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Research Article

STUDY OF PHYTOCHEMICAL SCREENING AND GC-MS ANALYSIS OF TWO EXTRACTS OF *COCONUT HAUSTORIUM*

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ABSTRACT

Coconut haustorium (CH) is found during germination of *Cocos nucifera*. This study was carried out to determine the existing phytochemicals in Coconut haustorium and to characterize it using GC-MS analysis. The qualitative analysis of phytochemicals was analyzed for hexane and methanolic extracts. The two solvent extracts were subjected to GC-MS analysis. The preliminary analysis of phytochemicals in hexane and methanol showed various compounds such as alkaloids, carbohydrates, phenol, flavonoid, terpenoids, saponin, protein, aminoacid, fats & oil. These biologically active compounds were found to be preventing variety of diseases. GC-MS analysis of phytochemicals showed a total of 13 compounds in hexane and 9 compounds in the methanolic extract. These identified compounds are reported to have biological activities and could be further isolated for therapeutic purpose in the field of traditional medicine.

Keywords: Coconut Haustorium, Phytochemicals, GC-MS, Biological activity, Traditional Medicine.

1. INTRODUCTION

The plant kingdom has been recognized to be potent in the curing of various diseases and provide all the various pharmaceuticals [1]. Medicinal plants are referred to as plants that possess medicinal properties and have potential compounds that can be used for synthesis of drugs [2]. These plants are an alternative to synthetic drugs and are significant because of their phyto-constituents [3]. The use of plants in different type of medicinal practices such as allopathy, aromatherapy and homeopathy has increased in the recent past. The World Health Organization has reported that about 80% population of the world depend upon the medicinal plants for the treatment of various diseases [1, 4].

Coconut (*Cocos nucifera*) is a tree belonging to the family Arecaceae. For many decades, the products from the coconut tree are considered to be a distinct Indian folklore medicine [5]. The different parts of the coconut possess various pharmacological properties. Earlier reports show that coconut exhibit hyperglycaemic, antinociceptive and anti-inflammatory [6, 7] while studies on coconut water revealed that it possess antifungal, nephroprotective activities [8, 9]. The bioactivities of husk fibre of Coconut showed antiplasmodial, cytotoxicity, antidepressant and antibacterial activity [10-12]. Study on the inflorescence of coconut revealed its cytoprotective and antihyperglycemic activities [13].

Coconut haustorium (CH) is a spongy structure found during germination in the Coconut. So far studies on the biochemical, nutritional, physiochemical and functional properties of CH have been studied [14-16]. The docking studies using the fresh CH revealed that due to the presence of triterpenoid squalene there was an affinity towards the ulcer causing bacteria *Helicobacter pylori* [17].

Phytochemicals are primary and secondary metabolites that naturally occur in plants [18]. These phyto-constituents are significant in preventing diseases in humans without causing any side effects [19]. Therefore, identification and quantification of the phytoconstituents is necessary for standardization and formulations. GC-MS is a technique that is employed in identifying the bioactive constituents. Though studies on phytochemical and GC-MS are carried out in CH there are variations due to different geographical location, genetic, environmental, harvest conditions, and ecology of the plant. The present study provides knowledge about the bioconstituents present in the (CH) extracts and thereby identifying the biological activities exhibited by CH for therapeutic purposes.

2. MATERIAL AND METHODS

2.1. Plant collection and extraction

Coconut saplings were collected in the month of November from Gudalur, Theni District, Tamilnadu,

India. The husk was broken carefully and the CH was removed. Through cold percolation method, fresh CH was extracted twice using hexane and methanol solvents for about 48h. The extract was filtered using whatmann's filter paper and concentrated using rotary evaporator at 60°C. Finally the extracts were dried using vacuum dessicator and stored for further experiments.

2.2. Qualitative phytochemical analysis

The preliminary phytochemicals of hexane and methanol extract were identified using standard procedures [20]. Tests for alkaloids, carbohydrates, glycosides, proteins, phenols, flavonoids, terpenoids, saponins, steroids, tannins, fats and oil were carried out.

2.3. GC-MS analysis

For GC-MS analysis, Jeol GC MATE II system equipped with HP 5MS column was used. High pure helium was used as the carrier gas at a flow rate of 1 ml/min. 70eV electron impact ionisation was used. The samples were analysed with initial oven temperature that was maintained between 50°C to 250°C at 10 deg/ min. The ion chamber and GC interface temperature was maintained at 250°C. Data acquisition was carried out in the MS scan mode (range 50-600 AMU) [21]. Interpretation of mass spectrum of GC-MS was conducted using the database obtained from NIST. The spectrum of the known component was compared with the spectrum of the known components stored in the NIST library. The name, retention time, molecular weight and molecular formula of the components of the test materials were ascertained.

3. RESULTS AND DISCUSSION

3.1. Qualitative phytochemical analysis

The results of phytochemical screening and the tests carried out are listed in table 1. The current investigation of phytocompounds of crude hexane and methanolic extract of CH revealed various compounds. Presence of alkaloids was seen in both the solvent extracts.

Table 1: Qualitative phytochemical analysis of *Coconut haustorium*

Phytoconstituents	Name of the test	Hexane	Methanol
Alkaloids	Dragendroff's Test	+	+
Carbohydrates	Fehling's Test	-	+
Glycosides	Borntrager's Test	-	-
Protein and Aminoacid	Biuret and Ninhydrin Test	-	+
Phenol	Ferric Chloride	-	+
Flavonoid	Alkaline reagent test	+	+
Terpenoids	Salkowki's Test	+	+
Steroids	Liebermann-Burchard test	-	-
Saponin	Foam test)	+	+
Tanin	Braymer's test	-	-
Fat and Oil	Spot test	+	+

Plant alkaloids are found to be one of the enormous natural products containing many chemical entities performing various functions. Literature reveals alkaloids inhibit cancerous growth in addition it also plays a vital role in induction of gene expression, anti-inflammatory, antiproliferative, apoptic induction, antiviral, antifungal and antibacterial [22]. Carbohydrates, proteins and amino acids presence was found in methanolic extract of CH and it was absent in hexane extract.

The bioconstituent flavonoid was present in both the crude extracts. Flavonoids are one of the vital groups among secondary metabolites. Earlier study on flavonoid reveals that they show increased antioxidant and antidiabetic effects [23]. This bio-active compound provides antiepileptic effect [24] and acts at different stages of cancer thus inhibiting its growth [25].

Moreover there are also other biological activities such as anti-inflammatory, antimicrobial, anti-angionic and anti-allergic properties exhibited by flavonoids [26].

Presence of Saponins was found in hexane and methanol extracts of CH. Saponins exhibit haemolytic activity and help in coagulation of red blood cells. Presence of saponins in plants help in preventing cancer growth and treating wounds [27] .Glycosides, steroids and tannins were not present in both the crude extracts of CH.

Terpenoids were present in hexane and methanolic extract of CH. Terpenoids are seen in higher plants and

are synthesized mainly in the vegetative tissue, flowers, and rarely found in roots. Terpenoids possess unique antioxidant activity; its compounds like carotene seem to offer protection against cancer [28]. In addition terpenoids are shown to be effective in anti-inflammatory, antibacterial, antiviral, antimalarial, hypoglycaemic and to control and prevent cardiovascular disease [29].

The presence of phenols is seen in both the extract. Phenols possess the ability to scavenge free radicals [30].

3.2. Gas Chromatography - Mass Spectrophometry

The bioactive compounds present in the hexane and methanolic extract of CH was identified using Gas Chromatography-Mass Spectrometry. The bioactive constituents of hexane extract with their retention time, molecular formula, molecular weight and concentration (area %) are listed in table 2. The chromatogram of hexane extract in fig.1 shows 13 bioactive compounds. Compounds such as Quinoline (15.53) are significant and effectively used against chloroquine-resistant and chloroquine-sensitive parasites. Oleic acid is seem to exhibit pharmacological properties such as anti inflammatory, antiandrogenic cancer preventive, dermatitisgenic hypocholesterolemic, 5-α reductase inhibitor, anemia-genic insectifuge, flavour [31]. Similar study on GC-MS analysis of CH methanolic extract also revealed compounds that are responsible for antimicrobial, antioxidant, anti-ulcer and anti-cancer properties [18]. The chromatogram of methanolic extract (fig. 2) shows 9 compounds. Major compounds in the hexane extract (table 3) such as Quinoline, 5-nitro,1-oxide (15.53), flavones (16.87), Cetylic acid(17.45), Oleic acid (19.1) seem to show anti-inflammatory, biosynthesis of lung lecithin, antiandrogenic cancer preventive, dermatitisgenic hypocholesterolemic, 5-α reductase inhibitor, anemiagenic insectifuge, flavour [31, 32]. In the GC-MS analysis of methanolic extract, major bioconstituents such as Phenol 2- propyl (13.43), flavones (15.17), methyl oleate (18.85), isopropyl stearate (20.98), 5-Cyclo-hexadece-1-one (16.5), hexadeconoic acid methyl ester (17.12), Coumarin -3-carboxylic acis, 7-methoxy (14.17). These compounds were reported to exhibit activities such as antitumour, anti-inflammatory, fragrance, food additive agent, emulsifiers, lubricant and as solvent in pharmaceutical formulation [32].

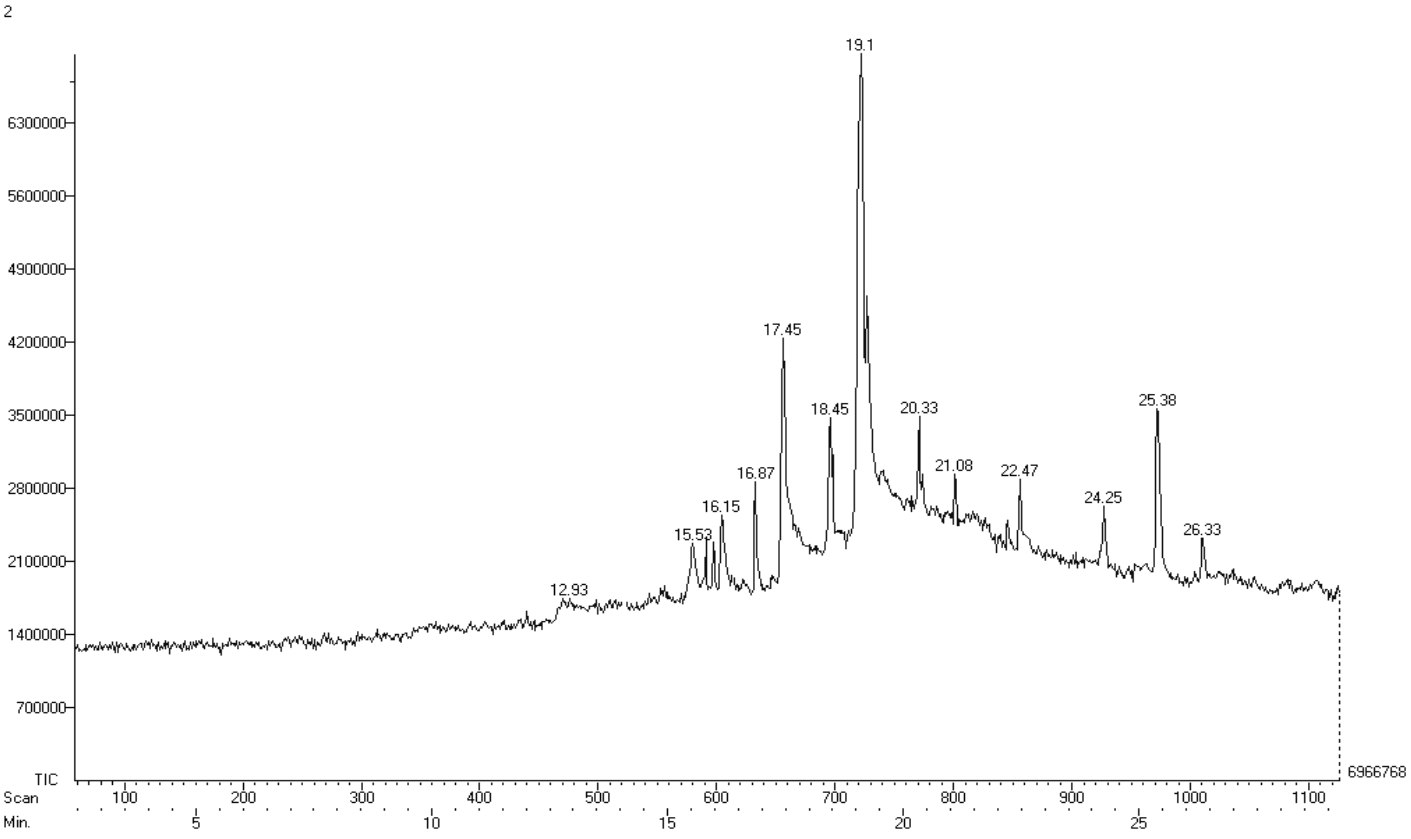

Fig. 1: Chromatogram of *Coconut haustorium* hexane extract

Table 2: Phytoconstituents of *Coconut haustorium* hexane extract identified through GC-MS

No	Name of the compound	Retention time	Molecular Formula	Molecular Weight (g/mol)	Area %
1	Allyl [2-methylphenyl]sulphide	12.93	$C_{10}H_{12}S$	164.27	3.9
2	Quinoline, 5-nitro,1-oxide	15.53	$C_9H_6N_2O_3$	190.16	5.8
3	2H- Indenol [1, 2-b]furan-2-one,3,3a,4,5,6,7,8,8b, octahydro -8,8-dimethyl	16.15	$C_{13}H_{18}O_2$	346.4	6.8
4	Flavone	16.87	$C_{15}H_{10}O_2$	222.24	22
5	Cetylic acid	17.45	$C_{16}H_{32}O_2$	256.42	22.6
6	16-Octadecenoic acid, methylester	18.45	$C_{19}H_{36}O_2$	296.5	11.4
7	Oleic Acid	19.1	$C_{18}H_{34}O_2$	282.5	34.5
8	Imidazole- 5- methanol,2-ethyl 1-methyl -a-(4-methylphenyl) -a-phenyl	20.33	$C_{11}H_{12}N_2O$	188.23	11.3
9	N- [4-[4,4-Diethyl-1,4-dihydro 2H-benzo [d] [1,3]oxazin-2-yl]-phenyl] – acetamide	21.08	$C_{20}H_{24}N_2O_2$	324.4	11.1
10	Tricosan -2-ol	22.47	$C_{23}H_{48}O$	340.6	6.2
11	Quinazolin -4 [3H]-one , 3 (3- methoxyphenyl]-2-[2-phenylethenyl]	24.25	$C_{23}H_{18}N_2O_2$	354.4	7.3
12	Benzoic Acid 2,4-dimethoxy-6-methyl[8,8-dimethoxy-2-octyl]ester	25.38	$C_{20}H_{32}O_6$	368.5	19.3
13	2,3,16,17-Octadecanetetraone tetraoxime	26.33	$C_{18}H_{34}N_4O_4$	370.494	8.8

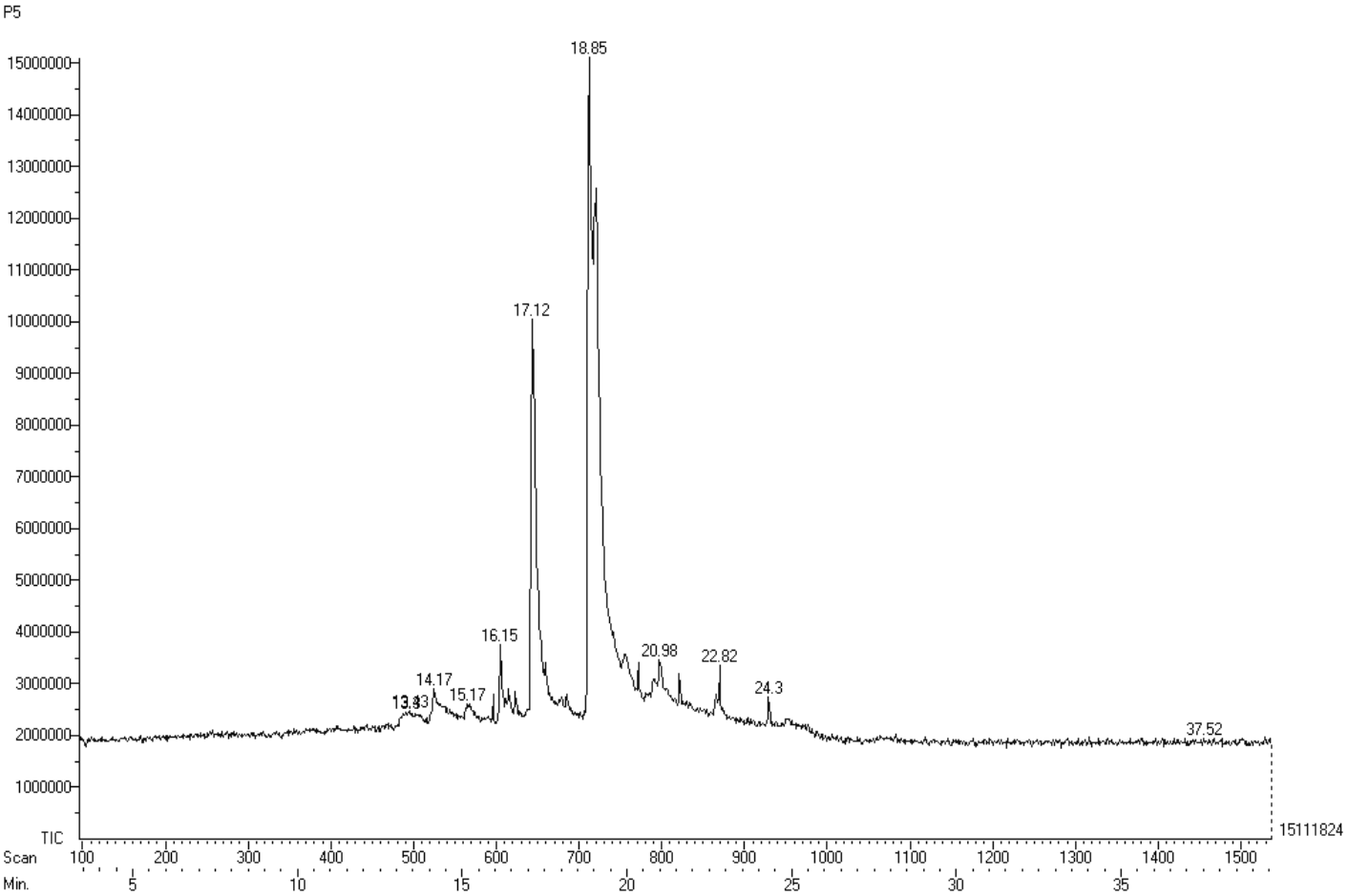

Fig. 2: Gas Chromatogram of *Coconut haustorium* methanolic extract

Table 3: Phytoconstituents of *Coconut haustorium* methanolic extract identified using GC-MS

No	Name of the compound	Retention time	Molecular Formula	Molecular Weight	Area %
1	Phenol 2 - propyl	13.43	$C_9H_{12}O$	136.1910	4
2	Cumarin- 3 - carboxylic acid , 7-methoxy	14.17	$C_{11}H_8O_5$	220.18	15.7
3	Flavone	15.17	$C_5H_{10}O_2$	222.24	9.3
4	5- Cyclohexadecen-1-one	16.5	$C_{16}H_{28}O$	236.39	15.5
5	Hexadecanoic acid, methylester	17.12	$C_{17}H_{34}O_2$	270.4507	100
6	Methyl oleate	18.85	$C_{19}H_{36}O_2$	296.5	100
7	Isopropyl stearate	20.98	$C_{21}H_{42}O_2$	326.6	14.2
8	Phenol, 2,6-bis (1,1-dimethylethenyl)-4-[(4-352-hydroxyl-3, 5-dimethylphenyl) methyl]	22.82	$C_{32}H_{30}O_2$	326.5	14
9	3,4-Dihydroxy-1, 6 bis (3-methoxyphenyl)-hexa-2,4-diene-1,6-dione	24.3	$C_{20}H_{18}O_6$	354.358	10.9

4. CONCLUSION

The present study reveals that phytocomponents present in hexane and methanolic extracts are effective against diseases. The results of GC-MS prove that the compounds are potent and are responsible for therapeutic purposes. Further isolation of compounds and subjecting it to biological activity will brighten up the properties of CH in the field of traditional medicine.

5. ACKNOWLEDGEMENT

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Conflict of interests

None declared

6. REFERENCES

1. Ajayi IA, Ajibade O, Oderinde RA. *Research Journal of Chemical sciences*, 2011; **1(3)**:58-62.
2. Kia FJ, Lorigooini Z, Khoei HA. *Journal of Herbmed Pharmacology*, 2018; **7(1)**:1-7.
3. Esmat AU, Mittapally S, Begum S.*Journal of Drug Delivery and Therapeutics*, 2020; **10(2)**:53-58.
4. Sagbo IJ, Orock AE, Kola E, Mbeng WO. *Pharmacognosy Research*, 2020; **12(1)**:35-39.
5. DebMandal M, Mandal S. *Asian Pacific Journal of Tropical Medicine*, 2011; 241-247.
6. Naskar S, Mazumder UK, Pramanik G, Gupta M, Kumar RBS, Bala A, et al. *Journal of Ethnopharmacology*, 2011; **138(3)**:769-773.
7. NaskarA, Mazumder UK, Pramanik G, Saha P, Haldar PK, Gupta M. *Inflammopharmacology*, 2013; **21**:31-35.
8. Cholan PK, Manipal S, Rajmohan, Kumar R. *Journal of pharmaceutical sciences and research*, 2017; **9(2)**:251-254.
9. Pinto IFD, Silva RP, Filho ABC, Dantas LS, Bispo VS, Matos IA, et al. *Journal of Medicinal Food*, 2015; **18(7)**:802-809.
10. Adebayo JO, Santana AEG, Krettli AU. *Human and experimental toxicology*, 2012; **31(3)**:244-249.
11. Lima EBC, Sousa CNS, Vasconcelos GS, Meneses LN, Pereira YFS, Ximenes NC, et al. *Journal of Natural Medicines*, 2016; **70**:510-521.
12. Akinyele TA, Okoh OO, Akinpelu DA, Okoh AI. *Molecules*, 2011; **16(3)**:2135-2145.
13. Renjith RS, Chikku AM, Rajamohan T.*Asian pacific journal of biomedicine*, 2013; **6(10)**:804-810.
14. Manivannan A, Bhardwaj R, Padmanabhan S, Suneja P, Hebbar KB, Kanade SR. *Food Chemistry*, 2018; **238:**153-159.
15. Arivalagan M, Manikantan MR, Yasmeen AM, Sreejith S, Balasubramanian D, Hebbar KB et al. *LWT-Food Science and Technology*, 2017: **89:**171-178.
16. Smita M, Bashir M, Haripriya S. *Journal of Food Measurement and Characterization,* 2019; **13(1):**61-69.
17. Valli SA, Gowrie SU.*Interantional journal of pharmacy and pharmaceutical sciences*, 2017; **9(3)**:129-142.
18. Wadood A, Ghufran M, Jamal SB, Naeem M, Khan A, Ghaffar A,*et al.Biochemistryand analytical biochemistry*, 2013: **2(4)**:1-4.
19. Banu KS Cathrine L. *International Journal of Advanced Research in Chemical Science*, 2015; **2(4)**:25-32.
20. Evans WC, Evans D, Trease GE. *Trease and Evan's Pharmacognosy*.15thed. Edinburgh, Toronto, WB Saunders; 2002.

21. Ghazali N, Abdullah NA, Bakar AA, Mohamad NK. *International Journal of Pharma and Bio Sciences*, 2014; **5(3)**:197-203.
22. BribiN. *Asian Journal of Botany,* 2018; **1(1):**1-6.
23. Sarian MN, Ahmed QU, So'ad SZM, Alhassan AM, Murugesu S, Perumal V, et al . *Biomed Research International*, 2017; **2017:**1-14.
24. Abbasi E, Nassiri-Asl M, Shafeei M, Sheikhi M. *Chemical biology and drug design*, 2012; **80(2):**274-278.
25. Wierzbicka MM,CzeczotH. *Europe PMC*, 2012; **33(198)**:364-369.
26. Hossain MA, AL-Raqmi KAS, AL-Mijizy ZH, Weli AM, Al-RiyamiQ. *Asian Pacific Journal of Tropical Biomedicine*, 2013; **3(9)**:705-710.
27. Sood A, Kaur P, Gupta R.*International Journal of Applied Biology and Pharmaceutical Technology*, 2012; **3(3)**:401-409.
28. Ludwiczuk A, Woźniak KS, Georgiev MI. *Pharmacognosy*, 2017; 233-266.
29. Yang W, Chen X, Li Y, Guo S, Wang Z, Yu X. *Natural Products Communications,* 2020; **15(3)**:1-13.
30. Stankovic MS. *KragujevacJouranl of Science,* 2011; **33**:63-72.
31. Gopalakrishnan S, Vadivel E. *International Journal of Pharma and Bio Sciences,* 2011; **2(1)**:313-320.
32. Sundaramoorthy PMK, Packiam, KK. *BMC Complementary Medicine and Therapies*, 2020; **20(129)**:1-12.