Determination of Acids And Bases Using Local Indicators

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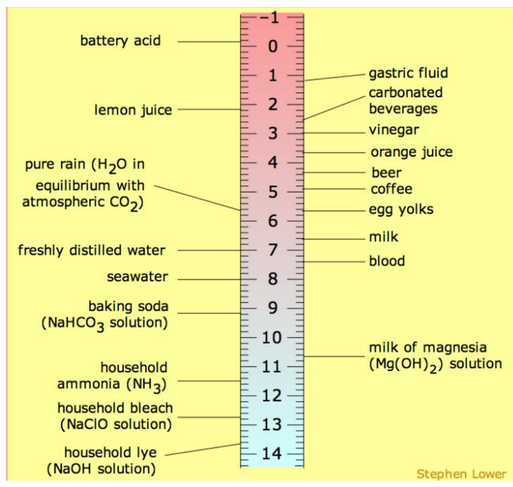
Introduction:
There are many common household products and garden plants that can be used as pH indicators. Most plants contain pH sensitive anthocyanins, so experiment with other plants, too. Many of these natural pH indicators exhibit a broad range of colors.
Our school has a small laboratory with limited resources. Yet our school is rich of natural resources (variety of flowers etc) and disposed materials (eg plastic bottles) which could be used as solution. We wanted to make chemical indicators out of our environment. An indicator is a chemical which can be used to detect that the reaction has completed since it changes the colour. Indicators can detect changes in pH (eg when the sample is acidic and basic). Common indicators in the laboratory are Methylorange (yellow in bases and pink in acids) and POP (colourless in bases and pink in acids). We wanted to make our own indicators by use of flowers. The hypothesis was that the extract of flowers could act as an indicator just like MO and POP.

Beets A very basic solution will change the color of beets or beet juice from red to purple.
Blueberries Blueberries are blue around pH 2.8-3.2, but turn red as the solution becomes even more acidic.
Cherries Cherries and their juice are red in an acidic solution, but turn blue to purple in a basic solution.
Curry Powder Curry contains the pigment curcumin, which changes from yellow at pH 7.4 to red at pH 8.6.
Grapes Red and purple grapes contain multiple anthocyanins. Blue grapes contain a monoglucoside of malvinidin which changes from deep red in an acidic solution to violet in a basic solution.
Onion Onions are olfactory indicators. You don't smell onions in strongly basic solutions. Red onion also changes from pale red in an acidic solution to green in a basic solution.
Petunia Petals The anthocyanin petunin changes from reddish-purple in an acidic solution to violet in a basic solution.
Red (Purple) Cabbage Red cabbage contains a mixture of pigments used to indicate a wide pH range.
We used experimental approach to test the flowers extracts on whether they can show clear colour change in food samples with assumptions that some food are acidic and others are basic. Control experiment was Sodium Hydroxide and Hydrochloric acids as strong bases and acid respectively to have the standard colours of flower extracts which could be compared with colours developing from reaction between food samples and indicators.
Materials: Reddish Bogaville flower, White Bogaville flower, Hibiscus flower, yellow flowers, Dry Whitish bogaville flower, Dry Bogaville flower, NaOH, HCl, lemon, odera, onion, milk, soda, source of heat, beaker, motor and pestle, filter paper, water, knife, match boxes, plastic bottles
Procedures
An extract of flower was made by grinding a flower and mix with water. Filter the extract. For dry flowers, mix the sample with water and then boil then filter the extract.
Add three to five drops of the extract and mix with NaOH shake well and observe the colour that develops.
Add three to five drops of the extract and mix with HCl shake well and observe the colour that develops.
Repeat the procedure for other flower species. Observe whether the colour which develops resembles with the one in step 2 and 3.
Use three to five drops of an extract from other flower samples to test the pH of the food samples you have. Observe the colour which develops.

Results:

Flower sample	NaOH	HCl	Milk	Okra	Onion	Lemon
Reddish Bogaville	Dark green	Pink	Pink	Dark Green	pink	pink
White Bogaville	Colourless	Colourless	No change	No change	No change	No change
Hibiscus	Dark	No change	No change	Dark	No change	No change
Yellow	Mixed colours	Mixed colours	No change	No change	No change	No change
Dry reddish Bogaville	Dark green	Pink	Pink	Dark Green	pink	pink
Dry white Bogaville	Colourless	Colourless	No change	No change	No change	No change



Conclusions:
The extract from Reddish Bogaville flower whether fresh or dry has two distinctive colour changes in acids and bases. Since an extract was Dark green in sodium hydroxide and constantly changed to pink in Hydrochloric acid, it can be reliably be used as a natural indicator.
Again, since same extract gave pink colouration in milk, onion, lemon, okra, and soda which is similar result as in Hydrochloric acid, we can conclude that these food samples are acidic.
On the other hand, the extract gave dark green colouration in okra, similar to results with Sodium hydroxide, we can conclude that okra has basic content in it.
These results suggest that our school could use Reddish Bogaville flowers (which are so many around) as indicators for science practicals in our laboratory. The indicator is cheap to make, easy to use and reliable.
Also the results suggests that milk, onion, lemon and soda are acidic. And okra is basic in nature. Since acidic food may cause cancer, our project suggests that we eat these food substances responsibly.
Future project may work to find out what chemical contents does Reddish Bogaville flower contain. We couldn't find the content due to lack of technology.

Further information:
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