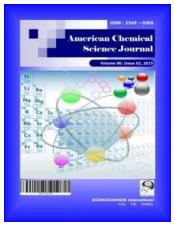

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Ethanolic Extract of *Moringa oleifera* as Potential Indicator for Acid-base Titration

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Indicator is one of the solution which is of great importance in volumetric analysis. Different flower extract were tested to see their effectiveness and how they can be used as substitute to synthetic indicators, because of their hazardous effect on to the environment and cost. Extract of *Moringa oleifera* flower also serve the same purpose tested at different concentrations of acid-base solution coupling in which the mean value and standard deviations obtained shows that, it can effectively stand in place of synthetic ones. As such extract of *Moringa oleifera* can be used as acid-base indicator.

Keywords: Indicator; Moringa oleifera; titration; UV- visible.

1. INTRODUCTION

The importance of indicators in volumetric analysis cannot be over emphasized or betone. It has a very wide range of applications in various fields. Indicators changes colour at various pH of acidic, basic and neutral solutions. The widest area in which indicator is use in is in acid-base titrimetry. The term titrimetric analysis refer to quantitative chemical analysis carried out by

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determining the volume of solution of accurately known concentration which is required to react quantitatively with a measured volume of a solution of the substance to be determined [1]. The end point in traditional titrimetry is usually indicated by some substances added into the analyte solution, which change colour immediately after the equivalence point has been attained [2]. The substances that change colour when the acidity of the solution changes are known as acid- base indicator [2]. The most commonly synthetic indicators used were phenolphthalein (HPh) and methyl orange (MeOH) which dissociate at equilibrium as

$HPh \leftrightharpoons H^+ + Ph^-$
$MeOH \leftrightharpoons Me^+ + OH^-$ respectively [3].

The choice of the indicator for a neutralization titration depends on the pH range covered by the vertical portion of the titration curve [4]. The world has become aware of environmental issue in recent years. Synthetic compounds are highly polluting, hazardous and much more costly. Researchers are working in the field of natural products extensively as they are less hazardous, low cost, easily available, and eco-friendly [5]. There are extracts of some natural flowers tested and also serve as substitute to synthetic indicators, such as: *Ipomoea biloba* [6], District Bannu [7], *Gerbera jamesonii and Tagertes erecta* [8], *Ipomea nil* [4], Golden beet root [5], Thespesia populnea Sol., *Nerium odorum* [9], *Basella alba* [2] *Hibiscus sabdariffa* [2], *Acalypha wilkesiana* [10], *Argyreia cuneata* [11], *Phyllanthus reticulatus* [12], *Dahalia* [13], *Aspilia africana* [14], *Rhoeo syathacea and Allamanda* [15], *Delonix regia* [16], *Hibiscus rosa sinensis* [17], *Clitoria ternatea* [18], *Jacaranda Acutifolia* [19], *Nerium indicum* [20], *Dianthus plumarius* and *Antirrhinum majus* [21] etc.

Natural plants, their stems, leaves, roots and flowers are of paramount importances which were used for so many purposes such as food, medicines, colourant etc. one of such is *Moringa* flower.

Moringa oleifera belongs to the family Moringaceae and commonly called "Zogale" in Hausa land Northern part of Nigeria. The tree originated from Agra and Qudh in Northwestern region of India, South of the Himalayan Mountain. The tree has spread to almost all tropical belt because it is drought- resistant. Also, the leaves, fruits, flowers and immature pods are edible and they form part of traditional diets in many countries of the tropics and sub-tropics [22]. There are about 13 species of *moringa* trees in the genus *Moringa* of family *Moringaceae.* These are *Moringa oleifera, M. arborea, M. borziana, M. concanensis, M. drouhardii, M. hildebrandtii, M. longituba, M. ovalifolia, M. peregrine, M. pygmaea, M. rivae, M. ruspoliana, and M. stenopetala The most widely known species Moringa oleifera reported as "Mpringa* [23]. The phytochemical studies of *Moringa oleirera* reveals that, compounds such as tannins, quinones, alkaloids, saponins, flavonoids and steroids and glycoside were present which are of paramount importance [24]. Many works have been done on *Moringa oleifera,* but from the literature currently sourced, there was no any research done on the its extract as potential acid-base indicator.

The aim of this research work is to test whether the flower of *Moringa oleifera* can be use in acid base titration.

2. MATERIALS AND METHODS

All the reagents used for this study were of analytical grade and distilled water was used for their preparation.

2.1 Collection and Identification of Flower

Moringa oleifera flower were collected on 6th oct, 2015 from the plant grown within the Faculty of science, Jodhpur National University, India and was identified by Dr. N.L Vyas. (a botanist).

2.2 Moringa Flower Extraction

The moringa flowers were clean with distilled water, cut into smaller pieces. 10 g of these were soaked into ethanol for 48 hrs to extract the colouring matter. The pH of the extract was then measured with a potentiometer as 6.4.

2.3 Titration Techniques

2-3 drops of moringa flower extract were added into the base (alkali) solutions which were titrated against acidic solution to test for its efficiency as acid-base indicator and compare the result obtained with that of synthetic indicators (methyl orange and phenolphthalein). The acid –base solutions used were strong acid strong base (HCl vs. NaOH), strong acid weak base (HCl vs. NH_3 solution), weak acid strong base (CH_3COOH vs. NaOH) and weak acid strong base (CH_3COOH vs NH_3 solution).

Table 1. Titrimetric screening parameters of acid-base titration using different indicators

TItrant/ Titrand	Indicator used	Mean (ml) ± S.D values
	Methyl orange	
0.5M HCl/ NaOH		20.00±0.082
1M HCl/ NaOH		19.80±0.050
05M HCl/ NH_3		20.10±0.082
1M HCl/ NH_3		19.90±0.043
0.5M CH_3COOH/ NaOH		19.90±0.082
1M CH_3COOH/ NaOH		20.10±0.082
05M CH_3COOH/ NH_3		20.20±0.082
1M CH_3COOH/ NH_3		20.10±0.082
	Phenolphthalein	
0.5M HCl/ NaOH		19.90±0.082
1M HCl/ NaOH		19.70±0.050
05M HCl/ NH_3		20.00±0.082
1M HCl/ NH_3		19.30±0.050
0.5M CH_3COOH/ NaOH		20.10±0.082
1M CH_3COOH/ NaOH		20.00±0.082
05M CH_3COOH/ NH_3		19.80±0.050
1M CH_3COOH/ NH_3		19.90±0.082
	***Moringa oleifera* extract**	
0.5M HCl/ NaOH		19.87±0.078
1M HCl/ NaOH		19.80±0.057
05M HCl/ NH_3		19.90±0.082
1M HCl/ NH_3		19.90±0.082
0.5M CH_3COOH/ NaOH		20.00±0.082
1M CH_3COOH/ NaOH		19.80±0.079
05M CH_3COOH/ NH_3		19.90±0.082
1M CH_3COOH/ NH_3		20.10±0.082

S.D = Standard deviation

3. RESULTS AND DISCUSSION

From Table 1 above, it shows that *Moringa oleifera* flower extract can effectively be used as indicator for acid-base titration, equally substitute methyl orange and phenolphthalein. In most of the readings obtained, the difference between the mean values was ±0.3. Similarly, standard deviations for the titrations values were obtained as ±0.025 these testifies the potentiality of the extract and were found to be within the expected and permissible range.

The UV-Visible of the extract was taken and found to have 476 nm absorption band. Anthocyanins are characterized by two absorption bands: one is wavelength =280 nm in the UV region and another is 520 nm in the visible region [25].

4. CONCLUSION

Many flower extract were tested and used as substitute to synthetic indicators in acid-base neutralization titration in volumetric analysis. A work has been conducted to test whether the flower of *Moringa oleifera* can be use in acid base titration; from the result obtained in all the types of acid base titration indicate that its flower extract could effectively substitute both methyl orange and phenolphthalein indicators.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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