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Comparative phytochemical analysis of aerial parts of *A. procumbeans, F. dichotoma, S. sponteneum, S. nigra* and *T. angustifolia*

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Abstract
Traditional medicinal plants can be good source of herbal drug. This herbal or traditional medicine have a use of various phytochemical or the bioactive compounds. Phytochemicals also known as secondary metabolites, natural plant constituents present in all plant parts which are responsible for medicinal properties of plants. The aim of the present work is comparative phytochemical analysis of aerial part of five different plants viz. *A. procumbean, F. dichotoma, S. sponteneum, S. nigra L, T. aungustifolia.* Qualitative phytochemical analysis was done by various phytoconstituent like flavonoid, tannins, phlobatannis, steroid, saponins, cardiac glycosides, triterpenes and alkaloid. Determination of total alkaloids content was carried out. The result shows the presence of cardiac glycosides and steroids in all the five plants maximum being in *A. procumbeans*. Maximum alkaloids content was found in *T. aungustifolia* aerial part. Phytochemical screening of plant extracts shows the presence of different level of the cardiac glycosides, steroids, saponins, tannins, alkaloids and triterpenes in the all five plants. The present study suggested that use of these plants in herbal medicine and recommends for making new therapeutic agents needs.

Keywords: Medicinal plants**,** Phytochemicals, Cardiac glycosides, Alkaloid content

1. Introduction
Nature has been an important source of medicine and has helped mankind in the maintenance of health since ancient time. The plant kingdom is a wealth house of potential drugs and at the present year there has been an increasing consciousness about the magnitude of medicinal plants [1]. All plant parts like leaves, stem, flowers, roots, bark, seeds, oil, rhizome etc. have been used as herbal medicine individually or in combinations with each other. According to the World Health Organization (WHO), almost 80% of the world's population depends on conventional medicines for treatment of many disease, because of green medicine easily available, safe, fewer side effects and better compatibility with the human body [2].
Phytochemicals present in the plants are non-nutritive plant bioactive chemical constituents that produce specific physiological action on the human body [3]. In the plant cell phytochemicals are synthesized by specific biochemical pathways. Phytochemicals can be classified into two groups viz. primary and secondary. Primary metabolites such as proteins, sugars, lipids, amino acids, chlorophyll etc. are required for growth and development of plants while secondary metabolites such as phenolic compounds, alkaloids, flavanoids, terpenoids, tannins, saponins, cardiac glycosides, essential oils, etc. which are important in plant defense against herbivory and adaption to environmental stress [4, 5, 6]. Secondary metabolites are structurally and chemically diverse group of compounds. They have a wide range of application in field of medicine, agriculture, veterinary and numerous other areas.
Flavonoids are ubiquitous plant secondary metabolites. They are comprising major subgroups like flavonols, catechins, tannins, anthocyanins, flavones, and flavanones [7]. These compounds are present in plant tissue as red, blue, and purple anthocyanin pigments which help the plant in reproduction by recruiting pollinators and seed dispersers [8]. Flavonoids exhibit a wide range of pharmacological effects including anti-oxidant [9], anticancer, cardiovascular, and anti-inflammatory activity [10], anti-allergic effects [11], etc.
Alkaloids are a highly diverse group of low molecular-weight, nitrogen-containing organic compounds derived mostly from amino acids or from the transamination process. Plants produce approximately 12,000 different alkaloids, which can be classify into groups according

to thei r carbon skeletal structures [12]. Alkaloids exhibit a wide range of pharmacological effects including anti-oxidant [13] antibacterial activity [14].

Tannins are the high molecular polymeric phenolics produced by secondary plant metabolism [15]. Tannins have a range of ecological functions, such as important constituents in nutrient cycling, provide defense against herbivore and pathogen and plant growth regulating activities [16]. Tannins exhibit various pharmacological effects including anti-oxidant [17], antibacterial [18], anticancer activity [19] etc.

Glycosides are characterized by a sugar portion attached by specific bond to non-sugar portions; it may be phenol, alcohol or sulfur compounds. Cardiac glycosides have been reported to have anti-arrhythmic activity [20] and anti-proliferative activity [21]. Plants rich in glycosides are reported for medicinal properties including antibacterial activity [22, 23].

Plant saponins are a group of naturally occurring secondary metabolites in which glycosyl residues are attached to a triterpenoid (triterpene or steroidal) aglycon [24]. In plants, saponins are mostly found in angiosperms [25, 26] and they have a large number of biologically and pharmacologically active compounds. Saponins have been reported to have wide range of biological effects including antioxidant [27], anti-inflammatory and anti-cancer activities [28].

In the present work, five plants viz. *A. procumbean, F. dichotoma, S. sponteneum, S. nigra L, T. aungustifolia* were selected to evaluate and compare their phyochemical constituents. Such analysis will give a clue to their probable biological activity and thus they can be further studied. Some of the reported biological activities of these five plants are given in Table 1.

Plant Description

❖ ***Alysicarpus procumbeans (Roxb.)***

- **Family**:- Fabaceae
- **Habit**:- Perennial herb
- **Distribution** :-Throughout India
- **Vernacular name** :- Nano Saneravo
- **Parts used** :- Aerial part
- **Action/uses** :- Fever, malaria, indigestion and pain

❖ ***Fimbristylis dichotoma L.***

- **Family**:- Cyperaceae
- **Habit**:- Grasses
- **Distribution** :-Throughout India
- **Vernacular name** :- Chio, Moth
- **Parts used** :- Aerial part
- **Action/uses**:- Cattle may graze on F. dichotoma but it has low nutritional value. It is considered a poor green manure crop and has been used to make inferior mats in Philippines

❖ ***Scchaarum spontenium L.***

- **Family**:- Poaceae
- **Habit**:- Herb
- **Distribution** :-Throughout India
- **Vernacular name** :- Dabh, Kans
- **Parts used** :- Aerial part
- **Action/uses**:- whole plant is used to treat diseases of vatam and pittam, vomiting, mental diseases, abdominal disorders, dyspnoea, anaemia, and obesity. Roots are useful in treatment of dyspepsia, burning sensation, piles, sexual weakness, gynecological troubles, respiratory troubles, etc

❖ ***Suaeda nigra* L.**

- **Family**:- Amaranthaceae (Suaedoideae)
- **Habit**:- Shrub
- **Distributio**n :-Throughout India
- **Vernacular name** :- Seepweed and Mojave sea-blite
- **Parts used** :- Aerial part
- **Action/uses**: - Leaves - cooked A salty flavour. They are used as a condiment to add a salty flavour when cooking other foods. Plants for a Future cannot take any responsibility for any adverse effects from the use of plants. Always seek advice from a professional before using a plant medicinally.

❖ ***Typha angustifolia* L.**

- **Family:-**Typhaceae
- **Habit**:- Grass
- **Distribution** :-Throughout India
- **Vernacular name** :- Ghabajariyu
- **Parts used** :- Aerial part
- **Action/uses**: - Dried pollen is used in the treatment of kidney stones, internal haemorrhage of almost any kind, painful menstruation, abnormal uterine bleeding, post-partum pains, abscesses and cancer of the lymphatic system. Externally, it is used in the treatment of tapeworms, diarrhoea and injuries.

Table 1: List of studied plants, part used, solvent extracts and their biological activity.+

No	Plant	Parts	Extracts	Activity	Reference
1	*Harpagophytum procumbeans*	Whole	ET	Analgesic	[29]
2	*Justica procumbeans*	Leaf	ME	Antidiarrhoeal	30
3	*Fimbristyli slittoralis Gaud*	Whole	ET, AQ	Antioxidant	31
4	*Fimbristyli smiliacea*	Whole	AQ	Allelopathic	32
5	*Fimbristyli saphylla L.*	Whole	ME	Antimicrobial, Cytotoxic, Antidiarrhoeal	33
6	*Saccharum spontaneum Linn.*	Whole	ME	Anti-diarrhoeal, CNS Depressant	34
7	*Saccharum spontaneum Linn.*	Whole	ET	Antioxidant	35
8	*Saccharum spontaneum Linn.*	Root	ET	Antilithiatic	36
9	*Saccharum spontaneum*	Flower	CH	Antimicrobial, Cytotoxic, Antioxidant	37
10	*Saccharum spontaneum Linn.*	Root	ET	Total Phenol and Flavonoid content	38
11	*Saccharum spontaneum Linn.*	Root	PE, ET, CH, AQ	Antioxidant	39
12	*Saccharum spontaneum Linn.*	Root	PE, EA, CH, ET, AQ	Antioxidant	40
13	*Saccharum spontaneum Linn.*	Root	ET	Urolithiatic	41
14	*Saccharum spontaneum Linn.*	Root	ET	Antioxidant	42
15	*Suaeda fructicosa*	Leaf	AQ	Diabetic	43
16	*Suaeda asparagoidesMiq.*	Whole aerial	ET	Antioxidant	44
17	*Suaeda baccata*	Aerial	ET	Antimicrobial	45
18	*Suaed vermiculataa*	Aerial	B4	Antimicrobial	46
19	*Typha angustata*	Leaves	PE, ME, AQ	Anti-inflammatory	47
20	*Typha angustifolia L*	Leaves	ME, CH, AQ,	Anti-thrombolytic, Cytotoxicity	48
21	*Typha angustifolia L.*	Rhizome	ME, AQ	Anti-inflammatory	49
22	*Typha angustifolia L.*	Pollen grains	ME, AQ,	Anti-inflammatory	50

Solvents : Petroleum ether (PE), Ethyl acetate (EA), Ethanol (ET), Methanol (ME), Chloroform (CH), Butanol (BU), Aqeous (AQ),

Material and methods

Plant Collection

The aerial parts of five plants (*A. procumbean, F. dichotoma, S. spontaneum, S. nigra,* and *T. aungustifolia)* were collected in August, 2014 from Jamnagar and Surendranagar districts of Gujarat, India. They were thoroughly washed with tap water and air dried under shade. The dried aerial parts were homogenized to fine powder and stored in air tight bottles.

Qualitative Phytochemical Analysis

The crude powder of aerial parts of different plants was subjected to qualitative phytochemical analysis [51].

Flavonoids

Alkaline reagent test was performed for checking the presence of flavonoids. The crude powder of aerial parts was treated with a few drops of diluted sodium hydroxide (NaOH) on of intense yellow colour which turned colourless on addition of a few indicated the presence of flavonoids.

Tannins

The crude powder of aerial parts was treated with alcoholic ferric chloride ($FeCl_3$) reagent blue colour indicated presence of tannins.

Phlobatanins

The crude powder of aerial parts was boiled with 1% aqueous HCI. Deposition of red precipitate was taken as evidence of the presence of phlobatanins.

Saponins

The presence of saponins was determined by Frothing test. The crude powder of aerial parts was vigorously shaken with distilled water and was allowed to stand for 10 minutes and classified for saponin content as follows: no froth indicates absence of saponins stable froth of more than 1.5 cm indicated the presence of saponins.

Steroids

Liebennann-Burchard reaction was preformed for checking the presence of steroids. A chloroformic solution of the crude powder of flower was treated with acetic anhydride and a few drops of concentrated H_2SO_4 were added down the sides of the test tube. A blue green ring indicated the presence of steroids.

Cardiac glycosides

Keller-kiliani test was performed for checking the presence of

cardiac glycosides. The crude powder of aerial parts was treated with 1.0 ml mixture of 5% $FeCl_3$ and glacial acetic acid (1. 199 v v^{-1}). To this solution, a few drops of concentrated H_2SO_4 were added. Appearance of greenish blue color within few minutes indicated the presence of cardiac glycosides.

Triterpenes

Chlorofonn extract of the crude powder of aerial parts was treated with concentrated sulphuricacid (H_2SO_4). Appearance of reddish brown ring indicated the presence of triterpenes.

Alkaloids

The crude powder of aerial parts was dissolved in 2 N HCl. The mixture was filtered and filtrate was divided into 2 portions. One portion was treated with few drops of Mayer's reagent and the other portion was treated with equal amount of Wagner's reagent. The creamish precipitate and brown precipitate indicate the presence of respective alkaloids. A (+) score was recorded if the reagent produced only a slight opaqueness; A (++) score was recorded if a definite turbidity but no flocculation was observed and A (+++) score was recorded if heavy precipitate of flocculation was observed.

Determination of total alkaloid content

Two gram of dried powder was taken in 150 ml flask and 80 ml 20% glacial acetic acid in methanol was added to it and was allowed to stand for 4 h at room temperature. This was filtered and the extract was concentrated in a water bath to one quarter of the original volume. Concentrated ammonium hydroxide (25%) was added drop wise to the extract until the precipitation was completed. Then it was taken in a separating funnel and an equal volume of chloroform was added. It was washed with distilled water three times to make it pH neutral. Sodium sulphate (Na_2SO_4) was added to remove moisture. It was filtered and dried. Crude alkaloid content was collected and weighed. Crude alkaloid content is expressed in mg/g of dried leaf powder (Harborne, 1973) [51].

Results and Discussion

Phytochemical Screening

The phytochemical screening of five medicinal plants tested was summarized in the table-2. The results showed presence of active secondary metabolites in the five plants studied. Analysis of the dried powder of plants revealed the presence of phytochemicals such as tannins, flavonoids, saponins, glycosides, steroids, and alkaloids.

In *A. procumbeans, F. dichotoma* and *S.nigra* aerial part, cardiac glycosides were found in maximum amount. Essiett and Udo, (2015) [51] reported presences of maximum amount of cardiac glycosides in stems, leaves and flowers of *Allamanda cathartica*. [52]

Maximum amount of steroid were present in aerial part of *A. procumbeans and S. sponteneum*. In *F. dichotoma, S.nigra* and *T. angustifolia* aerial parts, steroids were absent. Shah and Hossain, (2014) reported presence of steroids in leaves solvent extracts of *Merremia borneensis* [3].

In *S. sponteneum and T. angustifolia* aerial part, triterpens and flavonoids were found in maximum amount. In *A. procumbeans, F. dichotoma, and S.nigra* aerial parts, triterpens were absent. Dey *et al.,* (2014) and Padalia *et al.,* (2014) reported presence of triterpens and flavonoids in leaves of *Clerodendrum viscossum* and flowers of *Tagates erecta* [53, 54].

Saponins and alkaloids by Wagner's reagent were present in the *A. procumbeans and F. dichotoma* aerial part. Tannins were present in *A. procumbeans* and *T. angustifolia* aerial part, while absent in the other three plants. Iqbal *et al.,* (2015) reported presence of saponins, alkaloids and tannins in leaf extracts of *G. velutinus* [55]. Phlobotanins and alkaloids by Mayer's reagent were completely absent in all the five plants.

Total alkaloid content of crude powder of all the five plants is given in Table.3. The total alkaloid content in all the five plants varied between 0.41 mg/g to 0.83 mg/g. Maximum alkaloid was in *T. angustifolia.* Alkaloids and their derivatives have an important biological function and are used in analgesic, antispasmodic and bactericidal activities. Alkaloids are mainly found in large amount in flowering plants and they have an important physiological effect on mankind [56].

From the results of preliminary phytochemical analysis, it can be concluded that different aerial part of plants possessed different level of phytoconstituents in different amounts. Moteriya *et al.,* (2015) reported phytochemical analysis in dried powder of seven different flowers, various phytochemicl are present in varied level and maximum amount of flavonoid was present [57]. Phytochemicals are the heart of phytomedicine. The healing power of phytomedicines directly correlates with the presence of various phytochemicals. Various phytochemical constituents present in the plants may be used as a basic medicinal agent which show divers pharmacological activity [58].

Conclusions

Finally, it can be concluded that, the preliminary phytochemical analysis revealed mainly the presence of cardiac glycosides and steroids in all the five plants, maximum being in *A. procumbeans.* This plant can be essentially used as a source of antibacterial, antioxidant, anticancer agent and it may possess other pharmacological activities which can be explored.

Table 2: Qualitative phytochemical analysis of dried powder of aerial parts of *A. procumbeans, F. dichotoma, S. sponteneum, S. nigra*and *T. angustifolia.*

NO.	Test	*A. procumbeans*	*F. dichotoma*	*S. sponteneum*	*S. nigra*	*T.angustifola*
1	Flavonoids	-	-	+	-	+
2	Tannins	++	-	-	-	+
3	Phlobatannis	-	-	-	-	-
4	Saponins	++	+	-	-	-
5	Steroids	++++	-	++	-	-
6	Cardiac glycosides	++++	++	-	++	-
7	Triterpenes	-	-	+++	-	++
8	Alkaloids					
	(1)Mayer's reagent	-	-	-	-	-
	(2)Wagner's reagent	++	+	-	-	-

Table 3: Total alkaloid content of different plants

No.	Plant name	Total alkaloid content (mg/g)
1	*Alysicarpusprocumbean*	0.46
2	*Fimbristylishdichotoma*	0.72
3	*Saccharumsponteneum*	0.41
4	*Suaedanigra*	0.54
5	*Typhaaungustifolia*	0.83

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References

1. Pawar NK, Arumugam N. Leaf extract of *Centratherum punctatum* exhibits antimicrobial, antioxidant and anti proliferative properties. Asian J Pharmaceu Clin Res 2011; 4(3):71-76.
2. Kaur GJ, Arora DS. Antibacterial and phytochemical screening of Anethum graveolens, Foeniculum vulgare and Trachyspermum ammi. BMC Com Alt Med 2009; 9(30):1-10.
3. Shah MD, Hossain MA. Total flavonoids content and biochemical screening of the leaves of tropical endemic medicinal plant Merremia borneensis. Arab J Chem. 2014; 7:1034-1038.
4. Saxena HO, Soni A, Mohammad N, Choubey SK. Phytochemical screening and elemental analysis in different plant parts of Uraria picta Desv: A Dashmul species. J Chem Pharm Res 2014; 6(5):756-760.
5. Edeoga HO, Okwu DE, Mbaebie BO. Phytochemical constituents of some Nigerian medicinal plants. Afr. J. Biotechnol 2005; 4(7):685-688
6. Hill HF. Economic Botany. A textbook of useful plants and plant products, 2nd edn. McGarw-Hill Book Company Inc, New York, 1952.
7. Harborne JB. The Flavonoids, Advances in Research since 1986. Chapman & Hall, London, 1994.
8. Winkel-Shirley B. Flavonoid biosynthesis. A colorful model for genetics, biochemistry, cell biology, and biotechnology. Plant Physiol 2001; 126:485-492.
9. Huang Q, Guo Y, Fu R, Peng T, Zhang Y, Chen F. Antioxidant activity of flavonoids from leaves of Jatropha curcas. Science Asia 2014; 40:193-197.
10. Garcia O, Castillo J. Update on uses and properties of citrus flavonoids: new findings in anticancer, cardiovascular, and anti-inflammatory activity. J Agric Food Chem 2008; 56(6):6185-6205.
11. Kawai M, Hirano T, Higa S, Arimitsu J, Maruta M, Kuwahara Y *et al.* Flavonoids and related compounds as anti-allergic substances. Allergology Int 2007; 56:113-123.
12. Ziegler J, Peter J. Alkaloid biosynthesis: metabolism and trafficking. Facchini Annu Rev Plant Biol 2008; 59:735-69.
13. Czapski GA, Szypuła W, Kudlik M, Wileńska B, Kania M, Danikiewicz W *et al.* Assessment of antioxidative activity of alkaloids from *Huperzia selago* and *Diphasiastrum complanatum* using *in vitro* systems. Folia Neuropathol 2014; 52(4):394-406.
14. Karou D, Savadogo A, Canini A, Yameogo S, Montesano C, Simpore J *et al.* Antibacterial activity of alkaloids from Sida acuta. Afr J Biotech 2006; 5(2):195-200.
15. Strier KB. Primate Behavior Ecology, Allyn and Bacon, Boston, 2003.
16. Kraus TE, Dahlgren RAC, Zasoski RJ. Tannins in nutrient dynamics of forest ecosystems: A review. Plant Soil 2003; 256:41-66.
17. Amarowicza R, Naczka M, Shahidi F. Antioxidant activity of crude tannins of canola and rapeseed hulls. J Ame Oil Chem Sci 2000; 77(9):957-961.
18. Shohayeb M, Abdel-Hameed E, Bazaid S. Antimicrobial activity of tannins and extracts of different parts of Conocarpus erectus L. Int J Pharm Bio Sci 2013; 3(2):544-553.
19. Park M, Cho H, Jung H, LeE, Hwang TK. Antioxidant And Anti-Inflammatory Activities Of Tannin Fraction Of The Extract From Black Raspberry Seeds Compared To Grape Seeds. J Food Biochem 2014; 38:259-270.
20. Prassas I, Diamandis EP. Novel therapeutic applications of cardiac glycosides. Nat Rev Drug Discov 2008; 7:926-935.
21. Newman RA, Yang P, Pawlus AD, Block KI. Cardiac glycosides as novel cancer therapeutic agents. Mol Interv 2008; 8:36-49.
22. Afolabi C, Akinmoladun EO, Dan-Ologe IA. Phytochemical constituents and antioxidant properties of extracts from the leaves of Chromolaena odorata. Sci Res Essays 2007; 2(6):191-194.
23. Qadir U, Paul VI, Ganesh P. Preliminary phytochemical screening and *in vitro* antibacterial activity of *Anamirta cocculus* (Linn.) seeds. J King Saud Uni Sci. 2015; 27:97--104.
24. Lacaille-Dubois MA, Wagner H. Bioactive saponins from plants: An update. Stud Nat Pro Chem 2000; 21B:633-687.
25. Wink M. Evolution of secondary metabolites from an ecological and molecular phylogenetic perspective. Phytochemistry 2003; 64:3-19.
26. Henry M. Saponins and phylogeny: example of the ‘‘gypsogenin group’’ saponins. Phytochem Rev 2005; 4:89-94.
27. Hu JL, Nie SP, Huang DF, Li C, Xie MY. Extraction of saponin from *Camellia oleifera* cake and evaluation of its antioxidant activity. Int J Food Sci Tech 2012; 47:1676-1687.
28. Patlolla JMR, Rao CV. Anti-inflammatory and Anti-cancer Properties of β-Escin, a Triterpene Saponin. Curr Pharmacol Rep 2015; 1:170-178.
29. Wook LD, Jae GK, Daeseok H, Yun TK. Analgesic Effect of *Harpagophytum procumbens* on postoperative and neuropathic pain in rats. Molecules 2014; 19:1060-1068.
30. Veeresh K, Manasa V, Vijusha M, Suthakaran R Antidiarrhoeal activity of methanolic extract of *Justica procumbens* by castor oil and enter pooling induced methods in rats. Der Pharma Lett 2014; 6(5):121-129.
31. Yu-L H, Shyh-SH, Jeng-SD, Yaw-HL, Yuan-S Chang G, Guan-J *et al. In vitro* antioxidant properties and total phenolic contents of wetland medicinal plants in Taiwan. Bot Study 2011; 53:55-66.
32. Mohammed A, Siddique B, Ismail BS. Allelopathic effects of *Fimbristylis miliacea* on the physiological activities of five Malaysian rice varieties. Australian J Crop Sci 2013; 7(13):2062-2067.
33. Islam MT, Barua J, Karon B, Noor MA. Antimicrobial, cytotoxic and antidiarrhoeal activity of *Fimbristylis aphylla* L. Int J Green Pharm 2015; 5(2):135-137.
34. Vhuiyan MMI, Biva IJ, Saha MR, Islam MS. Anti-diarrhoeal and CNS depressant activity of methanolic

extract of *Saccharum spontaneum* Linn**.** *Stamford* J Pharm Sci 2008; 1(1-2):63-68.
35. Kodali G, Seru G. *In vitro* antioxidant studies on ethanolic extracts of *Boswellia ovalyoliolata* and *Snccharum spontaneum* by DPPH, Nitric oxide and Lipid peroxidation methods. Int J Res Pharm Therap 2013; 2(1):324-330.
36. Sathya, Kokilavani. Antilithiatic activity of *Saccharum spontaneum* Linn. on ethylene glycol – induced lithiasis in rats. *Int J Phamaceu Sci Res* 2012a; 3(9):467-472.
37. Ripa FA, Haque M, Ul-Haque MI. *In Vitro* antimicrobial, cytotoxic and antioxidant activity of flower extract of *saccharum spontaneum* Linn. Eur J Sci Res 2009; 30(3):478-483.
38. Khalid M, Siddiqui H. Pharmacognostical evaluation and qualitative analysis of *Saccharum spontaneum* (L.) root. Int J Pharm Sci Druge Res 2011a; 3(4):338-341.
39. Sathya M, Kokilavani R. Phytochemical Screening and *In Vitro* antioxidant activity of *Saccharum spontaneum* Linn. Int J Pharm Sci Rev Res 2013a; 18(1):75-79.
40. Khalid M, Hefazat H Siddiqui, Sheeba F. Free radical scavenging and total phenolic content of *Saccharum spontaneum* L. root extracts. Int J Res Pharm Chem 2011b; 1(4):1160-1166.
41. Sathya M, Kokilavani R. Effect of *Saccharum spontaneum* Linn. on lysosomal enzymes of Uro- Lithiatic rats. J Appl Pharm Sci 2012b; 2(9):122-126.
42. Sathya M, Kokilavani R. *In vitro* free radical scavenging activity of ethanolic root extract of *Saccharum spontaneum* Linn. Elixir Appl Biol 2013b; 56:13417-13421.
43. Kavishankar GB, Lakshmidevi N, Murthy SM, Prakash HS, Niranjana SR. Diabetes and medicinal plants a review. Int J Pharm Biomed Sci 2011; 2(3):65-80.
44. Kopalli SR, Koppula S. Attenuation of neuroinflammatory responses in lipopolysaccharide-induced bv-2 microglia by *Suaeda asparagoides* Miq. (Chenopodiaceae), Trop J Pharmaceut Res 2014; 13(9):1407-1413.
45. Al-Mohammadi S, Al-Khateeb SE, Al-Shamma A. Antimicrobial investigation of *Suaeda baccata* (Chenopodiaceae). American J Plant Sci 2005; 2(1):49-52.
46. Mahasneh AM, Jameel AA, Ahmad AE, Oquah A. Antimicrobial activity of extracts of herbal plants used in the traditional medicine of Bahrain. Phytotherap Res 1995; 10:251-253.
47. Pawar CR, Kolhe VN, Khedkar PA. Anti-inflammatory activity of leaves of *Typha angustata* (Typhaceae). Inl J Rese Ayurv Pharm 2011; 2(5):1598-1600.
48. Umesh MK, Sanjeevkumar CB, Hanumantappa B, Ramesh LL. Evaluation of *in vitro* anti-thrombolytic activity and cytotoxicity potential of *Typha angustifolia* L. leaves extracts. Int J Pharm Pharm Sci 2014; 6(5)81-85.
49. Fruet AC, Seito LN, Mores Rall VL, Di Stasi LC. Dietary intervention with narrow-leaved cattail rhizome flour (*Typha angustifolia* L.) prevents intestinal inflammation in the trinitron benzene sulphuric acid model of rat colitis. BMC Comp Alt Med 2012; 12(62):1-11.
50. Varpe SS, Juvekar AR, Bidikar MP, Juvekar PR. Evaluation of anti-inflammatory activity of *Typha angustifolia* pollen grains extracts in experimental animals. Indian J Pharmacol 2012; 44(6):788-791.
51. Harborne JB. Phytochemical Methods 2nd Ed. London: Chapman & Hall, 1973.
52. Essiett UK Udo ES. Comparative phytochemical screening and nutritional potentials of the stems, leaves and flowers of *Allamanda Cathartica* (Apocynaceae). Int J Sci Tech 2015; 4(6):248-253.
53. Dey P, Dutta S, Chaudhuri TK. Phytochemical analysis of the leaves of *Clerodendrum viscossum* Vent. Int J Pharm Pharm Sci 2014; 6(2):254-258.
54. Padalia *H, Moteriya P, Chanda S.* Green synthesis of silver nanoparticles from marigold flower and its synergistic antimicrobial potential. Arabian J Chem, 2014.
55. Iqbal E, Salim KA, Lim LBL. Phytochemical screening, total phenolics and antioxidant activities of bark and leaf extracts of *Goniothalamus velutinus* (Airy Shaw) from Brunei Darussalam. J King Saud Uni Sci. (In press), 2015.
56. Hussain I, Ullah R, Ullah R, Khurram M, Ullah N, BaseerA *et al.* Phytochemical analysis of selected medicinal plants. Afr J Biotech 2011; 10(38):7487-7492.
57. Moteriya P, Rinkal S, Chanda S. Screening of phytochemical constituents in some ornamental flowers of Saurashtra region. J Pharmacog Phytochem 2015; 3(5):112-120.
58. Kabera JN, Semana E, Mussa AR, He1 X. Plant Secondary Metabolites: Biosynthesis, Classification, Function and Pharmacological Properties. Journal of Pharmacy and Pharmacology 2014; 2:377-392.