Eco. Env. & Cons. 29 (3) : 2023; pp. (1407-1413)
Copyright@ EM International
ISSN 0971–765X

DOI No.: http://doi.org/10.53550/EEC.2023.v29i03.061

Phyto compounds identified in the methanol extract of *Sphagneticola trilobata* using GC-MS

Ashmita Chhikara, Preety Rohilla, and Pushpa Dahiya*

Department of Botany, Maharshi Dayanand University, Rohtak 124 001, Haryana, India

(Received 10 May, 2023; Accepted 5 July, 2023)

ABSTRACT

Medicinal plants play a significant role in the effective treatment of various disorders. Healing and health giving with herbs is already taking boom in pharmaceutical industry. As certain plants possess highly effective phytocompounds endowed with potential treatments capabilities for various disorders like free radicles, microbial infections, tumorous growth, diabetes, inflammations and further more. Natural products play significant role in pharmaceutical world as they are high ability to bind and change the cellular target in affected area. Lesser seen after effects along with affordable prices highlights them and being naturally present makes them easily accessible. *Sphagneticola trilobata* is selected in the present study looking at its vast medicinal potential in literature as being potential therapeutic. Current study is based on highlighting various active compounds in methanol plant extract of *Sphagneticola trilobata* via Gas Chromatography-Mass Spectroscopy (GC-MS) using vegetative aerial parts. Herein 17 main compounds were identified using standard protocol of GC-MS. Major compounds revealed includes Acetyl chloride (17.94%), D-limonene (2.22%), Caryophyllene (1.53%), Phenol, 2,4 bis- (1,1dimethylethyl) (3.17%), Cyclooctasiloxanehexadecamethyl (2.69%), Dibutyl phthalate (3.70%), Dehydroabietic acid (17.39%), and Abietic acid (11.29%). These findings support the medicinal potential of the plant and furthermore studies are required to elucidate the mechanism of action of these phytocompounds in treating diversified disorders.

Key words: *S. trilobata, GC-MS, Phyto-compounds, Medicinal plants, Asteraceae family*

Introduction

Phytochemical is a term that refers to plant-derived therapeutic chemical compound known to have antioxidant, antimicrobial, anticarcinogenic, detoxifying, anti-inflammatory, immunity-boosting, and antimutagenic properties (Makhuvele *et al.* 2020; Rizeq *et al*. 2020; Koyama *et al*. 2021). In general, phytochemicals act as micro and macronutrients while synchronously uphold plants from ecological disasters for example different kinds of stress (drought, salt, freezing, flooding, etc.), pathogenetic attack, polluting environment, UV radiations, and furthermore (Saggu *et al.,* 2022). Secondary metabolites such asalkaloids, flavonoids, tannins, coumarins, phenols, terpenes, terpenoids, glycosides, and polysaccharides were found to have significantly higher pharmacological activity (Hussein and El-Anssary 2019; Jain *et al*. 2019; Solárová *et al*. 2020). These secondary metabolites are not nutritive, but are used for safekeeping plants as well as humans against various kinds of diseases. They are widely dispersed in distinct taxonomic categories throughout kingdom Plantae. Extensive ranges of phytochemicals are found in a single plant; therefore, it is uncertain to use the entire plant as a medicine reason being each work differently.

Sphagneticola trilobata commonly known as "yel-

low dot" or "widelia" is a traditional medicinal plant belongs to Asteraceae family. In past couple of decades, wide environment tolerance and self-sowing property has made this plant naturalised in various countries. According to literature this mat forming plant is reported topossess high pharmaceutical value and being used in treating diabetes, cancer, free-radicals, inflammations, severe pain, wound healing agent and even more (RV 2019; Afzal and Rajesh *et al*., 2021). This perennial plant prefers littoral zones and can grow up to the height of 60cm in low elevation areas. This plant especially its flowers and leaves were reported to have extraordinarily benefits for women health complications like childbirth, amenorrhea, and uterine contractions (Balekar *et al*., 2014; Suchantabud *et al*., 2017). The present investigation is planned to find out active compounds in the vegetative aerial parts of *Sphagneticola trilobata* by GC-MS analysis using methanolic plant extract. Herein, listed out chemical compounds from *Sphagneticola trilobata* may serve as a great way for the discovery of new pharmaceuticals.

Materials and Methods

Considering the objective of current academic work following materials and methods werepracticed:

Collection

Above mentioned plant *Sphagneticola trilobata* was collected from its natural territory around pond (littoral zone) from Jhajjar, Haryana, India. Only vegetative aerial parts (leaves and stem) were cropped form the well grown plants.According to the official global positioning system the plant is specifically collected from coordinates 28.6176° N, 76.6875° E.

Extraction and sample preparation

Collected aerial parts of the plants were cleaned up firstly using tap water twice; thereafter cleansed parts were decontaminated using double distilled water. Plant parts were then kept over the filter paper for shade-drying. After complete dehydration of plant parts, they were crushed to powder form for extraction procedure. Soxhlet extraction technique was used for the extraction of plant in methanol solvent in ratio 1:5 (w/v). Following extraction, the constituents were filtered using Whatmann filter paper. Before storage the filtered extract was kept in rotary evaporator for removing solvent to the fullest. Finally obtained extract was used insample preparation for GC-MS study. Herein 1:1 (mg/ml) ratio of methanolic plant extract and methanol solventwas taken in aneppendorf tube and solution was mixed using vortex shaker for further utilization in characterization process via GC-MS.

GC-MS analysis

Characterization of methanolic plant extract was performed using Shimadzu QP2010 GC–MS device

Table 1. Phytocompounds detected in the methanolic extract of *Sphagneticola trilobata* via GC-MS

S. No.	RT	Compound name	Molecular formula	Molecular weight	Area %	Peak height
1	2.42	1,5-Hexadien-3-yne	C_6H_6	78.1118	2.73	1352706.44
2	3.52	2,4-Azetidinedione, 3,3-diethyl	$C_7H_{11}NO_2$	141.17	1.31	819819.28
3	3.84	Acetyl chloride	C_2H_3ClO	78.50	17.94	13501087.56
4	3.89	2-Pentanone, 4-hydroxy-4-methyl	$C_6H_{12}O_2$	116.1583	25.51	10683320.60
5	5.58	D-Limonene	$C_{10}H_{16}$	136.2340	2.22	857326.01
6	7.77	Cyclohexasiloxanedodecamethyl	$C_{12}H_{36}O_6Si_6$	444.9236	2.80	2596534.74
7	8.66	Caryophyllene	$C_{15}H_{24}$	204.35	1.53	1132200.71
8	8.93	Cycloheptasiloxanetetradecamethyl	$C_{14}H_{42}O_7Si_7$	519.0776	2.80	2134343.51
9	9.10	Phenol, 2,4 bis- (1,1dimethylethyl)	$C_{14}H_{22}O$	206.32	3.17	1451197.35
10	9.38	5-Methoxy-2,2,6-trimethyl-1-(3-methyl-buta-1, 3-dienyl)-7-oxa-bicyclo[4.1.0]heptane	$C_{15}H_{24}O_2$	236.35	1.09	815275.03
11	9.68	Spathulenol	$C_{15}H_{24}O$	220.35	1.48	1238198.77
12	9.74	Caryophyllene oxide	$C_{15}H_{24}O$	220.35	1.27	770789.73
13	9.97	Cyclooctasiloxanehexadecamethyl	$C_{16}H_{48}O_8Si_8$	593.2315	2.69	2032404.29
14	11.04	Cyclononasiloxaneoctadecamethyl	$C_{18}H_{54}O_9Si_9$	667.4	1.06	800078.40
15	12.40	Dibutyl phthalate	$C_{16}H_{22}O_4$	278.34	3.70	2104449.40
16	18.70	Dehydroabietic acid	$C_{20}H_{28}O_2$	300.4	17.39	4833734.62
17	21.70	Abietic acid	$C_{20}H_{30}O_2$	302.451	11.29	2293575.13

Table 2. Mass spectra of identified phytocompounds in methanolic extract of *Sphagneticola trilobata* along with their structures.

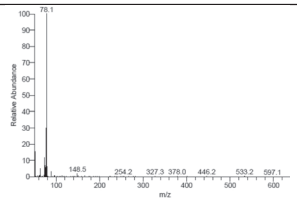
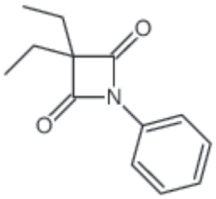
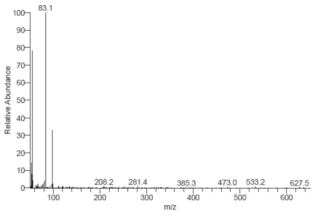
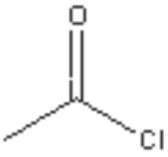
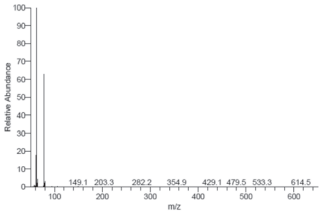
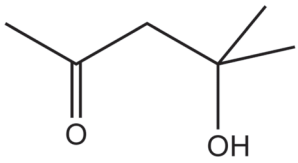
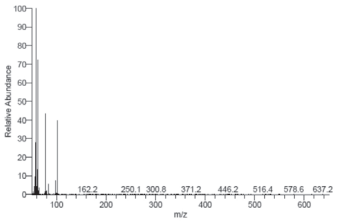
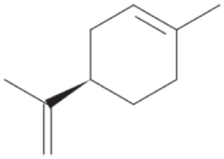
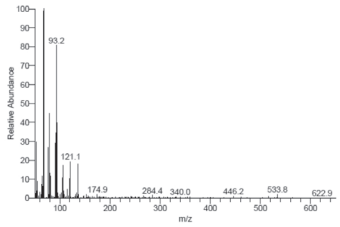
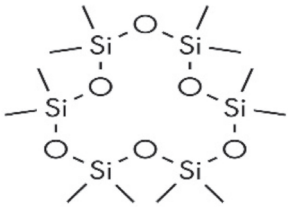
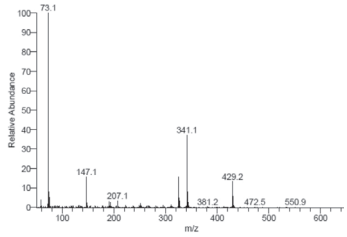
S. No.	Compound name	Compound Structure	Mass spectra
1	1,5-Hexadien-3-yne		
2	2,4-Azetidinedione, 3,3-diethyl		
3	Acetyl chloride		
4	2-Pentanone, 4-hydroxy-4-methyl		
5	D-Limonene		
6	Cyclohexasiloxanedodecamethyl		

Table 2. *Continued ...*

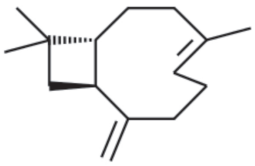
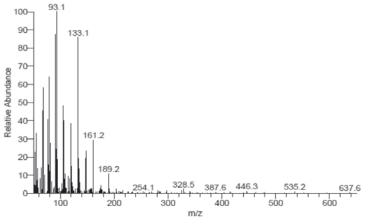
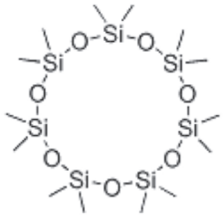
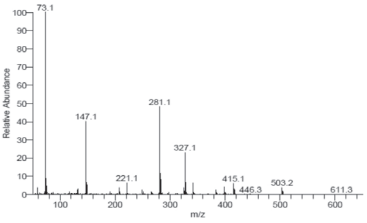
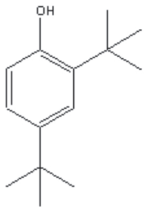
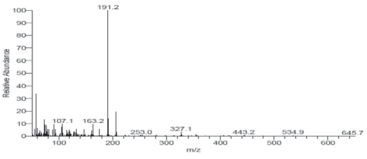
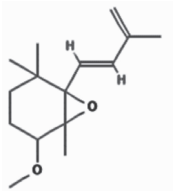
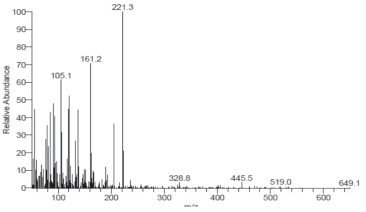
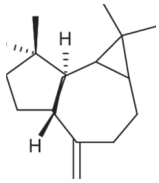
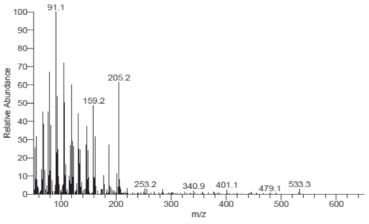
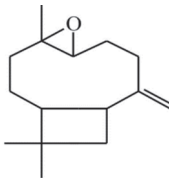
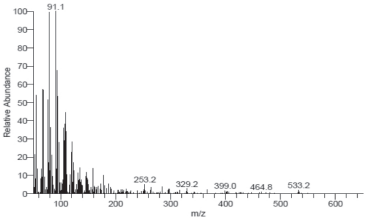
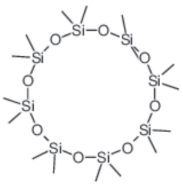
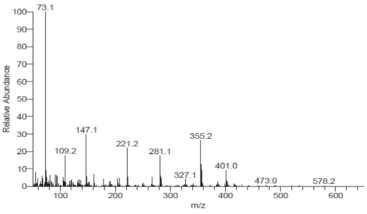
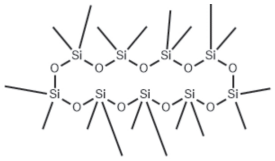
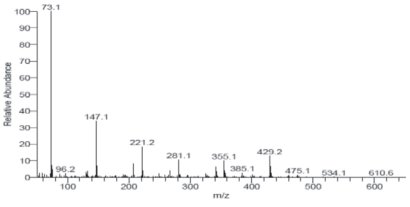
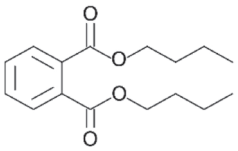
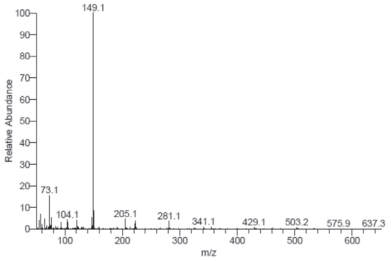
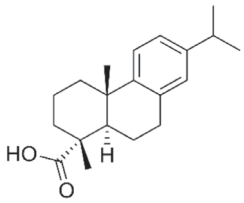
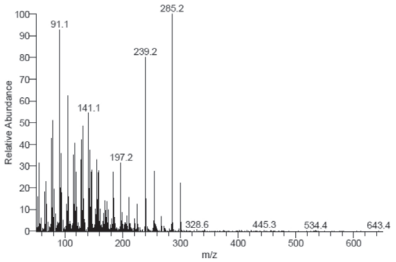
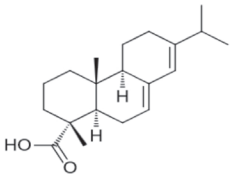
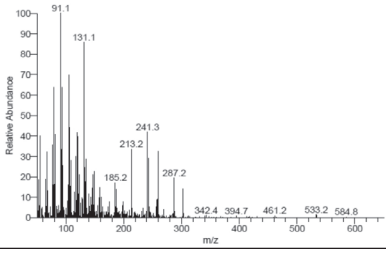
S. No.	Compound name	Compound Structure	Mass spectra
7	Caryophyllene		
8	Cycloheptasiloxanetetradecamethyl		
9	Phenol, 2,4 bis-(1,1dimethylethyl)		
10	5-Methoxy-2,2,6-trimethyl-1-(3-methyl-buta-1,3-dienyl)-7-oxa-bicyclo[4.1.0] heptane		
11	Spathulenol		
12	Caryophyllene oxide		
13	Cyclooctasiloxanehexadecamethyl		

Table 2. *Continued ...*

S. No.	Compound name	Compound Structure	Mass spectra
14	Cyclononasiloxaneoctadecamethyl		
15	Dibutyl phthalate		
16	Dehydroabietic acid		
17	Abietic acid		

from Tokyo, Japan. Instrument was outfitted with FID (flame ionization detector) conjoined with aZB-5MS silica capillary column. Helium (He) was the carrier gas in this procedure. Mass spectroscopy was conducted at 70 eV ionization energy with scanning range between 50-650 atomic mass units. Duration of operation was 25-30 minutes for the methanolic plant sample.

Results and Discussion

GC-MS analysis of methanolic extract of *Sphagneticola trilobata* revealed the presence of seventeen phytocompounds. Observed phytocompounds along with their retention time, molecular formula, molecular weight, peak area %, and peak height are mentioned in Table 1. Mass spectra of identified compounds along with the structures of respective phytocompounds are revealed in Table 2. Compounds prevailing in the methanolic extracts of *Sphagneticola trilobata* were 1,5-Hexadien-3-yne (2.73%), 2,4-Azetidinedione, 3,3-diethyl (1.31%), Acetyl chloride (17.94%), 2-Pentanone, 4-hydroxy-4-methyl (25.51%), D-Limonene (2.22%), Cyclohexasiloxanedodecamethyl (2.80%), Caryophyllene (1.53%), Cycloheptasiloxanetetradecamethyl (2.80%), Phenol, 2,4 bis- (1,1dimethylethyl) (3.17%), 5-Methoxy-2,2,6-trimethyl-1-(3-methyl-buta-1,3-dienyl)-7-oxa-bicyclo[4.1.0]heptane (1.09%), Spathulenol (1.48%), Caryophyllene oxide (1.27%), Cyclooctasiloxanehexadecamethyl (2.69%),

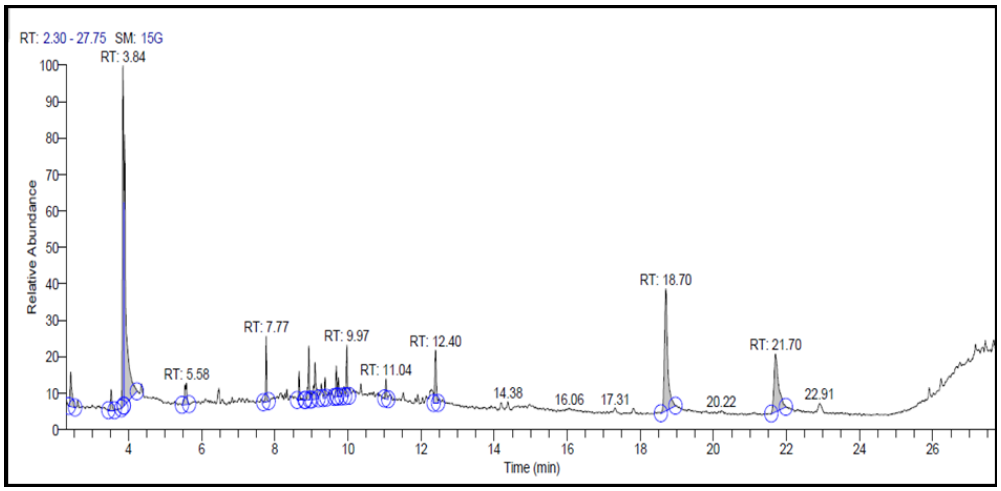


Fig. 1. GC-MS chromatogram using methanolic extract of *Sphagneticola trilobata* vegetative aerial parts

Cyclononasiloxaneoctadecamethyl (1.06%), Dibutyl phthalate (3.70%), Dehydroabietic acid (17.39%), and Abietic acid (11.29%). GC-MS chromatogram of *Sphagneticola trilobata* methanolic extract was shown in Fig. 1.

Identified compounds are known to possess several pharmacological activities like antimicrobial, antioxidant, anti-tumorous, anti-inflammatory, antidiabetic, immune boosting, wound healing, and feminine health related. Different researchers working in the field of phytocomponents have also reported various pharmacological potentials in the detected compounds like Paul *et al*. (2019) reported significant antibacterial activity along with high binding affinity with target protein in D-limonene. Kamaraj *et al.*(2017) mentioned antimalarial, anticancerous and antioxidant properties in caryophyllene. Katiwora *et al.*(2012) reported high antibacterial potentiality in dibutyl phthalate extracted from *Ipomea carnea* stem. Kang *et al.* (2008) concluded that dehydroabietic acid suppresses chronic inflammation during obesity and helps in improving insulin resistance. Roh *et al.*(2010) found out abietic acid extracted from pinus species as an inhibitory agent against testosterone 5á-reductase.

Conclusion

Current study concluded that *Sphagneticola trilobata* is a beneficial perennial shrub. GC-MS analysis of its methanolic extract using the vegetative aerial parts revealed the presence of seventeen important phytocompounds. The plant was found to have remarkable phytocompounds like acetyl chloride, d-limonene, caryophyllene, dibutyl phthalate, dehydroabietic acid, and abietic acid. Identified compounds turned outas potential therapeutics in the traditional medicinal system. Researchfinding have also justified their pharmacological importance ranging from antioxidant, antimicrobial, antidiabetic, anti-tumorous, and anti-inflammatory potential. The present study has provided a great basis to the scientists working on the ethnomedicinal usage of plants along with their pharmacological activity. Further scrutiny and appropriate mode of the action is still need of the time to avail the fruitful results in future.

Acknowledgements

Authors are highly obliged to the Department of Botany, Maharshi Dayanand University, Rohtak, Haryana, India for bestowing necessary facilities for the research.

Conflict of Interest

Authors affirms no conflict of interest.

References

Afzal, S. and Rajesh, B.R. 2021. Phytochemical screening and pharmacological evaluation of leaf extract of *Sphagneticola trilobata*. *World Journal of Pharmacognosy Research*. 10 (9): 1143-1154.

Balekar, N., Nakpheng, T. and Srichana, T. 2014. *Wedelia trilobata* L. A phytochemical and pharmacological review. *Chiang Mai Journal of Science.* 41(3): 590-605.

Hussein, R.A. and El-Anssary, A.A. 2019. Plants secondary metabolites: the key drivers of the pharmacological actions of medicinal plants. *Herbal Medicine*. 1(3): 11-28.

Jain, C., Khatana, S. and Vijayvergia, R. 2019. Bioactivity of secondary metabolites of various plants: a review. *International Journal of Pharmaceutical Science and Research.* 10(2): 494-504.

Kamaraj, C., Balasubramani, G., Siva, C., Raja, M., Balasubramanian, V., Raja, R.K., Tamilselvan, S., Giovanni, B. and Perumal, P. 2017. Ag nanoparticles synthesized using β-caryophyllene isolated from Murrayakoenigii: antimalarial (*Plasmodium falciparum* 3D7) and anticancer activity (A549 and HeLa cell lines). *Journal of Cluster Science*. 28: 1667-1684.

Kang, M.S., Hirai, S., Goto, T., Kuroyanagi, K., Lee, J. Y., Uemura, T., Ezaki, Y., Takahashi, N. and Kawada, T. 2008. Dehydroabietic acid, a phytochemical, acts as ligand for PPARs in macrophages and adipocytes to regulate inflammation. *Biochemical and Biophysical Research Communications*. 369(2): 333-338.

Khatiwora, E., Adsul, V.B., Kulkarni, M., Deshpande, N.R. and Kashalkar, R.V. 2012. Antibacterial activity of Dibutyl Phthalate: A secondary metabolite isolated from Ipomoea carnea stem. *Journal of Pharmacy Research.* 5(1): 150-152.

Koyama, S., Kondo, K., Ueha, R., Kashiwadani, H. and Heinbockel, T. 2021. Possible use of phytochemicals for recovery from COVID-19-induced anosmia and ageusia. *International Journal of Molecular Sciences*. 22(16): 8912.

Makhuvele, R., Naidu, K., Gbashi, S., Thipe, V.C., Adebo, O.A. and Njobeh, P.B. 2020. The use of plant extracts and their phytochemicals for control of toxigenic fungi and mycotoxins. *Heliyon*. 6(10): 1-11.

Paul, P., Sameera, U., Geetha K. and Bilichodmath, S. 2019. Antimicrobial Property of Lemongrass Oil against Porphyromonas Gingivalis. *Canadian Journal of Dentistry.* 3(1): 1-15.

Rizeq, B., Gupta, I., Ilesanmi, J., AlSafran, M., Rahman, M.M. and Ouhtit, A. 2020. The power of phytochemicals combination in cancer chemoprevention. *Journal of Cancer*. 11(15) : 4521.

Roh, S.S., Park, M.K. and Kim, Y.U. 2010. Abietic acid from Resina Pini of Pinus species as a testosterone 5α-reductase inhibitor. *Journal of Health Science*. 56(4): 451-455.

RV, S.R. 2019. Primary phytochemical investigation of *Sphagneticola trilobata* (L.) *Puruski. Journal of Pharmacognosy and Phytochemistry.* 8(1): 968-971.

Saggu, A.K., Tomer, V., Kumar, A. and Pandey, P. 2022. Consideration of Phytonutrients, Probiotics and Prebiotics for enhanced immunity during disaster relief situation-A review. *Clinical Nutrition Open Science*. 47 (2023): 131-146.

Solárová, Z., Liskova, A., Samec, M., Kubatka, P., Büsselberg, D. and Solár, P. 2020. Anticancer potential of lichens' secondary metabolites. *Biomolecules*. 10(1): 87.

Suchantabud, A., Katisart, T. and Talubmook, C. 2017. Chronic toxicity of leaf extract from *Sphagneticola trilobata* (L.) Pruski. *Pharmacognosy Journal*. 9(3) : 323-328.