The feasibility of barringtonia racemosa as an alternative highlighter ink essay ...

Environment, Plants

NOTE: All information was obtained from the all-mighty internet. No real experimentation was done. This is was just a practice thing. We take no credit whatsoever from all the following stuff. We thank all the people who helped us indirectly, especially Gonzaga and Mendoza, whoever you are. May God bless your sweet souls and may peace and good fortune fill you for the rest of your lives. Please don't sue us. Oh, and we thank Google and all the people who helped build it and all the humans who shared information. May God also bless your souls.

THE FEASIBILITY OF DERIVING ALTERNATIVE HIGHLIGHTER INKS FROM POWDER-PUFF FRUITS (Barringtonia racemosa)

CHAPTER 1:

I. Background of the Study

A highlighter is a form of a felt-tip marker pen which can be used to draw attention to certain words or sentences of documents by marking them with translucent, see-through colors. It is an essential stationary item for students as well as working people. The ink used in a highlighter pen or in any other pens plays an important part in defining the reading experience and comprehension, as well as the visual impact of the written message, to the person reading them. The ink, is of no small importance, and in the end, it is the one that determines the significance of the pen itself. Ink is one of the most important components of writing tool today. There are several brands of ink today in the market. However, all inks consist of a colorant (the substance that provides the ink with color) and a vehicle (the liquid or paste that carries and binds the ink to a surface). The selection of ink is an important decision one must make in terms of the performance of one's pen. The wrong ink means a pen that one may struggle with to use. This study attempts to find an alternative source of ink that can be used for highlighters. The sap of Powder-puff fruits is purplish and rich in color. It is this dye that interests the researcher to pursue the possibility of transforming it into an alternative source of highlighter ink.

II. Hypotheses

* An alternative highlighter ink can be economically produced from the sap of Powder-Puff fruits, of which quality resembles, or nearly resembles that of commercial highlighter inks. * The ink that will be produced by the researchers would not be a good alternative for commercial highlighter inks, as it is of poor quality and non-economic. III. Scope and Limitation

Samples of the alternative ink would be produced and compared commercial highlighter inks. The ratio of the components would be experimented upon. Since the method of this study is experimental, the researchers would be basing their findings on trial and error methods of sampling to determine the appropriate sample for a workable highlighter ink. IV. Problems

* What would be the ratio of the components of the proposed ink?

* Where would be the materials be acquired?

* How would the ink be tested?

* What is the effectiveness of the most acceptable sample of highlighter ink in the following type of paper:

a. Pad paper

b. Bond paper

c. Notebook paper

d. Book paper?

* Is there a significant difference on the effectiveness on the highlighter ink in the different type of paper? * What is the shelf-life of the highlighter ink?

V. Objectives

* To make an alternative highlighter ink from the sap of B. racemosa

* To make an effective highlighter ink

* To make an alternative ink which costs less than the conventional highlighters

* To launch reseraches on cheap yet efficient inks in the Philippines

VI. Significance of the Study

* This study will mostly benefit the students, as well as working people, who use markers, specifically, highlighters on a daily basis. If this experiment prove to be successful, they will be given an alternative source for pen ink or highlighters. * This study will give more job opportunities for those who are willing to manufacture pen or highlighter ink from putat plant's sap. This will serve as an added income and another business venture to to aspiring bussiness men/women. * This study will benefit other researchers who are in search for other sources of cheap ink, as conditions by the characteristic of the putat plant's sap. * This study will also benefit the community and the environment for the added re-plantation of putat plant if ever its sap will be mass-produced as an ink source. * This stufy will benefit society for its

success will provide them more variety in the type of highlighter they prefer to use.

CHAPTER 2: The Review of Related Literature:

I. Powder-puff fruits (Barringtonia racemosa)

Powder-puff trees, commonly known in Tagalog as Potat, are mostly found along tropical and subtropical coasts. It thrives under very humid, moist conditions, and is widely spread in the Philippines (http://www. plantzafrica. com/plantab/barringrac. htm). The fruits of a Powder-puff tree are " ovoid to oblong-ovoid, 5 to 6 centimeters long, somewhat 4-angled, crowned by a persistent calyx with a Leathery pericarp that is green or purplish in color (http://www. stuartxchange. org/Putat. html)." The sap of Powder-puff fruits is purplish and rich in color, leading the researchers to hypothesize that its extract can be cheap yet effective highlighter inks. Branching in Barringtonia is predominantly sympodial.

Flowering takes place during the night with the corolla opening early in the evening and falling the next morning. In Barringtonia asiatica only 1 flower per inflorescence opens every night whereas in Barringtonia racemosa about half of the flowers in a single inflorescence bloom simultaneously. Most species flower throughout the year but full bloom is generally reached in May and August to September. Pollination of the fragrant flowers is generally by bats or insects (mainly moths), which are also attracted by the copious nectar. After shedding of the flowers, the inflorescences are often crowded with ants attracted by the nectar. A comparatively high percentage of the fruits is seedless. Seed dispersal is usually by squirrels and other animals that feed on the fruits. Fruits of Barringtonia asiatica and several other species are buoyant thanks to the thick layer of spongy, fibrous pericarp, and are dispersed by rivers and sea currents.

Barringtonia can be propagated by seed or by cuttings. Seeds of Barringtonia asiatica show about 70% germination in about 35—65 days, compared with about 75% for Barringtonia scortechinii in 5—15 months. Sown fruits of Barringtonia macrostachya have a germination rate of about 40% in 9—22 months. Seeds of Barringtonia acutangula should be sown in full light, giving a germination rate of about 90%. Barringtonia asiatica can also be propagated by cuttings. (http://proseanet. org/prosea/e-prosea_detail. php? frt=&id= 937) A mature Barringtonia asiatica tree yields about 500—2000 fruits per year. II. Conventional Highlighter Inks

Highlighter inks are just like normal colored inks, but it contains fluorescent dye (http://en. wikipedia. org/wiki/Highlighter). Pyranine is usually used for its color. Like all inks, highlighter inks mainly contain pigment, binder and solvents. Highlighters contain high amounts of Phosphors, which reacts with UV light and makes the ink glow under black light. (http://answers. yahoo. com/question/index? qid= 20100521171922AAf1ubL) Highlighter ink compositions can include an acid buffer having a pKa from about 2 to about 6, a highlighter colorant, and a liquid vehicle. The solvent may comprise 70% of the solution, while the pigment may fill in the rest, depending on the desired effect and the kind of pigment.

III. Ink Processing

A concentrate of dye is dropped into a beaker of water that contains humectin, and its thickness is measured through the viscometer. Four revolutions per minute is just the right thickness for the highlighter inks (http://www. youtube. com/watch? v= ogezywfzDa0). The ratio of the solvent and pigment is yet to be experimented by the researchers. IV. Pigment Extraction

Extraction is a separation technique used to remove or separate one compound from a mixture. In the case of pigments or inks this method is used to get the desired color from the natural or synthetic source.

(http://materialsworld. utep. edu/Modules/Concrete/Chromatography/Extraction%20of%20Natural%20Pigments/Extraction%20of%20Natural%20Pigments. htm)

Usually, the source of pigment is pounded and then the solvent is added. In this case, it will be ethyl acetate. Afterwards, it will be filtered to remove the non-soluble components. It will be left in the hood for evaporation and the remaining liquid would be the crude form of the pigment. “ Ethyl acetate will be used as a carrier to extract the pigments from the natural plant samples. The solution will then be distilled to obtain a crude form of the pigment.

(http://scinet. dost. gov. ph/union/ShowSearchResult. php? s= 2&f=&p=&x=&page=&sid= 1&id= The+use+of+indigenous+plants+as+alternative+pigment+sources+for+highlighter+ink&Mtype= PROJECTS).”

V. Types of Ink

Ink formulas vary, but commonly involve four components which are the colorants, vehicles, additives, and carrier substances. Inks generally fall into four classes –aqueous, liquid, paste and powder. Colorants

Pigment inks are used more frequently than dyes because they are more color-fast, but they are also more expensive, less consistent in color, and have less of a color range than dyes. Pigments

Pigments are solid, opaque particles suspended in ink to provide color. Pigment molecules typically link together in crystalline structures that are 0. 1–2 µm in size and comprise 5–30 percent of the ink volume. Qualities such as hue, saturation, and lightness vary depending on the source and type of pigment. Dyes

Dye-based inks are generally much stronger than pigment-based inks and can produce much more color of a given density per unit of mass. However, because dyes are dissolved in the liquid phase, they have a tendency to soak into paper, making the ink less efficient and potentially allowing the ink to bleed at the edges of an image. VI. Pigments

A pigment is a material that changes the color of reflected or transmitted light as the result of wavelength-selective absorption. This physical process differs from fluorescence, phosphorescence, and other forms of luminescence, in which a material emits light. For industrial applications, as well as in the arts, permanence and stability are desirable properties. Pigments that are not permanent are called fugitive. Fugitive pigments fade over time, or with exposure to light, while some eventually blacken. Pigments are used for coloring paint, ink, plastic, fabric, cosmetics, food and other materials. Most pigments used in manufacturing and the visual arts are dry colorants, usually ground into a fine powder.

This powder is added to a vehicle (or binder), a relatively neutral or colorless material that suspends the pigment and gives the paint its adhesion. A distinction is usually made between a pigment, which is insoluble in the vehicle (resulting in a suspension), and a dye, which either is itself a liquid or is soluble in its vehicle (resulting in a solution). The term biological pigment is used for all colored substances independent of their solubility. A colorant can be both a pigment and a dye depending on the vehicle it is used in. In some cases, a pigment can be manufactured from a dye by precipitating a soluble dye with a metallic salt. The resulting pigment is called a lake pigment. (http://en. wikipedia. org/wiki/Pigment#Biological_pigments) a. Biological Pigments

The ink that the researchers would extract from the B. racemosa would fall under Biological pigments. Biological pigments, also known simply as pigments or biochromes[1] are substances produced by living organisms that have a color resulting from selective color absorption. Biological pigments include plant pigments and flower pigments. Many biological structures, such as skin, eyes, fur and hair contain pigments such as melanin in specialized cells called chromatophores. Pigment color differs from structural color in that it is the same for all viewing angles, whereas structural color is the result of selective reflection or iridescence, usually because of multilayer structures. For example, butterfly wings typically contain structural color, although many butterflies have cells that contain pigment as well. i. Biological pigments

* Heme/porphyrin-based: chlorophyll, bilirubin, hemocyanin, hemoglobin, myoglobin

* Light-emitting: luciferin

* Carotenoids:

* Hematochromes (algal pigments, mixes of carotenoids and their derivates)

* Carotenes: alpha and beta carotene, lycopene, rhodopsin

* Xanthophylls: canthaxanthin, zeaxanthin, lutein

* Proteinaceous: phytochrome, phycobiliproteins

* Polyene enolates: a class of red pigments unique to parrots

* Other: melanin, urochrome, flavonoids

The primary function of pigments in plants is photosynthesis, which uses the green pigment chlorophyll along with several red and yellow pigments that help to capture as much light energy as possible. Other functions of pigments in plants include attracting insects to flowers to encourage pollination. Plant pigments include a variety of different kinds of molecule, including porphyrins, carotenoids, anthocyanins and betalains. All biological pigments selectively absorb certain wavelengths of light while reflecting others. The light that is absorbed may be used by the plant to power chemical reactions, while the reflected wavelengths of light determine the color the pigment will appear to the eye. Chlorophyll is the primary pigment in plants; it is a chlorin that absorbs yellow and blue wavelengths of light while reflecting green. It is the presence and relative abundance of chlorophyll that gives plants their green color. All land plants and green algae possess two forms of this pigment: chlorophyll a and chlorophyll b. Kelps, diatoms, and other photosynthetic heterokonts contain chlorophyll c instead of b, while red algae possess only chlorophyll

a. All chlorophylls serve as the primary means plants use to intercept light in order to fuel photosynthesis. Carotenoids are red, orange, or yellow tetraterpenoids. They function as accessory pigments in plants, helping to fuel photosynthesis by gathering wavelengths of light not readily absorbed by chlorophyll. The most familiar carotenoids are carotene (an orange pigment found in carrots), lutein (a yellow pigment found in fruits and vegetables), and lycopene (the red pigment responsible for the color of tomatoes). Carotenoids have been shown to act as antioxidants and to promote healthy eyesight in humans. Anthocyanins (literally “ flower blue”) are water-soluble flavonoid pigments that appear red to blue, according to pH. They occur in all tissues of higher plants, providing color in leaves, plant stem, roots, flowers, and fruits, though not always in sufficient quantities to be noticeable.

Anthocyanins are most visible in the petals of flowers, where they may make up as much as 30% of the dry weight of the tissue. They are also responsible for the purple color seen on the underside of tropical shade plants such as Tradescantia zebrina; in these plants, the anthocyanin catches light that has passed through the leaf and reflects it back towards regions bearing chlorophyll, in order to maximize the use of available light Betalains are red or yellow pigments. Like anthocyanins they are water-soluble, but unlike anthocyanins they are indole-derived compounds synthesized from tyrosine. This class of pigments is found only in the Caryophyllales (including cactus and amaranth), and never co-occur in plants with anthocyanins. Betalains are responsible for the deep red color of beets, and are used commercially as food-coloring agents. (http://en. wikipedia. org/wiki/Biological_pigment)

REFERENCES:

http://en. wikipedia. org/wiki/Barringtonia_racemosa

http://www. stuartxchange. org/Putat. html

http://www. wildsingapore. com/wildfacts/plants/coastal/barringtonia/racemosa. htm

http://www. plantzafrica. com/plantab/barringrac. htm

http://en. wikipedia. org/wiki/Highlighter

http://en. wikipedia. org/wiki/Optical_brightener

http://scinet. dost. gov. ph/union/ShowSearchResult. php? s= 2&f=&p=&x=&page=&sid= 1&id= The+use+of+indigenous+plants+as+alternative+pigment+sources+for+highlighter+ink&Mtype= PROJECTS http://proseanet. org/prosea/e-prosea_detail. php? frt=&id= 937 http://materialsworld. utep. edu/Modules/Concrete/Chromatography/Extraction%20of%20Natural%20Pigments/Extraction%20of%20Natural%20Pigments. htm http://en. wikipedia. org/wiki/Biological_pigment http://answers. yahoo. com/question/index? qid= 20100521171922AAf1ubL