EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 5
Issue: 9
369-374
Year: 2018

COMPARATIVE STUDY OF NUTRITIONAL, PHYTOCHEMICAL AND ANTIOXIDANT POTENTIAL OF *BALANITES AEGYPTIACA, BUTEA MONOSPERMA* AND *HIBISCUS SABDARIFFA*

[1]Ekta Singh Chauhan, [2]*Shivani Srivastava and [3]Shivangi Yadav

Department of Food Science and Nutrition, Banasthali University, Rajasthan, India-304022.

***Corresponding Author: Shivani Srivastava**
Department of Food Science and Nutrition, Banasthali University, Rajasthan, India-304022.

Article Received on 29/06/2018 **Article Revised on 19/072018** **Article Accepted on 08/08/2018**

ABSTRACT
These flowers are nutritionally not very well known. The main objective of this study was to evaluate nutritional composition, phytochemicals screening and antioxidant activity in three edible flowers *Balanites aegytiaca, Butea monosperma* and *Hibiscus sabdariffa.* This study includes the estimation of moisture, ash, fat, fiber, protein, CHO. Mineral content (calcium and iron) of *Balanites aegytiaca, Butea monosperma* and *Hibiscus sabdariffa* flowers were determined by atomic absorption spectrophotometry (AAS). The aqueous extract was screened for the qualitative analysis of phytochemicals. Antioxidant activity (DPPH) was determined by standard methods. Results indicate that proximate composition was not similar in three flowers that are *Balanites aegytiaca, Butea monosperma* and *Hibiscus sabdariffa. Hibiscus sabdariffa* showed a high content of calcium (684.1±0.01 mg/100g). *Butea monosperma* also showed high content of protein (12.7±0.01g/100g). *Balanites aegytiaca* and *Hibiscus sabdariffa* showed a high content of iron (24.5±0.01 and 28.4±0.04 mg/100g). Flowers were also containing different phytochemicals and high antioxidant activity. The obtained results revealed that these flowers help to maintain nutritional status as well as prevent from various diseases and can be used as healthy dietary supplement for human being.

KEYWORDS: Nutritional composition, Mineral content, Phytochemical, Antioxidants, *Balanites aegytiaca, Butea monosperma, Hibiscus sabdariffa.*

INTRODUCTION
The medicinal value of plants has become more evident during the past few decades owing largely.[1] Flowers are generally not considered for consumption because people are not aware of the benefits of flowers. Flowers and the ability to recognize them have been attracting humans for over long period of time. The taxonomy of flowers originally contained approximately 8000 plants, but since it has been extended to more than 250000 flower species around the world.[2]

Balanites aegytiaca is known as dessert date and Hindi name is *Indugi*; it is a wild edible, arid zone tree belonging to the *Zygophyllaceae* family.[3] The tree produces a huge number of yellow green flowers. The flowers of dessert date are rich in many macro and micro nutrient. It shows the presence of some phytochemical.[4,6] *Butea monosperma* belongs to family *Fabaceae* is a medium size deciduous tree found throughout India[7,9] and contain essential nutrients. The plant also contains flavones[10], kinotannic and gallic acid. The flowers of this plant contains many bioactive components which is beneficial for health like as anticancer, antioxidant and free radical scavenging activity.[11,12] The genus *Hibiscus sabdariffa* (Malvaceae) includes more than 300 species of annual or perennial herbs, shrubs or trees.[13] It is cultivated for it's just like fiber in India, the East Indies, Nigeria and some extent in other parts of tropical Africa. The flowers of this plant are yellow and the red or green, non fleshy, spiny calyxes can be used for foods. The plant contains various constituents like phytochemicals, antioxidants and organic acids and sodium ions, iron, vitamin A and C.[14,15] The present study is focus on nutritional composition, phytochemicals screening and antioxidant activity of edible flowers *Balanites aegytiaca, Butea monosperma* and *Hibiscus sabdariffa.*

MATERIALS AND METHODS
Collection of sample
Flowers powders of *Balanites aegytiaca, Butea monosperma* and *Hibiscus sabdariffa* were purchased from Neeraj Traders, Jhansi (U.P) and stored in auto seal pouches till the time of assaying.

Nutritional analysis

The flowers powder used to determine the moisture content. It was examined by air oven method at 105°C and till to get the constant weight.[16] Ash, crude protein, fat, crude fiber were analyzed by reported methods. Ash content was determined by the sample incineration in a muffle furnace at 600˚C hr until the ash turned white.[17] Crude protein was estimated by the Kjeldahl method.[18] Determination of carbohydrates (CHO) by the difference method.[19] Crude fiber was determined by the enzymatic gravimetric method.[20] Fats was determined in a Soxhlet extractor.[21]

Mineral analysis, aliquots were prepared from the flowers powder. Calcium and iron were determined by atomic absorption spectrophotometric method.[22,23]

Extraction and Phytochemical Screening

Aqueous extract preparations, the flowers powder were extracted with water by boiling method. The extracts were completely evaporated by vacuum distillation and stored in refrigerator at 4^0C until used. The extract was screened for the presence of different primary and secondary metabolite using different phytochemical tests. The aqueous extract was screened for the presence or absence of alkaloid, glycosides, flavonoids[24], steroids, and terpenoids[25] by standard methods.

Antioxidant Activity

DPPH Radical Scavenging Assay

The free radical scavenging activity of the extracts and ascorbic acid as positive control was measured in terms of hydrogen donating or radical scavenging ability using the stable radical DPPH, 2 ml of each algal sample and control at various concentrations were added to 2 ml of freshly prepared DPPH solution in methanol.

The reaction was allowed for 30 minutes in dark and absorbance was measured at 517 nm using a spectrophotometer (Shimadzu UV-VIS spectrophotometer). All experiments were repeated three times independently. The degree of decolorization of DPPH from purple to yellow indicated the scavenging efficiency of the algal sample. The percentage scavenging effect of DPPH was calculated using the following equation:

Percentage scavenging effect = 1 − [(A sample−A sample blank)/A control] × 100

Where,

A sample= Absorbance of flowers extracts with DPPH in methanol

A sample blank= Absorbance of flowers extracts sample (sample/ascorbic acid),

A control= Absorbance of DPPH in methanol.[26,28]

RESULTS AND DISCUSSION

Nutritional composition

The importance and awareness of nutrition are public health issues, has resulting in the increasing demand of the biochemical nutrients of foods. Table 1 gives the nutritional composition of flower's powder. The levels of moisture were 29.5±0.06, 2.0±0.06 and 8.1±0.01 (g/100g) in the *Balanites aegyptiaca*, *Butea monosperma* and *Hibiscus sabdariffa* flowers powder. The ash content was respectively 5.7±0.04, 1.9±0.02 and 7.3±0.03 (g/100g) in all flower's powder. Fat content was low in all flowers powder mainly 2.5±0.01, 2.4±0.01 and 0.3±0.02 (g/100g). Fiber content was 2.9±0.01, 1.6±0.01 and 8.4±0.00 in *Balanites aegyptiaca*, *Butea monosperma* and *Hibiscus sabdariffa* flowers powder. Fiber content was high in *Hibiscus sabdariffa* flowers powder it can be used as a good source of dietary fiber and helpful in weight reduction in overweight persons. Protein content was high in *Balanites aegyptiaca* and *Butea monosperma* flower as compare to *Hibiscus sabdariffa* flowers powder. Occurrence of high protein content in *Balanites aegyptiaca* and *Butea monosperma* flower indicates its nutritional advantage over other conventionally consumed flowers. CHO values were low in *Balanites aegyptiaca* and *Butea monosperma* flowers powder 57.3±0.03, 56.3±0.12 as compare to *Hibiscus sabdariffa* 69.64±0.02 (g/100g). CHO highly contribute for energy signifies the role of flowers as a good source of energy. The level of macro nutrients was also high in flowers powder. Calcium content was high in *Hibiscus sabdariffa* 684.1±0.01 (mg/100g) as compare to the *Butea monosperma* and *Balanites aegyptiaca* 0.8±0.02 and 37.7±0.03 (mg/100g). Calcium is recommended ratio for good human health and very essentional in muscle contraction, oocyte activation, building strong bones and teeth, blood clotting, nerve impulse, transmission, regulating heart beat and fluid balance with in cell.[29,30] Iron content was high in all flowers powder 24.5±0.01, 0.6±0.01 and 28.4±0.04 (mg/100g) respectively as compare to other nutrients. All values for nutrients composition are expressed by mean ± standard deviation of triplicate determination in dry weight basis. Therefore, the use of edible flowers in our diet could be helpful to protect many diseases and maintain the nutritional status of human being.

Table 1: Results of Nutritional Composition of Flower's Powder.

Nutrients (DW)	*Balanites aegyptiaca*	*Butea monosperma*	*Hibiscus sabdariffa*
Moisture (g/100g)	29.5±0.06	2.0±0.06	8.1±0.01
Ash (g/100g)	5.7±0.04	1.9±0.02	7.3±0.03
Fat (g/100g)	2.5±0.01	2.4±0.01	0.3±0.02
Fiber (g/100g)	2.9±0.01	1.6±0.01	8.4±0.00
Protein (g/100g)	8.3±0.07	12.7±0.01	7.5±0.00
CHO (g/100g)	57.3±0.03	56.3±0.12	69.6±0.02
Calcium (mg/100g)	37.7± 0.03	0.8±0.02	684.1±0.01
Iron (mg/100g)	24.5± 0.01	0.6±0.01	28.4±0.04

Legend:- Each value represent the mean ±SD deviation of three determinations (n=3) on dried weight of flower's. DW: Dry Weight.

Phytochemical Screening

The results of phytochemical screening of *Balanites aegyptiaca, Butea monosperma* and *Hibiscus sabdariffa* flower's aqueous extract were depicted in Table 2. Alkaloids were absent in both flower's *Balanites aegyptiaca* and *Hibiscus sabdariffa*. Glycosides were present in *Balanites aegyptiaca* and *Hibiscus sabdariffa* and absence in *Butea monosperma* flower's extract. Terpenoids and flavonoids were present in *Balanites aegyptiaca* and *Butea monosperma*. Steroids were absence in all flower's extracts.

Table 2: Results of Phytochemical Screening of *Balanites aegyptiaca, Butea monosperma* and *Hibiscus sabdariffa* Flower's on Aqueous Extract.

Phytochemical Screening	*Balanites aegyptiaca*	*Butea monosperma*	*Hibiscus sabdariffa*
Alkaloids	_	+	_
Glycosides	+	_	+
Steroids	_	_	_
Terpenoids	+	+	_
Flavonoids	+	+	_

Legend:- Where (+) and (-) indicates the presence and absence of phytochemicals respectively.

A significant proportion of pharmaceutical products in current use are designed from flowers. The medicinal properties of plant could be attributed to the presence of one or more of the detected natural products. *Balanites aegyptiaca, Butea monosperma* and *Hibiscus sabdariffa* has been used for the treatment of a variety of disorders in traditional system of medicine. The therapeutic properties of medicinal flowers are possible due to the presence of many bioactive compounds such as alkaloids, steroids, terpenoids and flavonoids which immense medicinal properties. Alkaloids were present in *Butea monosperma* flowers powder extract, these compounds important for the treatment of syphilis and other venereal diseases treatment. Terpenoids were present in both flowers extracts; *Balanites aegyptiaca* and *Butea monosperma* these are considered as an important compound for the antimicrobial and antioxidant activities. Flavonoids were observed in two flowers extracts, which have contained many properties like antioxidant, anti-inflammatory activity, estrogenic activity and antimicrobial activity.[31,35] The phytochemical screening of *Balanites aegyptiaca, Butea monosperma* and *Hibiscus sabdariffa* flowers powder on aqueous extracts showed the fact that these flower's effective for different diseases. These flowers may retain a wide range of pharmacological actions.

Antioxidants Activity

DPPH Radical Scavenging Activity

The stable DPPH radical model is a widely used, relatively quick and precise method for the evaluation of free radical scavenging activity. DPPH is a stable free radical and accept an electron or hydrogen radical to become a stable diamagnetic molecule. Antioxidants on interaction with DPPH both transfer electron or hydrogen atom to DPPH and thus neutralizing its free radical character and convert it to DPPH and the degree of discoloration indicates the scavenging activity of drug. The reduction capacity of DPPH radical is determined by the decrease in its absorbance at 517nm induced by antioxidants. The decrease in absorbance of DPPH radical caused by antioxidants because of the reaction between antioxidants molecules and radical progress which results in the scavenging of the radical by hydrogen donation. It is visually noticeable as a change in color from purple to yellow. Hence, DPPH is usually used as a substance to evaluate the antioxidant activity.[36,37] Figures showed that radical scavenging activity of standard ascorbic acid and *Balanites aegyptiaca, Butea monosperma and Hibiscus sabdariffa* flower's extracts, respectively. The bioactive fraction of *Balanites aegyptiaca* flower's extracts showed in figure 1 at highest % inhibition of 60.7% at the concentration of 0.5 µg. Figure 2 showed *Butea monosperma* extract highest inhibition 70.8% at concentration of 0.5 µg. Figure 3 indicated *Hibiscus sabdariffa* extract highest inhibition 56.9% at concentration of 0.5 µg. Figure 3

showed the lowest DPPH scavenging activity and figure 2 showed the highest DPPH scavenging activity. DPPH scavenging activity presented in figures, which indicates that the aqueous extract of flower's possessed varying radical scavenging activity.

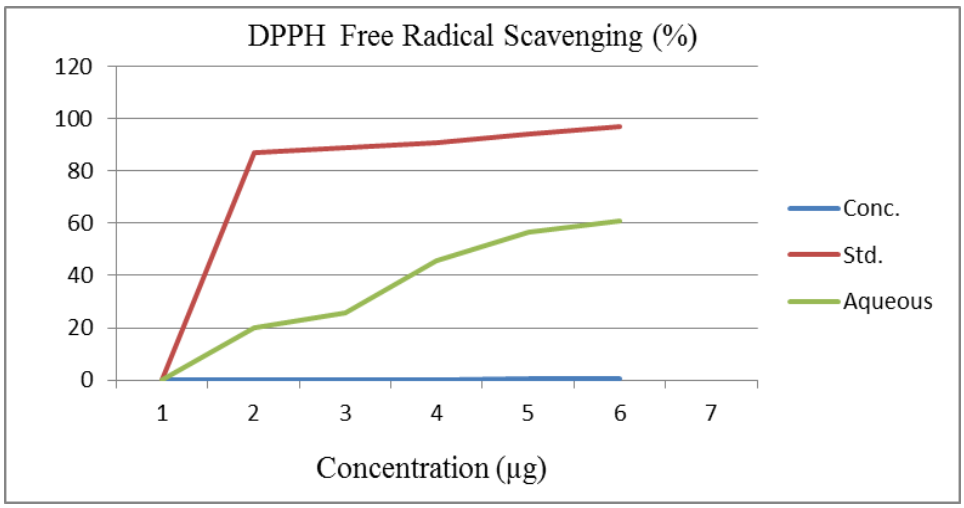

Figure 1: DPPH Scavenging % Inhibition of Ascorbic acid (Std) and Aqueous extract of *Balanites aegyptiaca* Flower's Extract.

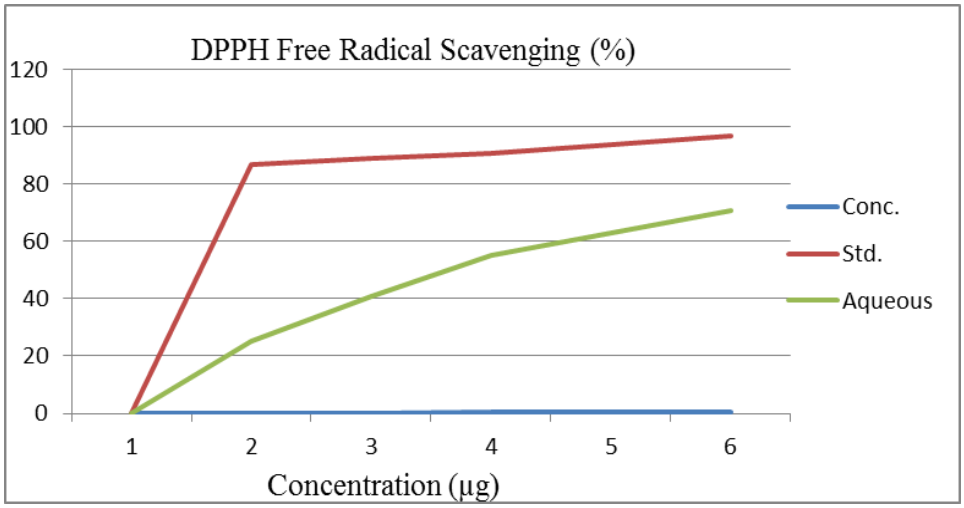

Figure 2: DPPH Scavenging % Inhibition of Ascorbic acid (Std) and Aqueous extract of *Butea monosperma* Flower's Extract.

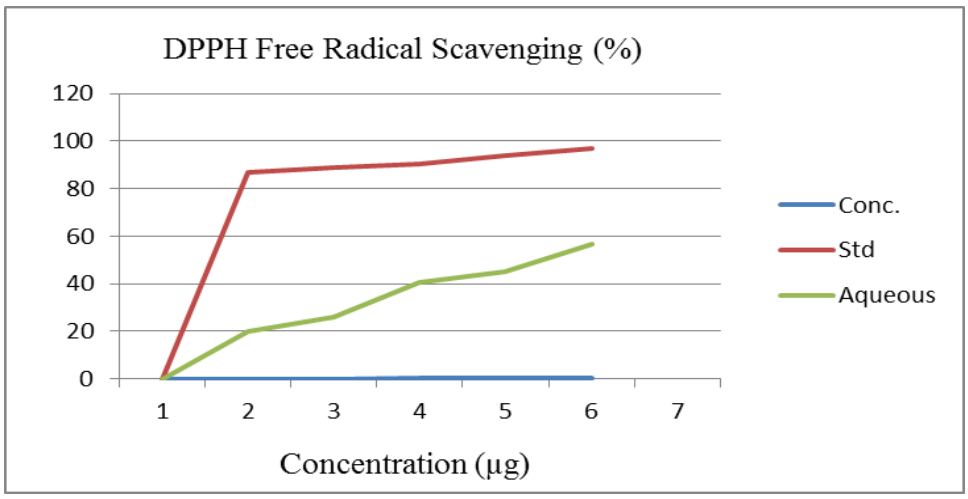

Figure 3: DPPH Scavenging % Inhibition of Ascorbic acid (Std) and Aqueous extract of *Hibiscus sabdariffa* Flower's Extract.

CONCLUSION

In present study the nutritional values of these flowers were evaluated. This study shows that *Balanites aegytiaca, Butea monosperma* and *Hibiscus sabdariffa* flowers are good source of major nutrients protein, calcium and iron, phytochemicals and antioxidant. These flowers can be recommended for human consumption and beneficial for health.

ACKNOWLEDGMENT

The authors are grateful to the Banasthali University, Rajasthan, Department of food science and nutrition for providing lab facility and valuable guidance.

REFERENCES

1. Aziz S, Saha K, Sultan N, Nur HP, Ahsan MA, Ahmed S, Hossain MK. Comparative studies of elemental composition in leaves and flowers of Catharanthus roseus growing in Banagladesh. Asian Pacific Journal of Tropical Biomedicine, 2016; 6(1): 50-54.
2. Kumar YHS, Kumar NV, Guru DS. Delaunay triangulation on skeleton of flowers for classification. Procedia Computer Science, 2015; 45: 226-235.
3. Feyssa HD, Njoka TJ, Asfaw Z, Nyangito MM. Nutritional content of *Balanites aegyptiaca* and its contribution to human diet. African Journal of Food Science, 2015; 9(5): 346-350.
4. K.P. Dubey, M. Yogi, A. Bharadwaj, L.M. Soni, A. Singh, K.A. Sachan. *Balanites aegyptiaca (L) Del*., a semi-arid forest tree: a review. Asian Journal of Plant Science, 2011; 12-18.
5. Ansari MM, Ahmad J, Ali M, Ansari HS. 10-methyl-n heptocosone and diglucosyldirhamnoside from the stem bark of *Balanites aegyptiaca delile*. Indian Journal of Chemistry, 2006; 45B: 2154-2156.
6. Kahsay T, Mulugeta A, Unnithan CR. Antioxidant and antibacterial activities of *Balanites aegyptiaca deil* from Northern Ethiopia. American Journal of Pharmtech Research, 2014: 415-422.
7. Pattanayak S, Mollick MMR, Maity D, Chakraborty S, Dash SK, Chattopadhyay S, Roy S, Chattopadhyay D, Chakraborty M. *Butea monosperma* bark extract mediated green synthesis of silver nanoparticles: Characterization and biomedical applications. Journal of Saudi Chemical Society, 2015; 21(6): 673-684.
8. Renimel IK, Destandau TEM, Reddy M, Andre P, Elfakir C, Pichon C. Protective effect of a *Butea monosperma* (Lam.) taub. Flowers extract against skin inflammation: Antioxidant, anti-inflsmmatory and matrix metalloproteinases inhibitory activitiea. Journal of Ethnopharmacol, 2013; 148(2): 537-543.
9. T. Michel, E. Destandau, V. Pecher, I. Renimel, L.Pasquire, P. Andre, C. Elfakir. Two step centrifugal partition chromatography (CPC) fraction of Butea monosperma (Lam.) biomarkers. Separation and Purification Technology, 2011; 80(1): 32-37.
10. Gupta A, Sheth NR, Pandey S, Shah DR, Yadav JS. Design and evaluation of herbal hepatoprotective formulation against paracetamol induced liver toxicity. Journal of Young Pharmacists, 2013; 5(4): 180–187.
11. Tenzin C, Shukla SK, Kumar V. Chemopreventive and anti-cancer properties of the aqueous extract of fowers of *Butea monosperma*. Journal of Ethnopharmacol, 2010; 129(2): 208-213.
12. Subramaniyan B, Polachi N, Mathan G. Isocoreopsin: An active constituent of n-butanol extract of Butea monosperma flowers against colorectal cancer (CRC). Journal of Pharmaceutical Analysis, 2016; 6(5): 318-325.
13. Wang ML, Morris B, Tonnis B, Davis J, Pederson GA. Assessment of oil content and fatty acid composition variability in two economically important *Hibiscus* species. Journal of Agricultural and Food Chemistry, 2012; 60(26): 6620–6626.
14. Adigun MO, Ogundipe OD, Anetor JI, Odetund AO. Dose dependent changes in some haematological parameters during short term administration of *Hibiscus sabdariffa* calyx aqueous extract (zobo) in Wistar albino rats. African Journal of Medicine and medicinal Sciences, 2006; 35(1): 73-77.
15. Iyare EE, Adegoke OA, Nwagha UI. Mechanism of the decreased food consumption and weight gain in rats following consumption of aqueous extract of the calyx of *Hibiscus sabdariffa* during pregnancy. Asian Pacific Journal of Tropical Medicine, 2010; 3(3): 185-188.
16. Anonymous. The Ayurvedic Pharmacopoeia of India. 1st ed. New Delhi: Ministry of Health and Family Welfare, Department of Indian System of Medicine & Homeopathy, 1990.
17. Sadasivam S, Manickam A. Biochemical methods. Delhi. New Age International Publishers, 1996.
18. Jayaram J. Laboratory manual in biochemistry. Delhi. New Age International Publishers, 2005.
19. James CS. Analytical Chemistry of Foods. U.K. University of Polymaths, 1995.
20. Watanable FS, Olsen S.R. Test for ascorbic acid method for determining phosphorus in water and sodium bicarbonate extract of soil. Soil Science Society of America, 1965; 29(6): 677-678.
21. Chopra SL, Kanwar JS. Analytical Agricultural Chemistry. 5th ed. New Delhi: Kalyani Publications, 1991.
22. Janani GK, Sondhi SM. Determination of mineral elements in some ayurvedic bhasmas used for the cure of various ailments. Indian Drugs, 1995; 32: 187-90.
23. Dangat BT, Gurav RV. Inorganic status of tubers of Habenaria longicorniculata J. Graham. Asian Journal of Pharmaceutical and Clinical Research, 2014; 7(2): 172-173.
24. Khandelwal KR. Practical Pharmacognosy, Techniques and Experiments. 8th ed. Pune: Nirali Prakshan, 2001.

25. Harborne JB. Phytochemical Methods. A Guide to Modern Techniques of Plant Analysis. London: Chapman and Hall, 1984.
26. Kolsi RB, Frikha D, Jribi I, Hamza A, Feki L, Belghith K. Screening of antibacterial and antifongical activity in marine macroalgae and magnoliophytea from the coast of Tunisia. Int J Pharm Pharm Sci., 2015; 7(3): 47-51.
27. Saranya C, Parthiban C, Anantharaman P. Evaluation of antibacterial and antioxidant activities of seaweeds from Pondicherry coast. Advances in Applied Science Research, 2014; 5(4): 82-90.
28. Sudha K, Priya KM, Kumari NV, Palanichamy V. Screening of antioxidant potential of green alga *Codium adhaerens*, Interenational Journal of Drug Development and Research, 2014; 6(4): 103-11.
29. Patil RB, Kore BA. Availability of mineral elements in an exotic weed alteranthera tenella colla var. Tenella veldk. Asian Journal of Pharmaceutical and Clinical Research, 2015; 8(15): 73-75.
30. Piste P, Didwagh S, Mokashi A. Calcium and its role in human body. International Journal of Research in Pharmaceutical and Biomedical Sciences, 2013; 4: 659-68.
31. Behra S, Behra B, Barik DP, Naik SK. Phytochemical analysis of the leaf, flower and bark of a medicinal plant Crataeva magna (LOUR)DC. Asian journal of Pharmaceutical and clinical research, 2016; 9(1): 177-178.
32. Sofowora A. Medicinal Plants and Traditional Medicine in Africa. New York: John Wiley and Son Ltd, 1993; pp.150-3.
33. Rijo P, Rodriguez B, Duarte A, Simoes MF. Antimicrobial properties of *Plectranthus ornatus* extracts, 11-acetoxyhalima-5, 13-dien-15-oic acid metabolite and its derivatives. Journal of Natural Products, 2011; 1: 57-64.
34. Oyedemi SO, Afolayan AJ. Antibacterial and antioxidant activities of hydroalcoholic stem bark extract of *Schotia latifolia* Jacq. Asian Pacific Journal of Tropical Medicine, 2011; 4(12): 952-958.
35. Cushine TP, Lamb AJ. Antimicrobial activity of flavonoids. Internatiopnal Journal of Antimicrobial Agents, 2005; 26(5): 343-356.
36. Devi LS, Ghosh S, Das A, Borthakur SK, Singh NI. Antioxidative and free radical scavenging activity of ethanolic extract of Lentinula Edodes. Asian Journal of pharmaceutical and clinical research, 2014; 7(3): 195-199.
37. Princely, Dhanaraju MD. Asssessment of phytochemical constituents, in vitro antimicrobial and antioxidant potential of ULVA extract fron Vishakhapatnam coast. Asian Journal of Pharmaceutical and Clinical Research, 2017; 10(8): 87-95.