STUDY AND PROCESSING OF PLANT EXTRACTS FOR USE AS pH INDICATORS

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ABSTRACT

This research studied about processing of plant extracts for use as pH indicator. The study tested 6 kinds of tropical plants: blue butterfly pea petal, red rose petal, red bougainvillea bract, purple cabbage leaf, red hibiscus petal, and roselle calyx. It was found from the study that every kind of plant extracts can be used successfully as pH indicators either in a form of liquid, paper or powder. When tested in very strong acid (pH 1 – pH 2), all of sample plant extracts turned red. At pH 3 – pH 10 range blue butterfly pea petal was blue, red hibiscus petal and purple cabbage leaf were purple, while the others were pink and red. In base solution, at pH 11 – pH 12 most of the sample extracts were greenish yellow and became yellow or brownish yellow at pH 13 – pH 14.

Keywords: plant extract, pH indicator

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INTRODUCTION

For teaching science and fundamental chemistry, the experiment to measure pH of a solution can be done by either using a digital pH-meter or use pH indicators. Some liquid indicators such as phenolphthalein, which is normally clear in color, when tests with bases turns to pink. After leaving at room temperature for a while the color turns to be clear again, that may confuse the student. An easy way is to use pH paper, which is a piece of paper with a chemical on it that will change colors if it is mixed with acids or bases. Many flowers, fruits, and vegetables naturally contain the special type of chemical substances that change color in solutions of different pH values (Helmenstine, 2009a; Jansons, 2009; Rhodium, 2009; Sonawane, et al, 2009). This research aimed to study color, pH range of color changing, and possibility of processing plant extract to a paper or powder form in order to keep the plant extract for use during off season.

MATERIALS AND METHODS

The research was performed in chemical laboratory of Rajamangala University of Technology Lanna, Phitsanulok Campus.

Procedure:
1. Collect only needful part of 6 fresh sample plants: blue butterfly pea petal, red rose petal, red bougainvillaea bract, red hibiscus petal, purple(red) cabbage leaf and roselle calyx.
2. Making ethanolic extract from red rose petal and red bougainvillaea bract, the rest samples making aqueous extract.
3. Testing of color change interval of plant extract at pH 1-14.
5. Process plant extract to powder form by freeze drying.

RESULTS AND DISCUSSIONS

When tested in very strong acid (pH 1 – pH 2), all of sample plant extracts turned red. At pH 3 – pH 10 range blue butterfly pea petal was blue, red hibiscus petal and purple cabbage leaf were purple, while the others were pink and red. In base solution, at pH 11 – pH 12 most of the sample extracts were greenish yellow and become yellow or brownish yellow at pH 13 – pH 14. (figure 1)
Figure 1  Color changing of plant extract when tested at pH 1-14. (from left to right)

After dipping the filter paper strip in plant extract and air dried, then it was so call pH paper. The color of pH paper made from blue butterfly pea petal and purple cabbage leaf were blue, while the paper made from the other kinds of plant extract were red. (figure 2)

Figure 2  The pH paper made from plant extract.

After freeze drying, the powder from blue butterfly pea petal and purple cabbage leaf extract were dark blue. The red rose petal and roselle calyx were red, while red hibiscus petal was dark red and red bougainvillaea bract was brown in color. (figure 3)
Figure 3  The powder from plant extract.

<table>
<thead>
<tr>
<th>Plant extract</th>
<th>pH paper in pH 1</th>
<th>pH paper in pH 14</th>
<th>Powder form in pH 1</th>
<th>Powder form in pH 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>blue butterfly pea petal</td>
<td>blue</td>
<td>red</td>
<td>yellow</td>
<td>blue</td>
</tr>
<tr>
<td>red rose petal</td>
<td>red</td>
<td>red</td>
<td>yellow</td>
<td>red</td>
</tr>
<tr>
<td>red bougainvillaea bract</td>
<td>red</td>
<td>red</td>
<td>yellow</td>
<td>red</td>
</tr>
<tr>
<td>purple cabbage leaf</td>
<td>purple</td>
<td>red</td>
<td>yellow</td>
<td>blue</td>
</tr>
<tr>
<td>red hibiscus petal</td>
<td>red</td>
<td>red</td>
<td>yellow</td>
<td>red</td>
</tr>
<tr>
<td>roselle calyx</td>
<td>red</td>
<td>red</td>
<td>yellow</td>
<td>red</td>
</tr>
</tbody>
</table>

The color testing of plant extract solution, pH paper and powder form resulted that every kind of plant extract colored red in acid and yellow in base solution (table 1, figure 4, 5 and 6).

Table 1  Color of plant extract, pH paper and powder form in acid (pH 1) and base (pH 14) solution.

Figure 4  Color of plant extract in acid (pH 1, left test tube) and base (pH 14, right test tube) solution.
These experiments revealed that all 3 forms of 6 sample plant extracts could be used successfully as acid – base indicator, because of their clear result in pH range of color changing and color stability in every test period. Blue butterfly pea aqueous extract changed color in the same way as methanolic extract did but in wider pH range (Red Cabbage pH paper, 2009). The red rose petal extract color changed similar to a report (Senese, 2009a). Purple cabbage changed color from red in very
acidic solution to purplish green in mildly alkaline solution, to yellow in very alkaline solution (Helmenstine, 2009b, Senese, 2009b). Aqueous and ethanol extract of roselle (*Hibiscus sabdariffa*) could serve as suitable indicator in acid – base titrimetry involving a strong acid and a strong base(Izonfuo *et al*, 2009). Making pH paper is not complicated and cheap, while making powder needs an expensive freeze dryer and must be carefully processed. Hence, processing plant extract to powder form is not necessary for using as pH indicator in a fundamental chemistry laboratory.

**CONCLUSION**

The result of this research showed that all 6 kinds of tropical plant extract: blue butterfly pea petal, red rose petal, red bougainvillaea bract, purple cabbage leaf red hibiscus petal, and roselle calyx could be used successfully as pH indicators either in a form of liquid, paper or powder. The pH paper and powder form of plant extract could be kept for a long term use, during off – season of those indicator plant.

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**REFERENCES**


