



Indicator Made from Countryside Flower Petals

ASHOKE HAZRA

Department of Chemistry, A.K.P.C. Mahavidyalaya, Bengai, Hooghly-712 611, India.

*Corresponding author E-mail: hazra.ashoke@gmail.com

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ABSTRACT

Present research introduces on the natural indicator (Acid-Base). For this samples were collected from countryside flower petals. These are pink Madhabilata flower, violet Dahlia flower, yellowish red *Miralibis jalapa*, light pink *Nerium oleander*. With the help of pH meter colour changes were observed using Soxhlet extractor. Cold extract of the flower petals are prepared. For this study we use UV/Visible Spectrophotometer to determine the maximum wave length. The decreasing order of intercept from the above spectroscopic plots that pink Madhabilata > violet dahlia > redish yellow *Miralibis jalapa* > light pink *Nerium oleander*. Natural indicators show prominent colour changes in acidic and basic solutions. So, it is easily replaceable to the synthetic indicator which is toxic in nature. These natural indicators are easily available, cheap, environment friendly and also nature friendly.

Keywords: Absorption, Acid-base, Dahlia, Madhabilata, *Miralibis*, *Nerium oleander*, Natural indicator, pH, Wavelength.

INTRODUCTION

In connection of our previous Experiment¹, here we observed that some common flower petals acts as natural indicators in acidic and basic conditions. Negative logarithm of concentration of hydrogen ion acts as pH of a solution. Value of pH 0 to 14 shows acidic and basic nature in a solution. pH value is more important for the analysis of a indicator. Here we discuss how solution acts as acidic or basic with the help of titrimetric method for the colour change in a particular pH range. We produce natural indicators and also to determine the colour scale. Most of the cases we use household materials as well as natural things.

Indicators are the pigments which are coming from different plants, fungus, algae²⁻⁵. Red, blue or violet colour from flower petals are the one kind of anthocyanin which change colour using pH⁶. Some naturally colourful thing changes the colour from when they are changes acidity and alkalinity e.g., grapes solution, brown tea, some pigments of flowers etc. These are known as acid-base indicator⁷.

In a particular chemical reaction, these change their colour in a certain stages⁸⁻⁹. Some indicators used in laboratory which are Methyl yellow, Methyl orange, Phenolphthalein, Methyl red, Penta methoxy red, Alizarin S etc. These indicators are mainly used in the different titrimetric analysis. For acid-base titration, organic pigments which are



weak acid acts as indicators^{10,11}. Attempts have been made for the eco friendly natural indicators due to the negative impact of synthetic indicators. These natural indicators are easily available, non toxic, environment friendly¹²⁻¹⁹. For a good indicator such properties are essential as they show sharp colour change in acid and basic solutions and change in colour in equivalence point. Indicators are colour or pigments that are found in leaf, flower petals, fruits, vegetable etc. Red, blue, pink, yellow, violet etc. colour flowers contain a pigment of anthocyanin which changes colour pH. Acid-base natural indicator first introduced in the Experimental History of colours of Robert Boylein²⁰ in 1964.

Methodology

Materials

Pink Madhabilata flower, Dahlia(Violet), *Miralibis jalapa* and *Nerium oleander* flowers, sodium hydroxide(NaOH) and H₂SO₄, CH₃COOH, KOH, distilled water.

Apparatus

Mortar and pestle, digital weighing balance, burette, pipette, spatula, stirrer, glass rod, stand, clamp, soxhlet extractor and filter paper (Whatmann 40) were use for this experiment.

Sample Preparation

Different flower petals were collected from country side places. At ordinary room temperature these are dried. For confirming the drying of the samples, constant weighing continues. For grinding the samples, mortar and pestle were used. Then filtering the processes (about 25 g of each sample) used whatmann 40 filter paper. After filtering, samples were ready to use for experiment.

Sample Extraction

The sample of flower petals was extracted by cold method of extraction²¹.

Cold Extraction

At first four (Madhabilata flower, Dahlia (Violet), *Miralibis jalapa* and *Nerium oleander* flower) samples were weighed near about 25 g. Then added 200 mL distilled water in each sample and settled these on overnight. Next day these decant solutions were taken in a clean beakers. Then these are concentrated in a water bath²².

Characterization of Extract

For characterization of these flower petal extracts we use UV/Visible Spectrophotometer (Elico, 171, Mini spectro) for the determination of the maximum absorption wave length and with the use of pH meter (Elico L1 614 pH analyser) to determine the pH of the cold extracts.

Reaction of extracts with acids and bases

Samples were added to the different strengths of Acid and bases to observe the colour changes. For this purposes, different strengths of strong and weak acid & bases are used.

UV/Visible Spectroscopy

In UV/Visible spectrophotometer, the sample cell was washed with distilled water. At 400nm wave length, the machine was calibrated by distilled water. So, 0.001 mL of each extract was diluted with 10 mL of distilled water and 5 mL of the extract was used for experiment and placed in the cell. The absorbance of the extract was observed within the visible region (i.e., 400-750nm) and from the extrapolation of the graph we can easily determine the maximum wave length of absorption. pH Study Elico L1 614 pH analyser was use to determine the pH of the four samples in different strengths.

RESULTS AND DISCUSSIONS

The results were tabulated in the Tables 1, 2, 3, 4. Table 1 to Table 4 shows the primary colour and colour change with acid and base of the four experimental naturally occurring colour pigments. Absorbance vs. Wavelength of these colour pigments shows in Fig. 1 to Fig. 4. From the graph it was noticed that pink Madhabilata shows better colour absorption peak than the other three.

The colour changes of some standard indicators in acidic and basic solutions show in Table 5.

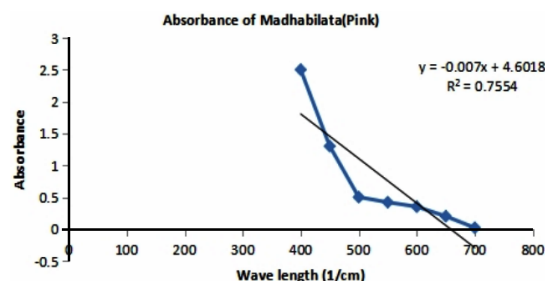


Fig. 1. For Madhabilata (Pink) flower distilled water extract

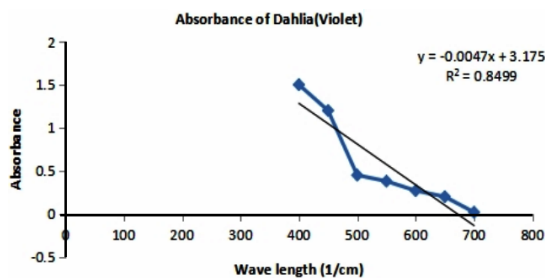


Fig. 2. For Dahlia (violet) flower distilled water extract

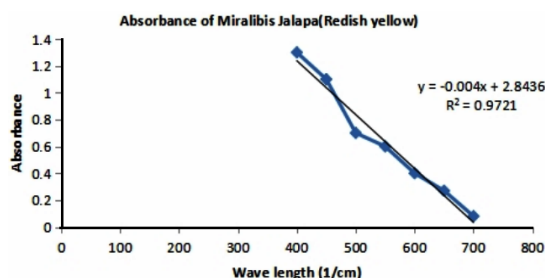


Fig. 3. For *Miralibis jalapa* (Redish yellow) flower distilled water extract

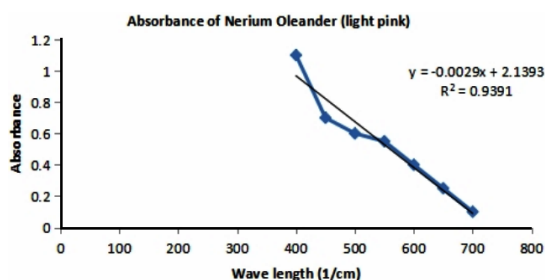


Fig. 4. For *Nerium oleander* (light pink) flower distilled water extract

Table 1: Madhabilata Flower (Pink) (Cold extract) (primary colour of extract, Light pink)

Solvent	+	Cold Extract	=	Colour change
Acidic				
H ₂ SO ₄	+	Cold Extract	=	Pink
CH ₃ COOH	+	Cold Extract	=	Light Pink
Basic				
NaOH	+	Cold Extract	=	Sap Green
KOH	+	Cold Extract	=	Sap Green

pH=8.4

Table 2: Dahlia Flower (violet) (Cold extract) (primary colour of extract, violet)

Solvent	+	Cold Extract	=	Colour change
Acidic				
H ₂ SO ₄	+	Cold Extract	=	Light orange
CH ₃ COOH	+	Cold Extract	=	Light orange
Basic				
NaOH	+	Cold Extract	=	Mustard oil colour
KOH	+	Cold Extract	=	Mustard oil colour

pH=8.4

Table 3: *Miralibis jalapa* (Yellowish red) (Cold extract) (primary colour of extract, Yellowish red)

Solvent	+	Cold Extract	=	Colour change
Acidic				
H ₂ SO ₄	+	Cold Extract	=	Redish brown
CH ₃ COOH	+	Cold Extract	=	Redish brown
Basic				
NaOH	+	Cold Extract	=	Sap Green
KOH	+	Cold Extract	=	Sap Green

pH=8.4

Table 4: *Nerium oleander* (Redish pink) (Cold extract) (primary colour of extract, light pink)

Solvent	+	Cold Extract	=	Colour change
Acidic				
H ₂ SO ₄	+	Cold Extract	=	Straw colour
CH ₃ COOH	+	Cold Extract	=	Straw colour
Basic				
NaOH	+	Cold Extract	=	Greenish Yellow
KOH	+	Cold Extract	=	Greenish yellow

pH=8.4

Table 5: Some common synthetic Acid-Base Indicators

Indicator Name	Colour change interval (pH)	Acidic colour	Basic colour
Thymol blue	1.2-2.8	Red	Yellow
Methyl orange	3.1-4.4	Red	Yellow
Methyl red	4.4-6.2	Red	Yellow
Chlorophenol red	5.4-6.8	Yellow	Red
Bromothymol blue	6.2-7.6	Yellow	Blue
Phenol red	6.4-8.0	Yellow	Red
Thymol blue	8.0-9.6	Yellow	Blue
Phenolphthalein	8.0-10.0	Colourless	Red
Alizarin yellow	10.0-12.0	yellow	Green

Figure 1 shows the variation of absorbance with wave length of pink Madhabilata (cold extract). Here maximum absorbance is near about 2.20. But same plot of different flower petals (Fig. 2 to Fig. 4) observed. For light violet dahlia flower distilled water extract absorbance peak at 1.4, Fig. 3 for redish yellow *Miralibis jalapa* flower distilled water extract absorbance peak at 1.3, Fig. 4 for light pink *Nerium oleander* flower distilled water extract absorbance peak at 1. So, from the figures maximum absorbance of pink Madhabilata is high than the other three flowers extract.

From the UV visible spectrophotometric data it has been found that Absorption Vs. wavelength plot, the intercept value of pink Madhabilata is high than the other three. Here absorption is high. So, colour density is high than the other three. We

search that naturally occurring colour which is cheap and easily available. So, pink Madhabilata is highly dense colour which is easily available in nature. The decreasing order of intercept from the above spectroscopic plots that pink Madhabilata > violet Dahlia > redish yellow *Miralibis jalapa* > light pink *Nerium oleander*.

From Table 1, it was observed that pink Madhabilata (cold extract) did not show any significant change in acidic and basic solutions, yet its pH was 8.4 (sap green). Prominent colour change was observed in basic solution. This is a good indication for natural indicator.

From Table 2, it was found that violet Dahlia respond violet to light orange at the acidic region and violet to mustard oil colour at basic region. Its colour change was prominent.

From Table 3, it was observed that yellowish red *Miralibis jalapa* respond yellowish red to redish brown and in basic region it turns to sap green.

From Table 4, it was observed that light pink *Nerium oleander* respond light pink to straw colour in acidic medium and in basic region it turns greenish colour (which is similar to Alizarin S). Its colour change was prominent. At basic region, its colour was similar with Alizarin S (well-known indicator of us) and at acidic region colour change did not match any standard indicators.

Dyes and pigments which contains in indicator that are interacting in plant tissues in presence of sunlight. The primary dyes of plants are chlorophyll, carotenoids, plastid, anthocyanin, betalainins etc. which are easily dissolved in vascular sap. Different pigments absorbed colour of different wave length of visible light. Flavonoids accompanied with anthocyanin shows a broad spectrum of different flower, fruits, and vegetables along with yellow.

From this study it has been found that naturally occurring flower petals are much more important to determine acid-base colour change. Here we found that colour responses in visible region of two flower petals.

CONCLUSION

From this experiment, it was observed

that the cold extract of different flower petals show distinct colour changes in strong and weak acidic and basic solutions. All the extracts (Experimental) show the maximum absorption spectrum in visible wave length. The values of the extracts of natural indicators are similar to the synthetic indicator.

We search that naturally occurring colour which is cheap and easily available. Therefore, pink Madhabilata is highly dense colour which is easily available in nature. The decreasing order of intercept from the above spectroscopic plots that pink Madhabilata > violet Dahlia > redish yellow *Miralibis jalapa* > light pink *Nerium oleander*.

From the above findings it may be concluded that countryside natural indicators (different flower petals) may be easily replaced by synthetic indicators (toxic, non eco-friendly). Whereas natural indicators are low cost, non toxic, environment friendly, cheap, easily available and also user friendly.

To determine acidity and alkalinity, natural indicators are uses such as tannery industries, pathological laboratories, different industries, school/ college laboratories etc.

From this experiment finally we expect that countryside natural indicators may be easily replaceable by synthetic indicators for the betterment of our society.

From this study we motivate our society to use this natural indicator instead of synthetic indicator. We campaign the positive effect of natural indicator of different Schools, Colleges, Pathological centres, different industries where testing acid and basic properties identifies using indicators. In this way we can spread the effect of natural indicator.

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Conflict of interest

The author declare that we have no conflict of interest.

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