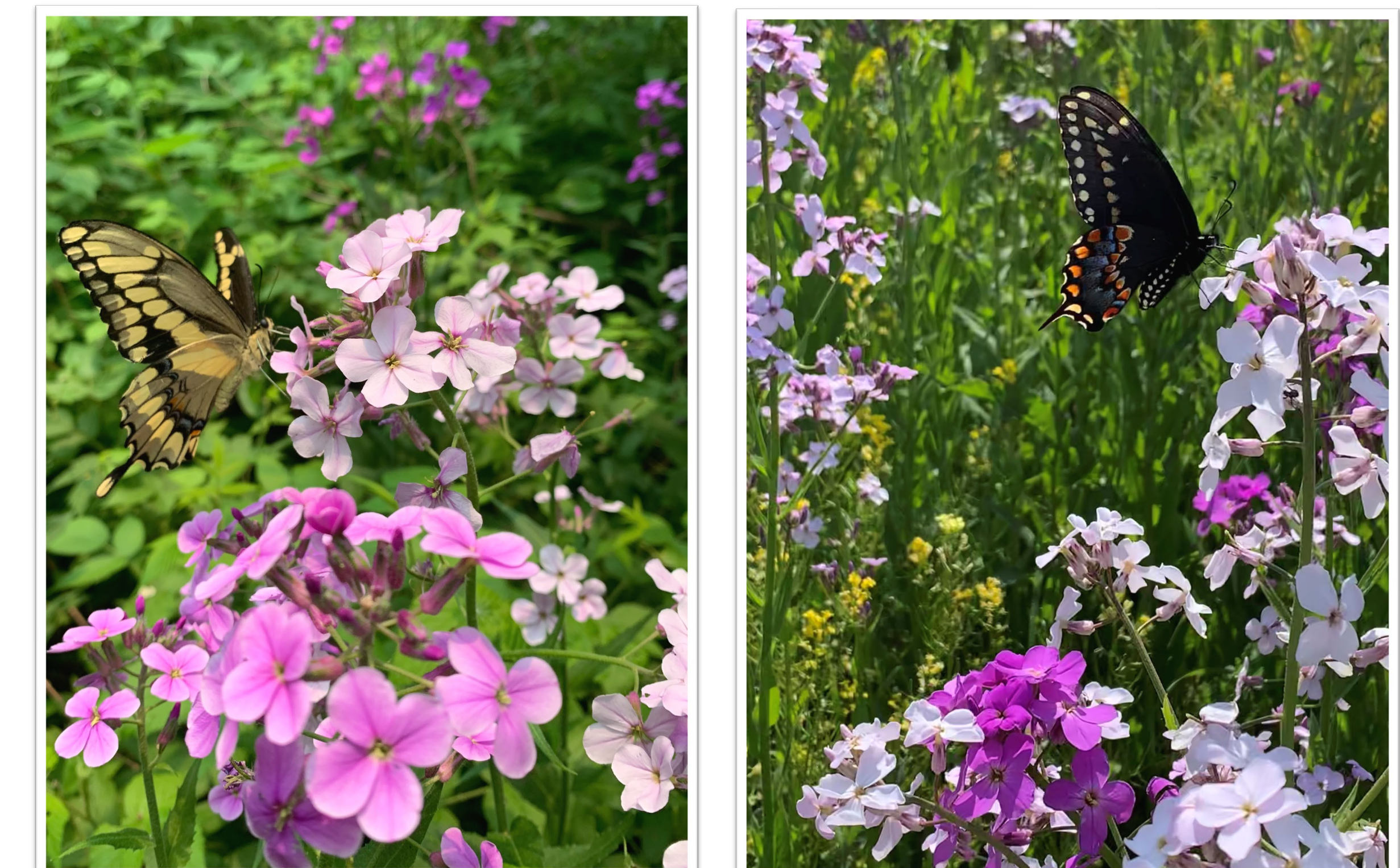
Figure 4. Anthocyanin content within the leaves of rural and urban populations of *Hesperis matronalis* (n=27).

- A significant correlation was not demonstrated between flower colour and leaf anthocyanin content in the *Hesperis matronalis* (ANOVA; $F_{2,24} = 0.012$, $p = 0.98$; Fig. 3).
- However, when comparing leaf anthocyanin content between the urban and rural populations, we found that rural plants had higher leaf anthocyanin levels on average (ANOVA; $F_{1,25} = 13.1$, $p = 0.00131$; Fig. 4).
- Within the urban population, *Hesperis matronalis* with white flowers had the most anthocyanin while pink had the least. However, within the rural population, the opposite result occurred (Fig. 4).

Discussion

- These results suggest that *Hesperis matronalis* leaf anthocyanin levels were **not significantly influenced** by the plant's flower colour (Fig. 3).
- Future studies could be conducted to determine if **another factor** is influencing the anthocyanin content.
- As shown in Figure 4, an **environmental difference** between the populations could be affecting the anthocyanin content within the plant's leaves. However, larger sample sizes and more populations will be required to determine what environmental factor is responsible.

This could potentially lead to greater understanding of the **effects of human activity** on the evolution of native and invasive plants. Therefore, increasing our awareness of the impacts of our actions on the natural world.



References and Acknowledgements

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