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FLOWERS AS NATURAL INDICATORS

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ABSTRACT

Natural pigments in plants are highly colored substances and may show color change with variation of pH. Many flowers, fruits and vegetables contain chemical substances called anthocyanins which are pigments that react in a different way to acids and bases that change colour in solutions of different pH values. *Pisum sativum* from family Fabaceae, *Catharanthus roseus* from Apocyanaceae and *Euphorbia ligularia* (Euphorbiaceae) gives sharp and intense colour change as compared to synthetic indicators in acid-base titrations. The qualitative chemical test for *Pisum sativum*, *Catharanthus roseus* and *Euphorbia ligularia* shows presence of flavanoid pigment anthocyanins, which may be the reason for their activity as an indicator. The *Pisum sativum*, *Euphorbia ligularia* and *Catharanthus roseus* indicator was found to be more significant in strong acid-strong base titration. The result obtained showed that the routinely used indicators could be replaced successfully by herbal extract prepared as they are simple, accurate and precise and can be prepared just before experiment. The isolation of pure compounds possessing indicator properties help to know the mechanism by which they show indicator properties and new theories of indicator could be established.

KEYWORDS: *Catharanthus roseus* (Apocynaceae), *Pisum sativum* (Fabaceae), E*uphorbia ligularia* (Euphorbiaceae).

INTRODUCTION

The pH indicators are used to show sharp color changes at intervals of pH. Natural pigments in plants are highly colored substances and may show color change with variation of pH. Indicator is a substance is an acid or a base. Many flowers, fruits and vegetables contain chemical substances called anthocyanins which are pigments that react in a different way to acids and bases that change colour in solutions of different pH values. All pH indicators

change colours depending on whether they donate or accept protons, (acids are proton donors and bases are proton acceptors). Therefore, pH indicators are themselves acids or bases. Examples of some natural pH indicators are alizarin [orange dye from roots of the madder plant] cur cumin [natural dye in curry powder] litmus [blue dye obtained from lichens] anthocyanins [natural pigments in various flowers and fruits].[1, 2, 3]

Catharanthus roseus, commonly known as the Madagascar periwinkle, rosy periwinkle or teresita is a species of flowering plant in the dogbane family Apocynaceae. The species has long been cultivated for herbal medicine and as an ornamental plant. In Ayurveda (Indian traditional medicine) the extracts of its roots and shoots, though poisonous, are used against several diseases. *Pisum sativum*, the common pea (also known as the garden or field pea), is an herbaceous annual in the Fabaceae (formerly Leguminosae) family.[2] *Euphorbia ligularia* is easily available in India and present in almost every garden to enhance their beauty. Presently available acid-base indicators like phenolphthalein and methyl orange are synthetic indicators which produce chemical hazards, availability problems and high cost.[4,5] The present study is to investigate the indicator activity of fresh flowers of *Catharanthus roseus*, *Pisum sativum* and *Euphorbia ligularia* and to establish analytical applications.[4]

MATERIALS AND METHODS

Plant materials

Fresh flowers of *Catharanthus roseus* (Apocynaceae), *Pisum sativum* (Fabaceae) and *Euphorbia ligularia* (Euphorbiaceae) were collected from the gardens of Pathanamthitta.

Reagents

Analytical grade reagents like hydrochloric acid, sodium hydroxide and phenolphthalein were used.[5]

The reagents and volumetric solutions were prepared as per Indian Pharmacopoeia (IP 1996).[6, 7]

Preparation of the extracts

Catharanthus roseus of 50 g and *Pisum sativum* flowers of 50 g were taken in conical flasks separately and sufficient quantity of boiling water was added and shaken for 15min. The solutions were filtered to obtain clear liquid. The liquids obtained were almost colorless and

the pH of the liquids was tested.[8] *Euphorbia ligularia*-10 g flower was taken in a conical flask and boiled with 100 ml of methanol for an hour. The solution was cooled and filtered to obtain a clear liquid.

The extracts were preserved in a tightly closed glass container and stored away from sunlight.[9]

RESULTS AND DISCUSSION

TABLE-1: Indicator characteristics

Parameters	***Catharanthus roseus***	***Pisum sativum***	***Euphorbia ligularia***
pH	5.8	5.6	4.75
Colour Of The Indicator	Colorless	Colorless	Pale pink
Colour In Acid (1M HCl)	Pink	Pink	Pink
Colour In Base(1M NaOH)	Green	Green	Green
Indicator Range	3.0-5.8	3.1-5.6	3.5-4.75
Test For Anthocyanins	Positive	Positive	Positive

TABLE-2: Acid- Base titrations

Natural indicator	***Catharanthus roseus***	***Pisum sativum***	***Euphorbia ligularia***
Name of the titrate	0.1M HCl	0.1M HCl	0.1M HCl
Name of the titrant	0.1M NaOH	0.1M NaOH	0.1M NaOH
Colour change	Pink To Green	Pink To Green	Pink To Green

TABLE-3: Natural indicator Vs Synthetic indicator

CHEMICALS USED	**Titrant**	**0.1M HCl**
	Titrate	**0.1M NaOH**
Volume of titrates required for equivalence point with titrant (25ml) with indicator	Standard Indicator	25.1 ± 0.2
	Catharanthus roseus	25.0 ± 0.35
	Pisum sativum flowers	24.8 ± 0.28
	Euphorbia ligularia	25.6 ± 0.52

Pisum sativum from family Fabaceae, *Catharanthus roseus* from Apocyanaceae and *Euphorbia ligularia* (Euphorbiaceae) gives sharp and intense colour change as compared to synthetic indicators in acid-base titrations (Table-1). Herbal indicators are evaluated by strong acid-strong base(Table-3), strong acid-weak base, weak acid-strong base and weak acid-weak base titrations. In all these titrations the extract was found to be very useful and accurate for indicating the equivalence point.[10, 11, 12]

The qualitative chemical test for *Pisum sativum* and *Catharanthus roseus* and *Euphorbia ligularia* shows presence of flavanoid pigment anthocyanins, which may be the reason for their activity as an indicator.

Titrants of low strength (0.1M) are used in the analytical procedures followed. Even in this strength of 0.1 M, the prepared herbal indicators are indicating the end point. The *Pisum sativum* indicator, *Euphorbia ligularia* and *Catharanthus roseus* indicator was found to be more significant in strong acid-strong base titration.

So the present work suggests that herbal indicators can be used as a substitute in acid-base titration.

CONCLUSION

Indicators are used to show sharp colour change at intervals of pH. An attempt has been made to investigate the indicator activity of water extract of plant pigments and to replace synthetic indicators as they have certain disadvantages like difficult method of preparation, high cost of production, chemical pollution and availability problems. In the present study herbal indicators are prepared from *Pisum sativum*, *Catharanthus roseus* and *Euphorbia ligularia* by simple method and evaluated by chemical and analytical procedures. The result obtained showed that the routinely used indicators could be replaced successfully by herbal extract prepared as they are simple, accurate and precise and can be prepared just before experiment. The isolation of pure compounds possessing indicator properties help to know the mechanism by which they show indicator properties and new theories of indicator could be established.

Further studies are to be carried out to investigate the effects of light, storage temperature, pH and variety on the stability of prepared herbal indicators. If stability datas are prepared, the more dangerous synthetic coloring agents in food preparations can be substituted by the natural pigments from flowers, fruits and vegetables.

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