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Article

Screening of Ornamental Flower Extracts as Natural Staining Agents

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Abstract: This study aimed to provide additional information using natural dyes as a substitute for synthetic dyes in the viewing of plant and animal cells. It utilized the quantitative descriptive experimental research design using standard laboratory procedures. An experimental method was used in the study: it started with collecting flowers, then extract preparation using mechanical extraction, plant cell preparation, animal cell preparation, and staining the specimen for microscopic observation. Basically, there were five (5) treatments, each treatment had 3 replications. The result of the study showed that *Begonia x hybrida* and *Mirabilis jalapa* can stain the nucleus, cell wall, and cytoplasm of the plant cell when viewed under 100x and 400x magnification. While in *Thunbergia erecta,* the parts of the plant cell cannot be distinctly seen. In contrast, none of the extracts successfully stained animal cells, suggesting their limited application in animal histology. Compared to synthetic dyes, which pose health and environmental risks, natural dyes offer an eco-friendly and biodegradable alternative. However, their selective staining ability emphasizes their potential use in plant histology rather than animal tissue staining. Further research is needed to enhance their staining efficiency and expand their applications in microscopy.

Keywords: Extracts, Natural Staining Agents, Ornamental Flower, Screening

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1. Introduction

Biology is a natural science that studies life from the cellular level to the organism level. In biology, students are doing laboratory activities on how to observe cells and tissues under the microscope, but some cells and tissues are translucent because they have little or no color pigment. This cannot be able to be observed under the microscope; as a result, a staining process on cells and tissues is needed to facilitate observation [1].

Staining is applying dyes to specimens to induce a chemical reaction that enhances the color of cells. According to Green, cited by Olise et al, dyes are chemical or synthetic chemical substances that are used to give color to non-food materials [2], [3]. Synthetic dyes are often effective but may pose risks to human and animal health [4]. But most of the stains that are currently available on the market are chemically synthesized from inexpensive petroleum sources, which can unquestionably damage our environment and lead to skin irritation [5]. Under rapid technological growth and advancement, if given a chance, many people prefer natural and organic substances over commercial and chemically synthesized ones [6].

Plants contain a diverse range of pigments that can be used as natural dyes. When oxidized, these pigments have the potential to serve as an alternative for staining certain specimens. Their vibrant color spectrum, including shades of pink, red, purple, and blue, makes them a promising natural colorant for plant and animal tissues, offering a cost-effective substitute for expensive synthetic dyes. Moreover, the process of creating alternative stains is simple, affordable, and utilizes readily available materials, making it accessible to students. Additionally, these natural plant extracts are non-toxic, biodegradable, and environmentally friendly [7].

To lessen the use of hazardous synthetic stain/dye, the researchers arise its interest in screening the ornamental flower extracts as natural staining agents. In line with this, the flower extract as a natural dye for plant and animal cells is expected to be used as a practical guide in the laboratory. This can be used as a guide or reference before doing a hands-on activity, especially in viewing plant and animal cells.

Objective of the Study

This study aims to provide additional information using natural dyes as a substitute for synthetic dyes in the viewing of plant and animal cells. Specifically, this study sought to answer the following objectives.

To determine the staining clarity of different ornamental flower extracts as staining agents.

a. T1- Begonia x hybrida
b. T2 - Mirabilis jalapa
c. T3 - Thunbergia erecta
d. T4 - Negative control
e. T5 - Positive control

To compare the staining clarity of different ornamental flower extracts.

2. Materials and Method

Research Design

This research used a qualitative descriptive experimental method to describe the quality of staining plant cells and animal cells in slides using the ornamental flower extract. The qualitative research used different ornamental flower extracts, namely: T1- dragon wing (*Begonia x hybrida*), T2- four o'clock (*Mirabilis jalapa*), T3- bush clock vine (*Thunbergia erecta),* with 3 replications.

Collection and Preparation of Flowers

Three (3) ornamental plants were used, which were collected in different barangays of Sagay City. The plants are dragon wing (*Begonia x hybrid*), four o'clock (*Mirabilis jalapa*), and bush clock vine (*Thunbergia erecta*). The flowers of these three ornamental plants were collected and let dry at room temperature for one (1) hour to ensure that there is no remaining water in the flowers.

Extract Preparation

The gathered flowers were pounded using the mortar and pestle. The extracted juice from the pounded flower of dragon wing (*Begonia x hybrida*), four o'clock (*Mirabilis jalapa*), and bush clock vine (*Thunbergia erecta*) was placed in a test tube for centrifugation. After centrifugation, each liquid (filtrate) was poured separately into the crystal bottle or vial and labeled as follows: T1, T2, and T3, and is ready for use as a staining agent. A clean dropper was used to apply the dye to each slide.

Staining Procedure and Slide Preparation

Plant Cell Preparation

The inner lining of the skin of the onion was removed and placed in glass slides, and one drop of the extracted flower of dragon wing (*Begonia x hybrida*), four o'clock *(Mirabilis jalapa), and bush clock vine (Thunbergia erecta)* was applied separately in the slides that contained the inner lining skin of the onion (*Allium cepa*). Coverslips were placed on the slides before viewing under the microscope.

Animal Cell Preparation

Using the toothpick, the inner lining of the cheek was scraped and placed on glass slides, and one drop of the extracted flower of dragon wing (*Begonia x hybrid*), four o'clock

(Mirabilis jalapa), and bush clock vine (Thunbergia erecta) was also applied to the slides that contained the cells of the inner lining of the cheek. Before viewing the specimen in the microscope, the cover slips were also covered in the slides. The negative and positive control slides were also prepared, but the positive control was stained with methylene blue.

Microscopy

Microscopical observation of each slide was made using x100 and x400 objectives. The different parts of the cell were observed and compared with a standard staining technique (methylene blue). Photomicrographs of each slide showing the different parts of the cell were taken using an iPhone camera.

3. Results and Discussion

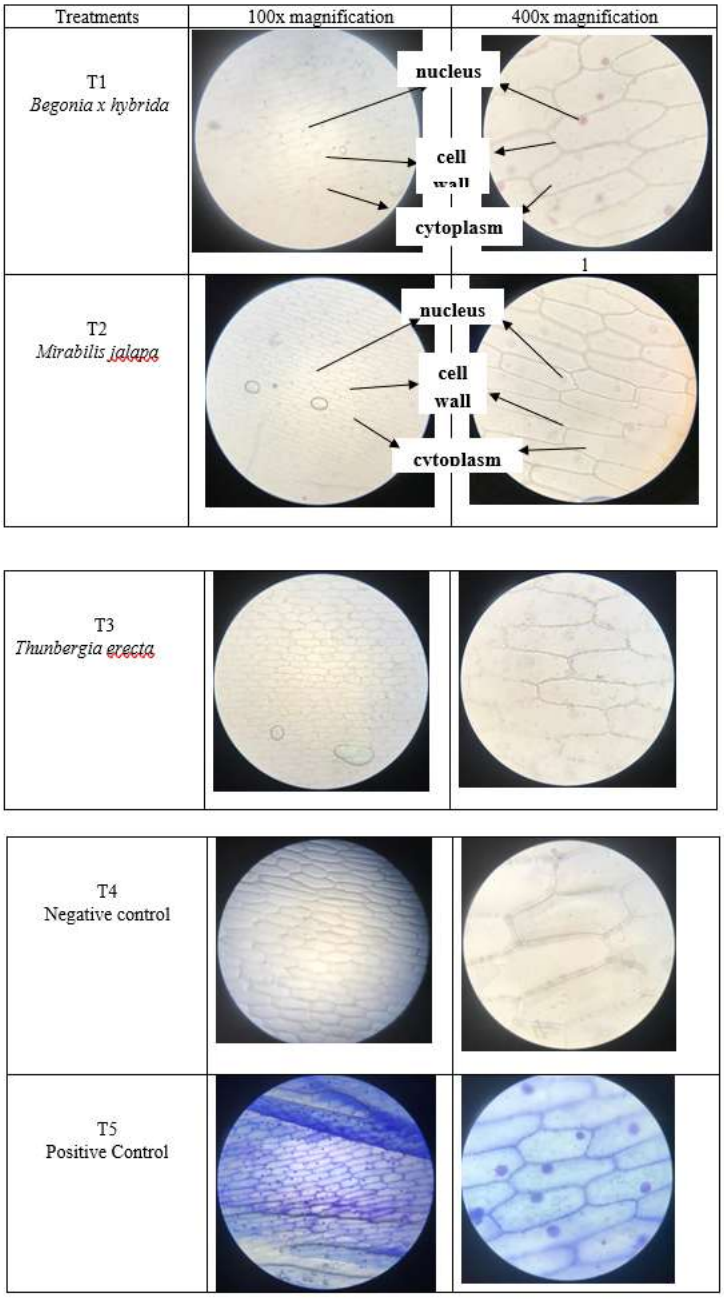

Figure 1. Different Flower Extracts of Ornamental Plants as Staining Agents in Plant Cells

Figure 1 shows the photomicrograph of the cells of the onion (*Allium cepa)* when stained with different flower extracts of ornamental plants and synthetic dyes, when

viewed under the microscope. Based on the result, the different flower extracts of ornamental plants have their own characteristic color, which can stain the parts of a cell of an onion (*Allium cepa*). As seen in the photomicrograph, treatment 1 *(Begonia x hybrid*) and treatment -2 (*Mirabilis jalapa* can stain the parts of the cell of an onion (*Allium cepa*). This can be seen in a photomicrograph of 100x and 400x magnification. The nucleus, cell wall, and cytoplasm of the cell of an onion can be seen when viewed at 100x and 400x magnification. While the study conducted by Madanakumar & Kumaraswamy on *Begonia malabarica* and *Begonia rex* demonstrated that anthocyanins extracted from these plants can effectively stain plant tissues [8], highlighting their potential as natural dyes. Rozina identified significant levels of phenolic and flavonoid compounds in *Mirabilis jalapa* flowers, which are known for their pigmentation properties [9]. These compounds suggest potential for staining applications. Using the *extract of Thunbergia erecta*, the parts of the cell of an onion, especially the nucleus, cannot be distinguishably seen when compared to T1- *Begonia x hybrid* and T2- *Mirabilis jalapa*. On the other hand, the positive control reveals a well-differentiated staining of onion cells from the cell wall to the nucleus. This can be seen in the photomicrograph of 100x and 400x magnification. However, synthetic dye is hazardous to human health, it is also expensive, and some have a carcinogenic component [10]. While natural dyes are free from carcinogenic components, they are easily biodegradable, and they are more eco-friendly than synthetic dyes [5], [10].

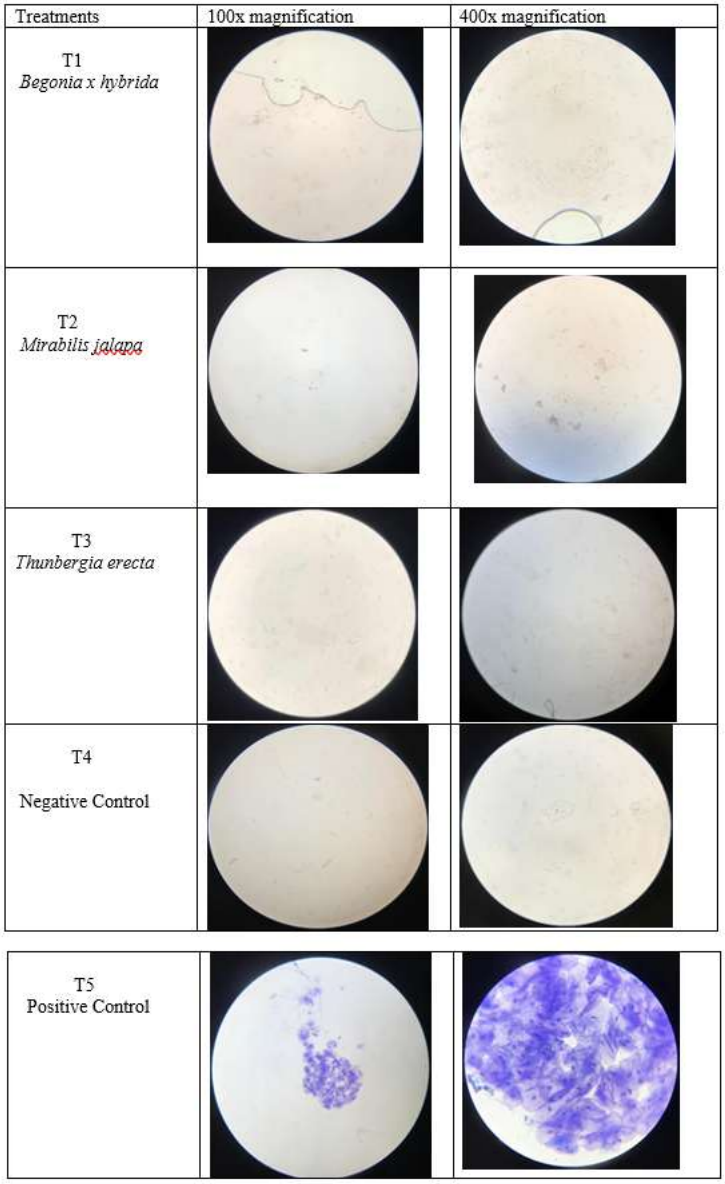

Figure 2. Different Flower Extracts of Ornamental Plants as Staining Agents in Animal Cells

The photomicrograph in Figure 2 indicates that T1- *Begonia x hybrida,* T2- *Mirabilis jalapa,* and T3- *Thunbergia erecta* did not stain the animal cell. A study evaluating *Bougainvillea spectabilis* bract extract as an alternative to Wright stain in blood smear preparation found it ineffective for staining blood cells, suggesting that not all plant-based dyes are suitable for animal cell staining [11]. Additionally, research on *Mirabilis jalapa* focused on its potential as a natural food dye and in nanoparticle delivery, without addressing its application in staining animal cells [12]. These findings imply that while certain plant extracts exhibit vivid pigmentation, their chemical properties may not facilitate effective staining for animal cells. Further research is needed to assess the staining capabilities of *Begonia x hybrida*, *Mirabilis jalapa*, and *Thunbergia erecta* on animal tissues [13], [14], [15].

4. Conclusion

The study demonstrated that flower extracts from *Begonia x hybrida* and *Mirabilis jalapa* effectively stained the plant cells of onion, making their cellular structures more visible. This suggests that the pigments present in these flowers, such as anthocyanins and flavonoids, interact well with plant cell components. However, *Thunbergia erecta* did not produce a distinct staining effect on onion cells, indicating that its pigments may lack the necessary affinity for plant cell walls. In contrast, all three plant extracts failed to stain squamous animal cells. This result suggests that the chemical properties of these pigments may not bind effectively to the cellular components of animal tissues or lack the necessary mordanting ability to adhere to animal cell structures. The findings highlight the selective staining potential of natural plant extracts and suggest further exploration of their applications in botanical histology rather than in animal cell staining.

REFERENCES

[1] H. Wagiyanti and R. Noor, "Red dragon fruit (Hylocereus costaricensis Britt. Et R.) Peel extract as a natural dye alternative in microscopic observation of plant tissues: The practical guide in senior high school," *Jurnal Pendidikan Biologi Indonesia*, vol. 3, no. 3, pp. 232–237, 2017.

[2] C. L. Green, *Nutritional Colourant and Dyestuff: A review of Production Markets and Development Potential*. Rome, Italy: Food and Agricultural Organization of the United Nations, 1995.

[3] N. A. Olise, I. B. Enweani, I. O. Oshim, E. U. Urama, and C. C. Ngwoke, "The use of extracts from Nigerian indigenous plants as staining techniques in bacteriology, mycology, and histopathology," *Int. J. Plant Res*, vol. 8, no. 1, pp. 15–24, 2018.

[4] M. P. Rubina, A. M. Krishnan, K. B. Riyas Basheer, T. K. Mohammed Safeer, and V. Soumya, "Assessment of staining quality of curcumin as a substitute for eosin in hematoxylin and eosin staining in histopathology," *J Res Med Dent Sci*, vol. 8, no. 5, pp. 146–150, 2020.

[5] K. Deepali, S. Lalita, and M. Deepika, "Application of Aqueous Plant Extracts as Biological Stains," *Int. J. Sci. Eng. Res.*, vol. 5, no. 2, pp. 1587–1589, 2014.

[6] C. C. Bondoc, "Curcuma longa Linn rhizome extract as an alternative stain for histological studies," *J. Pharmacogn. Phytochem.*, vol. 7, no. 5, pp. 3010–3017, 2018.

[7] S. M. Adeyemo, A. J. Akinloye, and G. B. Adekanmi, "The Use of Plant Dyes for Microbial Staining and Identification: An Eco-friendly and Non-Toxic Alternative Method," *J. Adv. Biol. Biotechnol.*, vol. 16, no. 4, pp. 1–10, 2017.

[8] A. J. Madanakumar and M. Kumaraswamy, "Purified anthocyanin, its elicitation from cell cultures of Begonia malabarica and Begonia rex-cultorum 'Baby Rainbow'and it's in vitro cytotoxicity Analysis by MTT Assay," *Pharmacognosy Journal*, vol. 10, no. 3, 2018.

[9] R. Rozina, "Pharmacological and biological activities of Mirabilis jalapa L.," *Int J Pharmacol Res*, vol. 6, no. 5, pp. 160–168, 2016.

[10] R. Bhuyan and C. N. Saikia, "Isolation of colour components from native dye-bearing plants in Northeastern India," 2004.

[11] H. J. R. Calilung, A. L. Castillo, C. A. U. Gasmido, C. Anne, S. Legaspi, and R. M. E. Castor, "Efficacy of Bougainvillea spectabilis (Bougainvillea) bracts crude extract as an alternative to Wright stain in blood smear preparation," *European Journal of Molecular & Clinical Medicine*, vol. 7, no. 2, 2020.

[12] C. R. Rathi and S. N. Suresh, "Mirabilis jalapa Flower Extract as Therapeutic Agent and Cellular Delivery by Nanoparticles," *Journal of Drug Delivery & Therapeutics*, vol. 11, 2021.

[13] R. Siva, "Status of natural dyes and dye-yielding plants in India," *Curr. Sci.*, pp. 916–925, 2007.

[14] O. Uchejeso and O. Ejinaka, "Beetroot and turmeric as alternative dyes for haematoxylin and eosin in histological staining," *Sci Res J Clin Med Sci*, vol. 2, pp. 54–88, 2022.

[15] Ş. S. Bayazit, "Investigation of Safranin O adsorption on superparamagnetic iron oxide nanoparticles (SPION) and multi-wall carbon nanotube/SPION composites," *Desalination Water Treat.*, vol. 52, no. 37–39, pp. 6966–6975, 2014.