International Journal of Advance Research in Science and Engineering
Vol. No.6, Issue No. 01 , January 2017
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

SCREENING OF GC-MS COMPOUNDS IN SOME PTERIDOPHYTES OF NORTHERN WESTERN GHATS

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ABSTRACT

In the present investigation, the bioactive compounds of Acrostichum aureum L. , Asplenium trapeziformae Wall., Blechnum orientale Linn., Dicranopteris linearis (Burm.F.) Underwood and Lygodium flexuosum L. have been evaluated by using GC-MS. The chemical components of whole plant ethanol extracts of all above species are investigated using Perkin-Elmer Gas Chromatography- Mass Spectroscopy. In recent years GC-MS studies have been increasingly applied for the analysis of medicinal plants. This technique has proved to be a valuable method for the analysis.

GC-MS analysis of A. aureum, A. trapeziformae, B. orientale, D. linearis and L. flexuosum in ethanol extract revaluated the existence of the GC-MS Chromatogram of the 11, 14, 5, 3 and 7 peaks respectively. The major compounds like Tetradecanoic acid, ethyl ester, n-Hexadecanoic acid, Hexadecanoic acid, ethyl ester and Octadecanoic acid, ethyl ester shows important medicinal properties. So, all these fern species shows a characteristic medicinal potential.

Keywords:- GC-MS analysis, Bioactive compounds, Tetradecanoic acid, ethanol extract.

I. INTRODUCTION

Pteridophytes are primitive vascular plants, which can adopt well in terrestrial habitat. With the introduction of ethno-botany, many attempts have been made on the study of relationships of plants particularly for medicinal value of pteridophytes. (Singh L. *et.al.* 2001). *Acrostichum aureum* Linn., belongs to the family Pteridaceae, a large terrestrial plant observed in flooded areas during rainy seasons and at high tides, its association with mangroves is common in Kerala. (Easa P S, 2003). *A. aureum* is a highly medicinal pteridophyte. Rhizomes are used for the healing of stubborn ulcers. Leaves used topically as emollient. In Malaya and Borneo, powdered or grated rhizomes applied as paste to wounds and boils. Fronds and roots are applied to syphilitic ulcers. In Bangladesh, leaves used for cloudy urination in women. (GOLDEN LEATHER FERN Philippine).

Asplenium trapeziformae Wall. is an Epiphytic fern belongs to the family Aspleniaceae. The fern *A. trapeziformae* Wall. is used as a disputative and sedative in Philippines Quisumbing, E. (1951). The plant is antibacterial and used in sore and ulcer Singh, H.B. (1999). It is grown as an ornamental fern and also used in ornamental plaitory Fosberg, F.R. (1942). *Blechnum orientale* Linn belonging to family Blechnaceae is one of

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the medicinally important pteridophyte. This fern is used ethno medicinally for the treatment of various skin diseases, stomach pains, urinary bladder complaints and sterilization of women. (Lai How *et.al* 2010).

Dicranopteris linearis (Burm. F.) Underwood. is a unique terrestrial fern with long creeping , dichotomously branched rhizome. This plant shows some economic importance, rhizome is used as anthelmintic, fronds are used for asthma, fluid extracted from fronds shows antibacterial activity(Manickam and Irudayaraj 1992).

Lygodium flexuosum (L.) Sw. is a large terrestrial climbing rhizomatous perennial fern belongs to the family Lygodiaceae. (Manickam & Irudayaraj,1992). The fern *L. flexuosum* very commonly used in treating various ailments like jaundice, dysmenorrhea, wound healing and eczema. Rhizome powder is useful in skin diseases. Plants are used as expectorant, rheumatism, sprains, scabies, eczema and cut wounds. Fresh roots boiled with mustered oil used in casbundes and rheumatism (Upreti *et al.* 2009).

Gas Chromatography–Mass Spectroscopy (GC-MS) is normally used for direct analysis of components existing in traditional medicines and medicinal plants. In recent years GC-MS studies have been increasingly applied for the analysis of medicinal plants. This technique has proved to be a valuable method for the analysis.

II. MATERIAL AND METHODS

Plant material

All the fern species are collected during rainy season from Sawantwadi, Radhanagari, Castle Rock, Anmode and its environs. The plant specimens are identified with help of Pteridophyte flora of Western Ghats, South India (Manickam and Irudayaraj 1992). The voucher specimens are deposited in the Department of Botany, Jaysingpur College.

Then the plants are washed thoroughly with distilled water and subjected to drying in shadow till proper drying. Thus dried plant material is powdered finally using grinder. The sample is transferred in to air tight container with proper labeling.

Preparation of extract - The rhizome of all selected species are dried and pulverized to powder in a mechanical grinder. Required quantity (5 gm) plant materials are weighed and subjected to Soxhlet extraction with 50ml Ethanol separately. The extracts then concentrated to 5ml and employed in GC-MS analysis for different compounds.

GC-MS Analysis - For quantification of compounds Mass Spectra are recorded in the Selective Iron Monitoring (SIM) mode use NIST library.

Identification of Compound- Interpretation on mass spectrum GC-MS are conducted using the database of National Institute Standard and Technology (NIST) having more than 62,000 patterns. The spectrum of the unknown components are compared with the spectrum of the known components stored in the NIST library.

III. RESULT AND DISCUSSION

The components present in the ethanolic extract of rhizome of *A. aureum* are identified by GC-MS analysis. The active principles with their retention time (RT), molecular formula, molecular weight (MW) and concentration (% peak area) are presented in table 1. The GC-MS chromatogram of 11 peaks of compounds detected are

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shown in fig.1. The compounds present in the ethanol extract of whole plant of *A. trapeziformae* presented in Table 2, the GC-MS chromatogram of 14 peaks of compounds detected are shown in fig. 2. *B. orientale* showed the presence of 5 picks Fig. 3. The active principles of the compounds are shown in Table 3. The GC-MS chromatogram three compound peaks of the *D. linearis* are shown in Figure 4, active principles of these compound are depicted in Table 4. The GC-MS chromatogram of the seven compound peaks of *L. flexuosum* are shown in Figure 5. These active principles of these compounds are depicted in Table5.

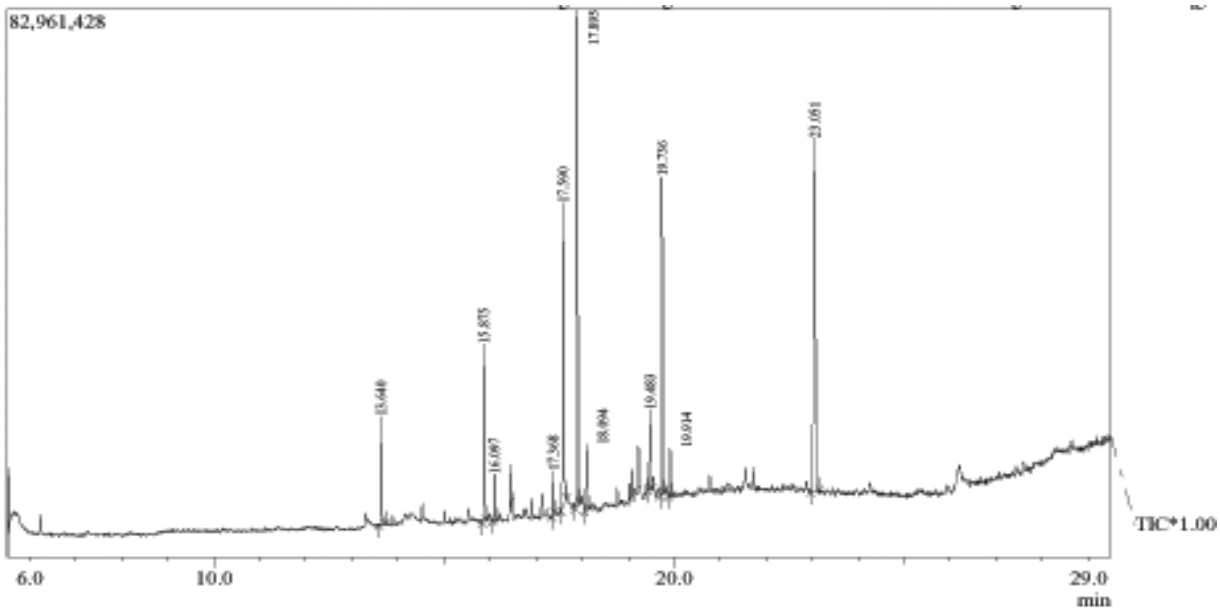

Fig.1.GC-MS Chromatogram of ethanolic extract of whole plant extract of *A. aureum*

Table 1: Analyzed Bioactive Compound from *A. aureum* showing following compounds

Sr No	Bioactive Compounds	Molecular Weight	Molecular Formula	CAS Value	Retention time
1.	Dodecanoic acid, ethyl ester	228 gram	$C_{14}H_{28}O_2$	106-33-2	13.59-13.72
	Tetradecanoic acid, ethyl ester	256 gram	$C_{16}H_{32}O_2$	124-06-1	15.84-15.90
	n-Octadecane	254 gram	:$C_{18}H_{38}$	593-45-3	16.05- 16.13
	Dibutyl phthalate	278 gram	$C_{16}H_{22}O_4$	84-74-2	17.34-17.40
	n-Hexadecanoic acid	256 gms	$C_{16}H_{32}O_2$	57-10-3	17.55-17.66
	Hexadecanoic acid, ethyl ester	284 gms	$C_{18}H_{36}O_2$	628-97-7	17.85-17.94
	Heneicosane	296 gms	$C_{21}H_{44}$	629-94-7	18.05-18.14
	Ethyl Oleate	310 gms	:$C_{20}H_{38}O_2$	111-62-6	19.42-19.51
	Octadecanoic acid, ethyl ester	312 gms	$C_{20}H_{40}O_2$	111-61-5	19.70-19.78
	Docosane	310 gms	$C_{22}H_{46}$	629-97-0	19.88-19.95
	Di-n-octyl phthalate	390 gms	$C_{24}H_{38}O_4$	117-84-0	22.96-23.15

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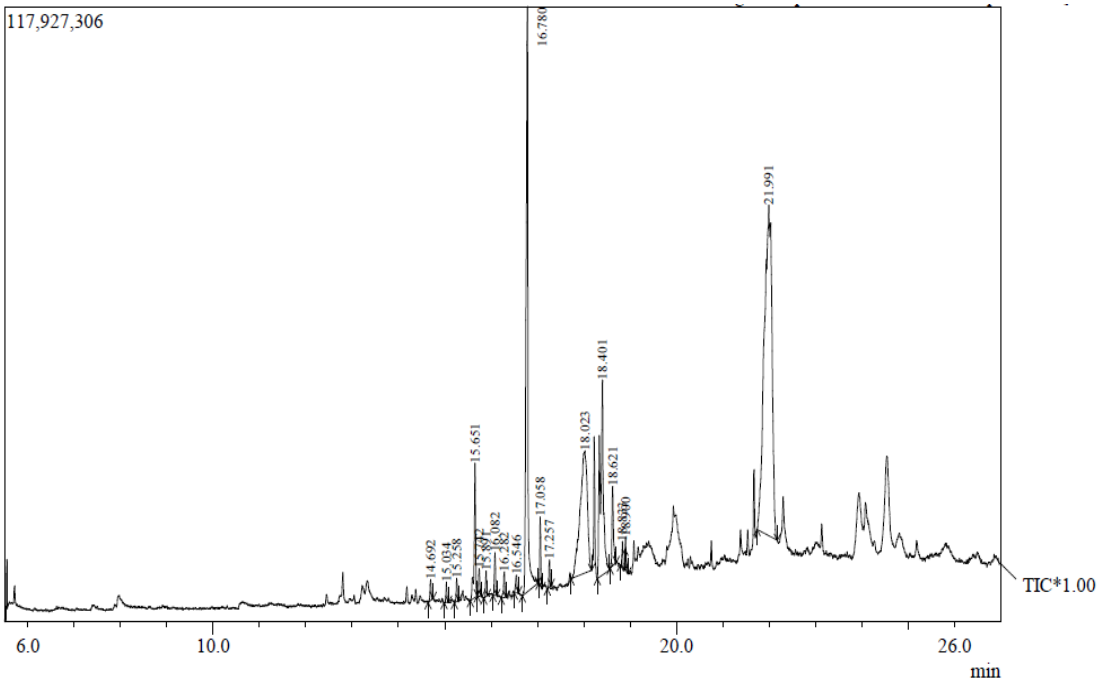

Fig. 2. GC-MS Chromatogram of ethanolic extract of whole plant of *A. trapeziformae*

Table 2: Analyzed Bioactive Compound from *A. trapeziformae* showing following compounds

Sr No	Bioactive Compounds	Molecular Weight	Molecular Formula	CAS Value	Retention time
01.	Tetradecanoic acid	228 gms	$C_{14}H_{28}O_2$	544-63-8	14.64- 14.75
	Tetradecanoic acid, ethyl ester	256 gms	$C_{16}H_{32}O_2$	124-06-1	14.98-15.08
	Octadecane	254 gms	$C_{18}H_{38}$	593-45-3	15.20- 15.30
	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	296 gms	$C_{20}H_{40}O$	102608-53-7	15.55- 15.70
	Pentadecanoic acid	242 gms	$C_{15}H_{30}O_2$	1002-84-2	15.70- 15.80
	Octacosane -	394 gms	$C_{28}H_{58}$	630-02-4	16.21- 16.32
	Phthalic acid, bis-(10-hydroxy-decyl ester	478 gms	$C_{28}H_{46}O_6$	-----	16.50- 16.59
	n-Hexadecanoic acid	256 gms	$C_{16}H_{32}O_2$	57-10-3	16.67- 17.01
	Hexadecanoic acid, ethyl ester	284 gms	$C_{18}H_{36}O_2$	628-97-7	17.03- 17.10
	Eicosane	282 gms	$C_{20}H_{42}$	112-95-8	17.20- 17.30
	10-Nonadecanone	282 gms	$C_{19}H_{38}O$	504-57-4	17.72- 18.16
	9-Octadecenoic acid,	282 gms	$C_{18}H_{34}O_2$	112-79-8	18.29- 18.55
	Octadecanoic acid	284 gms	$C_{18}H_{36}O_2$	57-11-4	18.56- 18.70
	Octadecanoic acid, ethyl ester	312 gms	$C_{20}H_{40}O_2$	111-61-5	18.89- 18.95
	Lup-20(29)-en-3-ol, acetate, (3.beta	468 gms	$C_{32}H_{52}O_2$	1617-68-1	21.74- 22.17

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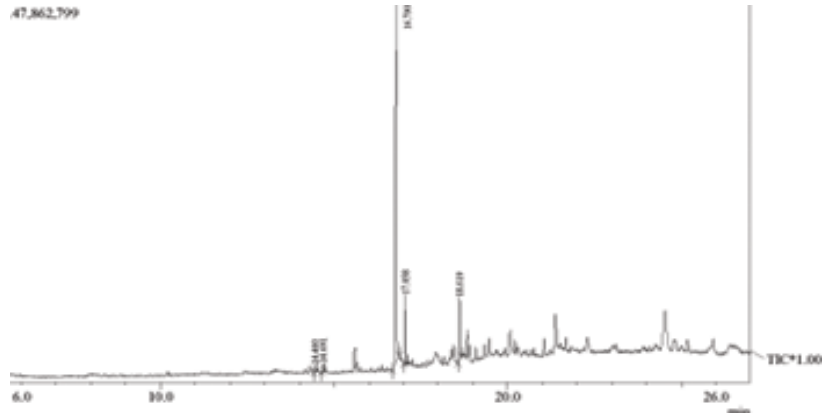

Fig.3: GC-MS Chromatogram of ethanolic extract of whole plant extract of *B. orientale*

Table 3: Analyzed Bioactive Compound from of *B. orientale* showing following compounds

Peak No.	Retention Time (RT)	Compound Analyzed	Molecular Formula	Molecular Weight	Peak Area %
1.	14.458	4,4- Dimethyl-cyclohex-2-en-1-ol	$C_8H_{14}O$	126	1.20
2.	14.692	Tetradecanoic acid (Myristic acid)	$C_{14}H_{28}O_2$	284	1.03
3.	16.782	n-Hexadecanoic acid	$C_{16}H_{20}O_2$	256	80.80
4.	17.058	Hexadecanoic acid,ethyl ester	$C_{18}H_{36}O_2$	284	7.74
5.	18.617	Octadecanoic acid	$C_{18}H_{36}O_2$	284	9.23

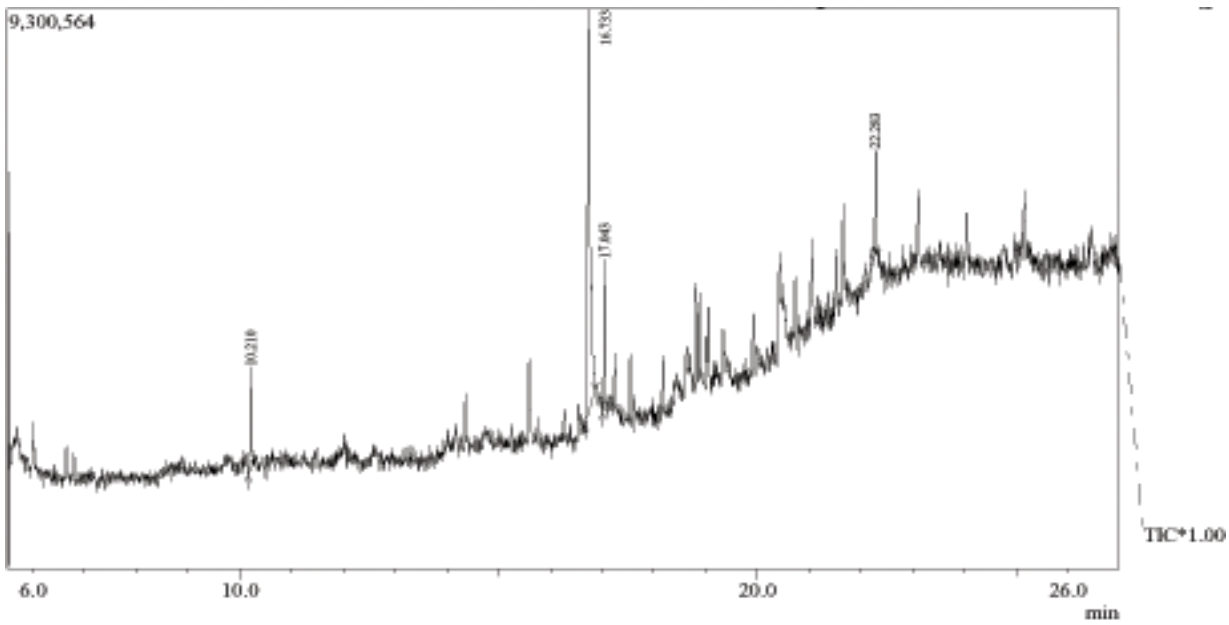

Fig.4. GC-MS Chromatogram of ethanolic extract of whole plant extract of *D. linearis*.

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TABLE 4 : Analyzed Bioactive Compound from *D. linearis* showing following compounds

Sr No	Bioactive Compounds	Molecular Weight	Molecular Formula	CAS Value	Retention time
01.	Nonane, 1,1-diethoxy	216 gms	$C_{13}H_{28}O_2$	54815-13-3	10.15-10.25
	n-Hexadecanoic acid	256 gms	$C_{16}H_{32}O_2$	57-10-3	16.66-16.87
	Hexadecanoic acid, ethyl ester	284 gms	$C_{18}H_{36}O_2$	628-97-7	17.01- 17.07

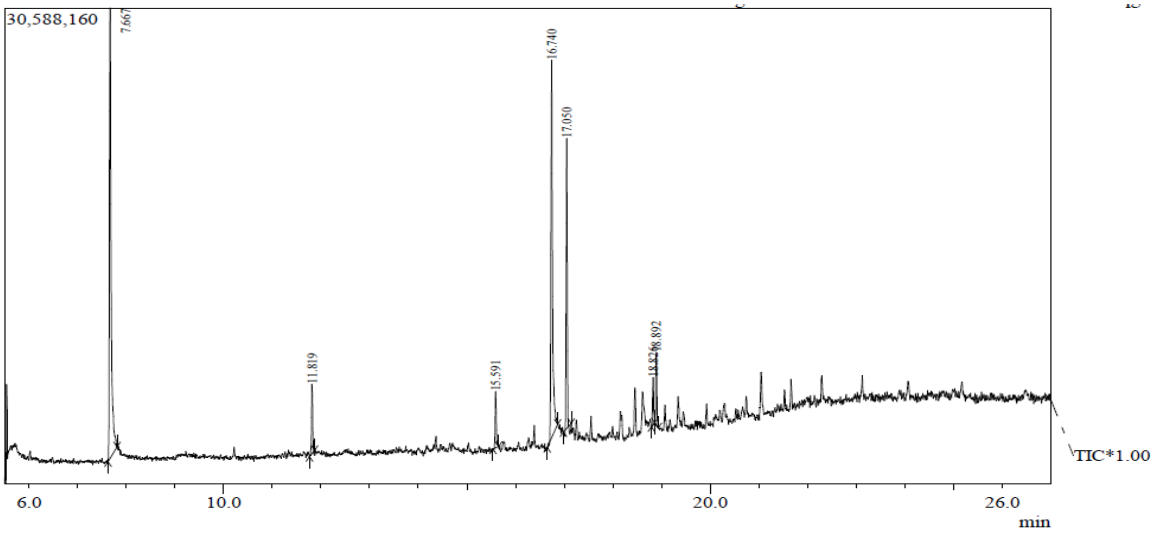

Figure.5. GC-MS Chromatogram of ethanolic extract of whole plant of *L. flexuosum*.

Table 5: Analyzed Bioactive Compound from *L. flexuosum* showing following compounds

Sr. No.	Bioactive Compounds	Molecular Weight	Molecular Formula	Retention time	Area %
1.	Benzene, 1-chloro-4-	156 gms	C_8H_9ClO	7.66	39.94
2.	Butylated Hydroxytoluene	220 gms	$C_{15}H_{24}O$	11.81	3.76
3.	2-Pentadecanone, 6,10,14-trimethyl	268 gms	$C_{18}H_{36}O$	15.59	3.19
4.	n-Hexadecanoic acid	256 gms	$C_{16}H_{32}O_2$	16.74	31.14
5.	Hexadecanoic acid, ethyl ester	284 gms	$C_{18}H_{36}O_2$	17.05	15.20
6.	Hexadecanoic acid, butyl ester	312 gms	$C_{20}H_{40}O_2$	18.82	2.60
7.	Octadecanoic acid, ethyl ester	312 gms	$C_{20}H_{40}O_2$	18.89	4.16

Above all five species shows the common most prevailing compounds like Tetradecanoic acid, ethyl ester, n-Hexadecanoic acid, Hexadecanoic acid, ethyl ester and Octadecanoic acid, ethyl ester.

Tetradecanoic Acid (Myristic acid) is used as an Antioxidant lubricant hypercholesterolemic cancer preventive, N-hexadecanoic acid (palmitic acid) having antioxidants, hypochloresterolenic, nematiside, pestiside, lubricant, antiandrogenic flavor, hemolytic properties . Sermakkani, M and Thangapandian, V. (2012).

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Octadecanoic acid, ethyl ester known to have potential antibacterial and antifungal activity (MC Grew *et.al* 2012; Seidel V. Taylor 2004) and Hexadecanoic acid (Palmitic Acid) is Having antioxidants hypocholesterolenic nematicide, pesticide, lubricant antiandrogenic flavor, hemolytic 5 alpha reductase inhibitor Antifibronolytic and antialopecic properties Sermakkani, M and Thangapandian, V. (2012).

IV. CONCLUSION

In the present study these four chemical compounds have been identified from ethanolic extract of the rhizome of *A. aureum*, *A. trapeziformae*, *B. orientale*, *D. linearis* and *L. flexuosum* by GCMS analysis. The presence of various bioactive compounds justifies the use of plant for various ailments by traditional practitioners.

V. ACKNOWLEDGEMENT

The authors are grateful to UGC, New Delhi for financial assistance and the Principal, Jaysingpur College, Jaysingpur for providing laboratory facilities.

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