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Flower Extract of *Jacaranda acutifolia* Used as a Natural Indicator in Acid Base Titration

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Abstract: *Jacaranda Acutifolia* is a species of the genus Jacaranda, belonging to the family Bignoniaceae. The present study reported the use of *Jacaranda Acutifolia* flower extract as an acid base indicator in different types of acid base titrations. The equivalence points obtained by the flower extract coincident with the equivalence points obtained by standard indicators. The results obtained by the flower extract matched with the results obtained by mixed indicator in case of weak acid and weak base titration. This natural indicator was found to be a very useful, economical, simple and accurate for the said titration.

Keywords: *Jacaranda Acutifolia*, Acid base indicator, Natural indicator.

Introduction:

Jacaranda Acutifolia, also known *Jacaranda mimosifolia* and *Jacaranda ovalifolia* is a species of the Jacaranda genus, belonging to the family Bignoniaceae. It is cultivated in Indian gardens, also found in Brazil, Bolivia and Argentine. In Pakistan; the flowers are sold as a substitute for the Unani herb Gul-e-Gaozabaan[1]. A deciduous tree with a large spreading crown vase like in shape having height up to 10-15m and width 10-15 m. Leaves are large, dark green fern like 30-40 cm in long and bi pinnate . Flowers are trumpet shaped lavender 4-5 cm long, produced in abundance clusters 15-20 cm long, with up to 40-60 flowers per cluster. Very faintly perfumed[2].

Leaves of *Jacaranda Acutifolia* found to contain jacaranone, verbascoside, phenyl acetic -β – glucoside, scutellarein-7-glucoronide and hydro quinone[3]. The flowers of *Jacaranda Acutifolia* are blue. The appearance of blue color is due to presence of flavonoids and anthocyanins[4].

The bark of *Jacaranda acutifolia* has been used in the treatment of wounds and dermatitis. Astringent and diuretic properties have also been assigned to the bark extracts[5]. *Jacaranda acutifolia* has been attributed with properties to treat syphilis and diseases related to urinary tract problems. The ground bark is used as a decoction against venereal diseases or as ethanolic maceration, along with a small amount of *Cordia alliodora* against rheumatism and sciatica[6].

The biological activities of plant have been extensively reviewed. Some of them have been found to possess antioxidant[7], antihypertensive[8], anti microbial[9,] antitumor activities[10].

Flavonoids have also been found to inhibit a wide range of enzymes involved in oxidation systems such as 5-lipoxygenase, cyclooxygenase, mono oxygenase, or xanthine oxidase[11].

As flavonoids, anthocyanins are present in flowers of *Jacaranda Acutifolia* and are pH sensitive[12]; it was hypothesized that the flower extract could be utilized as an indicator for different types of acid base titrations. Hence the flavonoids were extracted, and identified for their potential use as an acid base indicator in various acid base titrations.

Material and Methods:

Analytical grade reagents were made available by Shree Santkrupa College of Pharmacy, Ghogaon. Reagents and volumetric solutions were prepared as per standard books[13, 14]. Flowers were collected from plants growing wild in the hilly region of Ghogaon (Karad) and authenticated from Prof. B.D. Mohite, Department of Botany Sant. Gadge Maharaj College of Science, Karad.

The flowers were collected. The fresh petals were cut into small pieces and were kept at room temperature. The petals were dried and ground to fine powder with a mechanical blender. The resulting powder was extracted with methanolic hydrochloric acid and the anthocyanins were converted into their corresponding soluble chlorides. From this solution, anthocyanins were isolated by using ether [15]. Finally extract was filtered and used as indicator.

The experimental work was carried out by using the same set of glasswares for all type of titrations. As the same aliquots were used for both titrations i.e. titration by using standard indicators and flower extract, the reagent were not calibrated. The equimolar titrations were performed using 20 ml of titrant with three drops of indicator. A set of five experiments was carried out and mean and standard deviation were calculated from results.

Result and Discussion:

The flower extract was screened for its use as an acid base indicator in various acid base titrations, and the results of this screening compared with the results obtained by standard indicators methyl red, phenolphthalein and mixed indicator [methyl orange: bromocresol green (0.1:0.2)] for strong acid v/s strong base (HCl and NaOH), Strong acid v/s weak base (HCl and NH_4OH), weak acid v/s strong base (Oxalic acid and NaOH), and weak acid v/s weak base (Oxalic acid and NH_4OH) titrations respectively[16]. All these parameters are shown in Table 1. For all titrations the equivalence points obtained by the flower extract matched with the equivalence points obtained by standard indicators. The results of screening were listed in Table 2.

Jacaranda acutifolia flower extract alone can serve the purpose of indicator in weak acid and weak base titration, where generally mixed indicators are employed. Another benefit of this titration is that it gives colorless end point at the equivalence point. If we add more amount of titrant (acid) it gives pink colored solution.

The results obtained in all the types of acid base titrations lead us to conclude that it was due to the presence of flavonoids, sharp color changes occurred at the end point of the titrations. Lastly we can say that it is always beneficial to use *Jacaranda acutifolia* flower extract as an indicator in all types of acid base titrations because of its economy, simplicity and availability.

Table 1: Parameters Used For Analysis and the Comparison of Color Change.

Titrant	Titrate	Indicator Color Change	
		Standard (pH range)	Flower Extract (pH range)
HCl	NaOH	Yellow to Red (8.6-3.7)	Green to colorless (8.9 - 4.12)
HCl	NH_4OH	Pink to Colorless (8.1-3.5)	Green to colorless (8.2 - 4.34)
Oxalic acid	NaOH	Pink to Colorless (9.2- 4.6)	Green to colorless (9.1-5.35)
Oxalic acid	NH_4OH	Blue-green to Orange (7.9-4.4)	Green to colorless (8.1-5.12)

HCl: Hydrochloric Acid, NaOH:Sodium Hydroxide, NH4OH:Ammonium Hydroxide.

Table 2: Screening Results of various titrations.

Sr. No.	Titration (Titrant v/s Titrate)	Strength in Moles	Indicator	Readings with S.D. (±)
			Methyl red	20.12 ± 0.10
		0.1	Flower extract	20.24± 0.11
			Methyl red	19.98 ± 0.13
1	HCl V/S NaOH	0.5	Flower extract	20.18±0.16
			Methyl red	20.42 ± 0.14
		1	Flower extract	20.28 ± 0.19
			Phenolphthalein	10.42 ± 0.13
		0.1	Flower extract	10.32± 0.16
			Phenolphthalein	10.26± 0.18
2	NH_4OH V/S HCl	0.5	Flower extract	10.38 ±0.14
			Phenolphthalein	10.12 ± 0.13
		1	Flower extract	10.16 ± 0.15
			Methyl red	20.28 ±0.14
		0.1	Flower extract	20.48 ±0.19
3	Oxalic Acid V/S		Methyl red	20.28 ±0.23
	NaOH	0.5	Flower extract	20.32 ± 0.16
			Methyl red	20.44 ± 0.18
		1	Flower extract	20.4 6± 0.15
			Mixed indicator	9.50 ± 0.15
		0.1	Flower extract	9.38 ± 0.13
4	Oxalic Acid V/S		Mixed indicator	9.42 ± 0.19
	NH_4OH	0.5	Flower extract	9.22 ± 0.19
			Mixed indicator	9.50 ± 0.21
		1	Flower extract	9.40 ± 0.20

HCl: Hydrochloric Acid, NaOH: Sodium Hydroxide, NH_4OH: Ammonium Hydroxide. S.D.: Standard Deviation.

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