

APPLICATION OF FLOWER COLOR VARIATIONS TO *Impatiens balsamina* L. AS AN ENVIRONMENTALLY FRIENDLY ACID-BASE INDICATOR

Nanik Siti Aminah*, Andika Pramudya Wardana, Alfinda Novi Kristanti,
Brilliana Via Safitri and Mafalda Rosa

Department of Chemistry, Faculty of Science and Technology, Universitas Airlangga,
Jl. Mulyorejo, Surabaya, Indonesia 60115

*E-mail : nanik-s-a@fst.unair.ac.id

ABSTRACT

An acid-base titration is one of the quantitative analysis methods involving a high-polluting, harmful, hazardous, and relatively expensive synthetic indicator. The development of the concept of green chemistry encourages research to invent natural indicators that are more environmentally friendly. *Impatiens balsamina* L. flower has a variety of colors and contains anthocyanin pigments. Rose pink, red, violet, orangish red, and pink *Impatiens balsamina* L. flower were extracted with acidified ethanol solvent. All five *I. balsamina* L. flower extracts indicate discoloration on pH range 10-12. Violet flower extract has an error percentage of strong acid-strong base titration which was $50.48 \pm 2.18\%$, while in strong acid-weak base titration was $19.27 \pm 1.15\%$. Meanwhile, it cannot be applied in weak acids-strong base titration. Thus, *I. balsamina* L. flowers can be used as an alternative to environment-friendly natural acid-base indicators.

Keywords: Acid-base, Green Chemistry, *Impatiens balsamina* L., Natural Indicator, Titration

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INTRODUCTION

The beginning of green chemistry was dominated by the green organic synthesis in various branches of the chemical industry.¹ This green chemistry activity has been applied to the role of analytical chemists in making laboratory practices more environmentally friendly.² Green analytical chemistry (GAC) emerged in 2000, where the main principle was to replace toxic reagents, reduce the number of reagents used and the waste produced dramatically, thereby reducing or avoiding the side effects of the analytical process. It is carried out to increase the awareness of environmental problems caused by analytical processes and industries in the chemical field.³

Titration is the most common laboratory method carried out by quantitative chemical analysis used to determine the concentration of analytes.⁴ Some scientists frequently conducted titration using high-polluting, harmful, hazardous, and relatively expensive synthetic indicators⁴. Both dye and synthetic indicators have become a cause of concern because of the damages to the environment and living systems. Therefore, efforts to replace hazardous synthetic indicators with the natural one obtained from plant sources have been made.⁵ Therefore, various studies on the indicators from natural products are being carried out widely by many scientists around the world because they are less dangerous, low cost, easily available, and environmentally friendly.⁶ Research on acid-base indicators of natural products includes flower estates such as *Nerium oleander* and *Catharanthus roseus*⁷, *Antirrhium majus* and *Dianthus plumarius*⁸, *Quisqualis indica*, *Pentas lanceolata*, *Malabathricum melastoma*, *Impatiens acaulis*⁹, *Thunbergia erecta*¹⁰, and *Syzygium cumini*.¹¹

Anthocyanin compounds are water-soluble pigments and are naturally found in various types of plants. The color of red to blue flowers comes from anthocyanins, a class of flavonoids. Flower color is one of the most important characteristics of floricultural crop.¹² Color is given by anthocyanin due to its long and conjugated double bond arrangement, so it can absorb light in the visible light range.

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