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An account of Antioxidant Potential in Pteridophytes: A Biochemical Perspective

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ABSTRACT

Plants manufacture a remarkably diverse variety of over 50,000 low molecular mass natural compounds also referred as secondary metabolites. The Pteridophytes in the Plantae are ancient yet modern representatives of the plant world. In addition to the unique and specific active biochemical ingredients pteridophytic plants houses innumerable minerals, vitamins, alkaloids, saponins, phenols, tannins, phytosterols, triterpenes and terpenoids in a substantial amount. Pteridophytes are one of the most important plant groups that enrich in Antioxidants and have been used significantly and successfully in folk medicine for several years. Antioxidants are molecular substances that prevent various cellular target molecules from oxidative damage. Pteridophytic antioxidants can neutralize the effect of AOS which are one of the several factors involved in various physiological malfunctioning of living organisms. Various pharmaceuticals formulations and bioinformatic approaches for drug designing in respect of chemical ligand binding and bioactivity assay *in vitro* as well as *in vivo* with reference to these antioxidants can relive disorders whose medicines are not yet available such as cancer. The antioxidant composition Pteridophytic generas also can aid in solving the phylogenetic puzzle and its chemotaxonomic approaches could also contribute in a new and revised system of Plant classification.

Keywords: Antioxidant, Pteridophtes, Metabolites, AOS, Pharmacological

India is a mega diversity nation with its unique and diverse floral and faunal pool. The representatives of Kingdom Plantae are the most integral part of nature[1]. The Plant kingdom is nature's own treasure box with reference to the fact of housing uncountable potential biochemical compounds and drugs, which are very useful to human beings[2]. Plant drugs are naturally available, economical, highly efficient and rarely have side effects[3]. Plants manufacture a remarkably diverse variety of over 50,000 low molecular mass natural compounds also referred as secondary metabolites[4]. Plants are considered as the major source of natural antioxidants. Several chemical compounds synthesized by plants like Polyphenols (Flavonoids, Phenolic acids, Lignans, Tannins, Anthocyanins, Catechins, Isoflavones), vitamins and pro-vitamins (ascorbic acid, α-tocopherol and β-carotene) act as Antioxidants[5-7].

The Pteridophytes in the Plantae are ancient yet modern representatives of the plant world[8]. Pteridophytes hold a unique identity between the cryptogams and phanerogams and thus hold the key for various probes on phylogenetic and morphological puzzles of the Kingdom Plantae[9]. In India about 950-1000 species of Pteridophytes has been reported among which 414 species of pteridophytes (219 at Risk, of which 160 critically endangered, 82 near-threatened and 113 rare) are threatened or rare[10]. In addition to the unique and specific active biochemical ingredients pteridophytic plants houses innumerable

minerals, vitamins, alkaloids, saponins, phenols, tannins, phytosterols, triterpenes and terpenoids in a substantial amount[1]. Pteridophytes are one of the most important plant groups that enrich in Antioxidants and have been used significantly and successfully in folk medicine for several years as mentioned in ancient literature[11-18]. The usage of Pteridophytes with respect to its medicinal values dates back to 2000 years. Pteridophytes form a major basis of Ayurveda, Homeopathy and Unani systems of medicine along with reported insecticidal activities[8]. Recent works done by many scientists reported that Pteridophytes has several pharmacological activites such as antimicrobial, anti tumor, anti diabetic, anticancer, and most important of all the antioxidant activity. Though Pteridophytes are known for their biological and pharmacological properties but very less attention is given to this group. In this review the main objectives is to highlight the antioxidant potential of various Pteridophytic genera in addition to their associated biochemical and functional perspectives.

Antioxidants

Antioxidants are molecular substances that prevent various cellular target molecules from oxidative damage. Oxygen (O_2), which plays the most important role in all living organism, also surprisingly creates adverse situation in the cell when it is present in higher concentrations. In conditions of oxidative stress, Dioxygen by its partial reduction generates Active Oxygen Species (AOS) such as singlet oxygen, super oxide radical anion, hydrogen peroxide etc[19]. These Free oxygen radicals starts multiple chain reaction comparable to nuclear fission reaction in a nuclear reactor causing adverse damage to the cell. Antioxidant removes these Free oxygen radicals by oxidizing themselves and inhibits other cellular oxidation reactions, preventing cell from the potential harmful and grave consequences of AOS[20]. Thus antioxidants neutralizes the effect of AOS which are one of the several factors involved in various physiological malfunctioning like cardiovascular diseases, neurological disorders and even cancer[21]. Antioxidants are generally categorized into two groups – synthetic and natural. Synthetic antioxidants like BHT (Butylated hydroxytoluene) and BHA (Butylated hydroxyanisole) have been widely used in food industries for decades, but recent studies found that this synthetic antioxidant has potential carcinogenicity[7 & 22]. So, now a day's scientists are giving more attention to sources of natural antioxidants as these are considered safer than synthetic ones. The reported Pteridophytic generas along with their antioxidant potentialities are summarized subsequently.

Antioxidant properties in *Selaginella*

Gayathri *et al*. (2005) studied the antioxidant properties of *Selaginella* species belonging to the family *Selaginellaceae* and their medicinal value. Three species of *Selaginella*, mainly *S. involvens* (Sw.), *S. delicatula* (Desv. Ex Poir.) Alston, and *S. wightii* Hieron. were mainly studied. They observed the antioxidant activity of these pteridophytes, *in vitro* lipid peroxidation assay and hydroxyl radical scavenging activity. The results showed that aqueous extract of *S. involvens* had maximum capacity for inhibition of lipid peroxidation. However this activity was found to be dose dependent. The water extract of these three species were also found to have varying levels of hydroxyl radical scavenging activity; *S. delicatula* showed more potency in hydroxyl radical scavenging activity compared to the other two species[23].

Natural Antioxidants in the 'Horsetails'

Field Horsetail *Equisetum arvense* L. (Equisetaceae) is rich in phenolic compounds that may play significant role as antioxidant[24]. Mimica-Dukic *et al*. (2008) made the preparations of three separated fractions of methanolic extract (EtOAc, n-BuOH and H_2O) from sterile stem of *Equisetum arvense* to investigate the total flavonoid content (TFC) in addition to determining the HPLC chemical profile of phenolic constituents in each extract. Further the antioxidant activity was experimented by measuring the total reducing power, inhibition of induced lipid peroxidation in liposome and free radical scavenging

capacity (RSC) in reference to DPPH and NO radicals. The results of HPLC-DAD phenolic identification and quantification of *E. arvense* extracts showed that the EtOAc extract mainly contains flavonoid glycosides like isoquercitrin, apigenin 5-*O*-glucoside and kaempferol 3-*O*-glycoside; in *n*-BuOH extract, beside isoquercitrin , di-*E*-caffeoyl-*meso*-tartaric acid is present in huge amounts and in H_2O extract beside di-*E*caffeoyl-*meso*-tartaric acid, two more phenolic acids were detected. The ultimate conclusion was that the antioxidant activity of EtOAc extract was higher or similar to that of commercial antioxidant BHA and BHT and both EtOAc and n-BuOH extracts shows strong scavenging of NO compared with synthetic antioxidants. Thus, it was proved that the NO scavenging property of *E. arvense* plays an important role in the protection against many pathological conditions[24]. Semwal *et al.* (2013) analyzed the antioxidant potential of *Equisetum romosissimum* Desf. by DPPH radical scavenging assay and Superoxide radical scavenging assay. The methanolic extract of this plant material showed significant results in DPPH and Superoxide radical scavenging activity marking its antioxidant potentialities[25].

Antioxidant properties in the group Pteropsida

Antioxidant activities and polyphenol contents of six folk medicinal ferns used as Gusuibu revealed that rhizomes of *Drynaria* fortunei (Kze.) J. Sm., *Pseudodrynaria coronans* (Wall. ex Mett.) both from Polypodiaceae, *Davallia divaricata* Bl., *Davallia mariesii* Moore ex Bak, *Davallia solida* (Forst.) Sw., and *Humata griffithiana* (Hk.) C. Chr. from Davalliaceae, are used as or called "Gusuibu" or "Shibu" in Taiwan and used in Chinese traditional medicine[26]. Chang *et al*. (2007) searched for phenolic compounds present in these ferns and their antioxidant potentials by preparing two extracts from those six plant materials- Ethanol extract and Aqueous extract, after which antioxidant assays along with polyphenol contents of those six ferns were estimated. For antioxidant activities different techniques were approached such as, ABTS assay, Dot-blot and DPPH assay. Total polyphenol content was also estimated. Results showed that the aqueous extract of most of the ferns had higher antioxidant activity than the ethanol extracts of those ferns. This observation may suggest that the more polar solvent extracts has higher antioxidant activity compared to the non- polar solvent extracts. The ABTS assay result revealed the maximum Trolox Equivalent Antioxidant capacity (TEAC) in aqueous extract of the fern *Davallia mariesii*. Scavenging activity against DPPH radical showed that the ethanol extract of fern *Davallia solida* had the highest activity while the aqueous extract of fern *Davallia mariesii* showed the maximum reducing capacity. It also showed that the correlation coefficient (R^2) values of TEAC and total polyphenol contents had higher levels of correlation. This investigation gives a clear indication that these six ferns are rich in high amount of polyphenols which shows noticable antioxidant properties.

Antioxidant activity of some common pteridophytes like *Diplazium esculentum* (Retz.) Sw. (Athyriaceae); *Adiantum lunulatum* Burm. f. (Polypodiaceae), *Pteris vittata* L. (Pteridaceae), and *Ampelopteris prolifera* (Retz.) (Thelypteridaceae) were studied by DPPH radical scavenging assay and Superoxide radical scavenging assay by Semwal *et al*. (2013). The methanolic extracts of all these plant materials showed significant results in DPPH radical scavenging activity and Superoxide radical scavenging activity. *Diplazium esculentum* among these were found to have maximum potency in case of both experiments[25]. This describes the usage of traditional usage of *Diplazium esculentum* as a common 'Saag'/leafy vegetable among the various local people of Bengal. Soare *et al*., (2012), studied the antioxidant activity, total polyphenol content and antimicrobial activity of three ferns namely *Athyrium filix-femina* (L.) Roth (Athyriaceae); *Dryopteris affinis* (Lowe) Fraser-Jenkins and *Dryopteris filix-mas* (L.) Schott of the family Dryopteridaceae in Romania. For the test of antioxidant activity alcoholic extract of plant samples were prepared and ORAC (Oxygen Radical absorbance capacity) assay was performed. These three fern showed significant ORAC antioxidant activity, and was reported to have more or less similar antioxidant activity to that of medicinal plants. It was also reported that correlation coefficient between ORAC and total

polyphenol content had higher correlation depicting the fact that phenolic compounds are the major groups that act as antioxidants[27]. The phloroglucinol derivatives extracted from *Dryopteris crassirhizoma* (Dryopteridaceae) was tested for antioxidant activity by various biochemical assays[28]. Two phloroglucinol derivatives, flavaspidic acids PB and flavaspidic acids AB were isolated by a bio-assay of the EtOAc and MeOH extracts obtained from the rhizome of this fern. The antioxidant activities of these two compounds were then evaluated by DPPH radical scavenging activity, Superoxide radical scavenging activity and LPO inhibitory activity by comparing their respective activities with two synthetic antioxidants (α–tocopherol and BHA). Result showed that these two flavaspidic acid compounds had mild antioxidant activity against DPPH assay and Superoxide radical scavenging assay and interestingly had potent inhibitory activity against LPO inhibitory assay, similar to those synthetic antioxidants[28].

In 2011, antioxidant activities of some Malaysian ferns were studied by a group of researchers[29]. In this report, antioxidant properties of ferns was determined by estimating their DPPH radical scavenging activity, Ferric Reducing Power assay and β-carotene Bleaching assay; and total phenolic content was also estimated. For their study 15 fern species were taken as sample (*Cyathea latebrosa* (Wall. ex Hook.) Copel (Cyatheaceae), *Dicranopteris linearis* (Burm.) (Gleicheniaceae), *Pteris vittata* L. (Pteridaceae), *Cibotium barometz* (L.) J. Sm. (Dicksoniaceae), *Drynaria quercifolia* (L.) J.Sm. (Polypodiaceae), *Blechnum orientale* L. (Blechnaceae), *Adiantum raddianum* C. Presl. (Pteridaceae), *Diplazium esculentum* (Retz.) Sw. (Athyriaceae), *Pityrogramma calomelanos* (L.) Link (Adiantaceae), *Lygodium circinnatum* (Burm.f.) Swartz, (Lygodiaaceae), *Microsorum punctatum* (L.) Copel Cv. (Polypodiaceae), *Nephrolepis biserrata* (Sw.) Schott (Nephrolepidaceae), *Pteris venulosa* Bl. (Pteridaceae) and *Pyrossia numularifolia* (Sw.) (Polypodiaceae), and *Acrostichum aureum* L. (Pteridaceae). Methanol extract of each fern species were prepared from their fresh leaves. It was observed that all these 15 ferns had significant antioxidant potential and were rich in phenolic contents. However it was found that among these 15 fern species some ferns like *Adiantum raddianum*, *Cyathea latebrosa*, *Drynaria quercifolia*, *Blechnum orientale* , *Cibotium barometz*, *Dicranopteris linearis* and *Pteris vittata* stood out with respect to their very high Total Phenolic Contents and also higher antioxidant potencies[29]. The two medicinally important fern species, *Adiantum* (Pteridaceae) and *Pteris* (Pteridaceae), were also studied for their phytochemical composition and antioxidant activity by DPPH radical scavenging activity and reducing power activity[30]. It was observed that various concentration of leaves and stem extracts of both these ferns has significant antioxidant potential and can used as good source of natural antioxidant.

Stenochlaena palustris (Burm. F.) (Blechnaceae) an edible medicinal fern, found in India through Southeast Asia to Polynesia and Australia, was studied for their Phenolic content and antioxidant properties, by Chai *et al*. (2012) Four extracts were prepared from mature sterile, mature fertile, young sterile and young fertile fronds and then their antioxidant activity, phenolic contents, Flavonoids, hydroxycinnamic acid and anthocyanin content was determined. It was observed that mature sterile fronds contained maximum amount of phenolic compounds, flavonoids, and hydroxycinnamic acids, where as young sterile fronds contained larger amount of anthocyanins. Results revealed that mature fertile fronds had highest radical scavenging activity and metal chelating activity while mature sterile fronds showed most effective ferric reducing activity. It was also reported that, total phenolic content showed strong and positive correlation with radical scavenging activity and ferric reducing activity[31]. The antioxidant potential of methanolic extracts of the ferns, *Actiniopteris radiata* (Sw.) Link. (Pteridaceae) and *Equisetum ramosissimum* Desf. (Equisetaceae) also revealed strong antioxidant activities[32]. Antioxidant assays showed that both these Pteridophytes has great antioxidant potentials and are rich sources of natural antioxidant. The rhizome of the fern *Dryopteris cochleata* (D. Don) C. Chr. (Dryopteridaceae), has great therapeutic value, used

mainly for the treatment of epilepsy, leprosy, cuts, wounds, ulcers, swelling etc. Kathirvel *et al*. (2014) investigated the antioxidant activity, phytochemical constituents and antimicrobial potential of this fern, mainly for the rhizome part. Various types of solvent extracts (chloroform, petroleum ether, ethyl-acetate, acetone, methanol and water) were analyzed for this experiment. Various antioxidant assays and inhibition of lipid peroxidation using TBARS was done and the antioxidant potential of those various extracts was compared with standards like BHT, ascorbic acid, and TBHQ. Result revealed that different kind of extracts has different levels of antioxidant potential and Acetone extracts significantly shows maximum antioxidant potential. However qualitative and quantitative analysis of acetone extracts was also studied by GC-MS system which showed about 61 compounds, among which several phenolics, flavonoids, alkaloids and other compounds were observed. So it was concluded that acetone extracts showed maximum antioxidant activity due to the presence of higher amount of secondary metabolites in it[33].

Jaishee & Chakraborty (2014) studied the antioxidant activity of *Pteris biaurita* L. (Pteridaceae) by preparing three kinds of plant extracts like ethanol, methanol and hot water extracts and then determined their antioxidant activity by various *in vitro* assay techniques. It was observed that all those three extracts showed significant antioxidant activity and also noted that methanolic extracts had the maximum antioxidant potential[34]. The antioxidant activity of eight different ferns from Mawsynram of the state Meghalaya, India were studied[35]. The eight different ferns were *Pteris scabristipes* Tagawa (Pteridaceae), *Aleuritopteris flava* (Ching *et* S.K. Wu) Ghosh (Cheilanthaceae), *Microlepia rhomboidea* (Wallich *ex* Kunze) Prantling (Dennstaedtiaceae), *Diplazium esculentum* (Koenig *ex* Retzius) Swartz (Athyriaceae), *Asplenium khasianum* Sledge (Aspleniaceae), *Microlepia hallbergii* (d'Almeida) C. Christensen (Dennstaedtiaceae), *Adiantum edgeworthii* Hooker (Adiantaceae), and *Lindsaea odorata* Roxburgh (Lindsaeaceae). Methanolic extracts from each plant were then evaluated for their *in vitro* antioxidant activity by standard protocols. It was reported that among all these eight ferns *Aleuritopteris flava* and *Lindsaea odorata* showed the highest antioxidant activity and other ferns also showed significant antioxidant potentials[35]. *Blenchum orientale* L. (Blechnaceae), an important medicinal fern, growing rapidly in Southeast Asia, was studied for their antioxidant activity and total phenolic contents by Jasim *et al*. (2015). This fern was collected from two different location Chini forest reserve and UKM Fern Garden and aqueous acetone extracts of those two samples were prepared. The results of antioxidant analysis revealed that *B. orientale* fern which was collected from Chini forest had higher antioxidant potential than the plant collected from the UKM fern garden. So it was concluded that TPC and antioxidant content were affected by the locations where the plant grows[36]. Another medicinally important fern, *Drynaria quercifolia* L. (Polypodiaceae) was studied to evaluate their *in vitro* antioxidant activity by Prasanna and Anuradha, (2015). Rhizome of this fern was the mainly used experimental material and methanolic extracts were prepared from the rhizome. Antioxidant activity was investigated by DPPH assay and FRAP assay and was observed that both these assay shows a dose dependent antioxidant activity[37]. Janakiraman and Johnson, (2015) investigated the *in vitro* antioxidant properties of three species of *Cyathea* namely, *Cyathea nilgirensis*, *Cyathea gigantea* and *Cyathea crinite* of the family Cyatheaceae collected from different places of Tamilnadu. The results of antioxidant assays reported that all these three species showed significant antioxidant properties, however *C. nilgirensis* was observed to have highest antioxidant potential than other two species[38].

Wali *et al*. (2016) evaluated the antioxidant capacity of two edible ferns *Diplazium esculantum* and *Diplazium maximum* of the family Athyriaceae by various assay such as DPPH, ABTS, and FRAP assay. Result of these studies showed that *D. maximum* had higher antioxidant potential than *D. esculantum*[39]. Rajesh *et al*. (2016) studied the antioxidant activity of *Dicranopteris linearis* (Burm. f.) Underw. (Gleicheniaceae) and

Table 1: List of the Pteridophytes used as reference of antioxidant studies

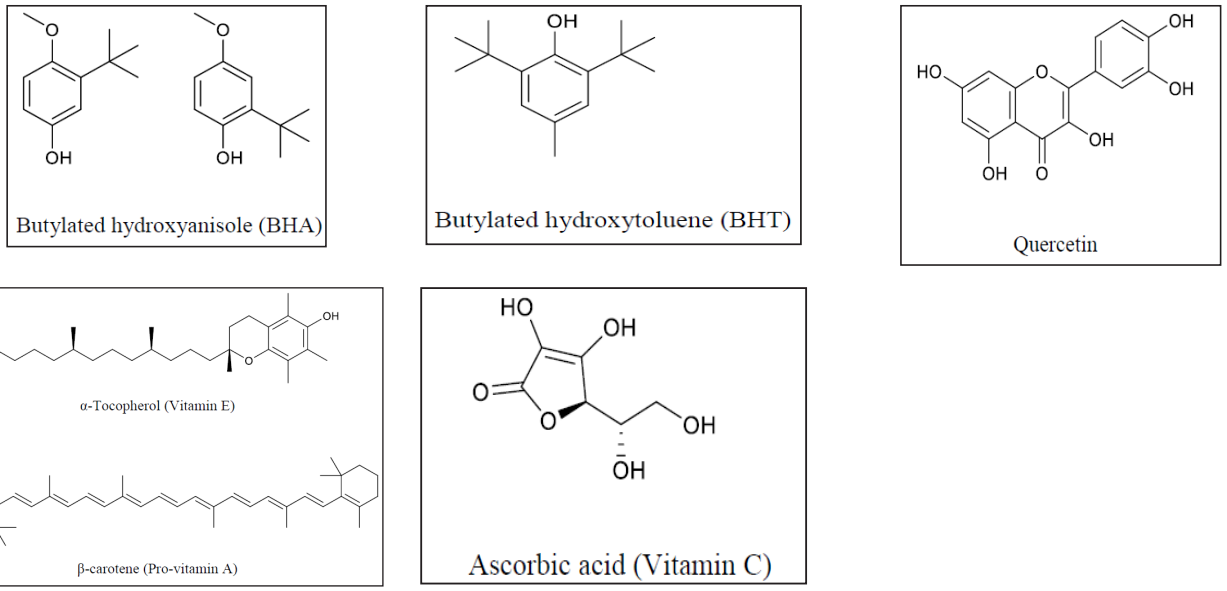
Sl. No.	*Species*	Family	Sl No.	*Species*	Family
1.	*Equisetum arvense*	Equisetaceae	25.	Pityrogramma alomelanos	Adiantaceae
2.	*Equisetum romosissimum*	Equisetaceae	26.	*Adiantum lunulatum*	Adiantaceae
3.	*Drynaria fortune*	Polypodiaceae	27.	*Aleuritopteris flava*	Adiantaceae
4.	*Pseudodrynaria coronans*	Polypodiaceae	28.	*Adiantum edgeworthii*	Adiantaceae
5.	*Pyrossia adnascens*	Polypodiaceae	29.	*Pteris biaurita*	Pteridaceae
6.	*Microsorum punctatum*	Polypodiaceae	30.	*Pteris scabristipes*	Pteridaceae
7.	*Drynaria quercifolia*	Polypodiaceae	31.	*Pteris vittata*	Pteridaceae
8.	*Pyrossia numularifolia*	Polypodiaceae	32.	*Acrostichum aureum*	Pteridaceae
9.	*Davallia divaricata*	Davalliaceae	33.	*Actiniopteris radiate*	Pteridaceae
10.	*Davallia mariesii*	Davalliaceae	34.	*Pteris venulosa*	Pteridaceae
11.	*Davallia solida*	Davalliaceae	35.	Microlepia rhomboidea	Dennstaedtiaceae
12.	*Humata griffithiana*	Davalliaceae	36.	*Microlepia hallbergii*	Dennstaedtiaceae
13.	*Dryopteris affinis*	Aspidiaceae	37.	*Lindsaea odorata*	Dennstaedtiaceae
14.	*Dryopteris filix-mas*	Aspidiaceae	38.	*Marsilea minuta*	Marsileaceae
15.	*Dryopteris crassirhizoma*	Aspidiaceae	39.	*Dicranopteris linearis*	Gleichiniaceae
16.	*Dryopteris cochleata*	Aspidiaceae	40.	*Lygodium circinnatum*	Lygodiaceae
17.	*Cyathea latebrosa*	Cyatheaceae	41.	*Nephrolepis biserratum*	Nephrolepidaceae
18.	*Cibotium barometz*	Cyatheaceae	42.	*Diplazium maximum*	Athyriaceae
19.	*Cyathea crinite*	Cyatheaceae	43.	*Ampelopteris prolifera*	Thelypteridaceae
20.	*Cyathea nilgirensis*	Cyatheaceae	44.	*Diplazium esculentum*	Athyriaceae
21.	*Cyathea gigantean*	Cyatheaceae	45.	Athyrium filix-femina	Dryopteridaceae
22.	*Blechnum orientale*	Blechnaceae	46.	*Asplenium khasianum*	Aspleniaceae
23.	*Stenochlaena palustris*	Blechnaceae	47.	*Selaginella involvens*	Selaginellaceae
24.	*Adiantum raddianum*	Adiantaceae	48.	*Selaginella delicatula*	Selaginellaceae

Table 2: Important antioxidant compounds isolated and their Pteridophytic sources

Sl No	Name of the Pteridophytes	Antioxidant compounds
1.	*Equisetum arvense*	Isoquercitrin, apigenin 5-*O*-glucoside, kaempferol 3-*O*-glycoside, and di-*E*-caffeoyl-*meso*-tartaric acid
2.	*Dryopteris crassirhizoma*	Flavaspidic acid
3.	*Dicranopteris linearis*	Quercetin7,3′,4′-Trimethoxy
4.	*Stenochlaena palustris*	Phenolic contents, Flavonoids, hydroxycinnamic acid and anthocyanin

also analyzed the bioactive compounds by GC-MS chromatogram. DPPH assay result found that acetone extract of the plant had maximum antioxidant activity and GC-MS analysis found a total of 11 phytoconstituents among which Quercetin 7, 3′, 4′-Trimethoxy, a potent flavonoid (polyphenolic group) could be attributed to possess a strong antioxidant property[40]. Phytochemical constituents, antioxidant activity and anti-inflammatory activity of three ferns *Drynaria quercifolia* (L.) J. Sm., *Microsorum punctatum* (L.) Copel. and *Pyrrosia adnascens* (Sw.) Ching, Bull. Chin., belonging to the same family Polypodiaceae, was studied by Cruz *et al*. (2017). DPPH radical scavenging activity result showed that

Chemical structure of some Synthetic Antioxidants (BHA & BHT) and Natural Antioxidants (Quercitin, α-Tocopherol, β carotene, **Ascorbic acid)**



all these three fern had much antioxidant potential; however *Microsorum punctatum* rhizome showed the maximum antioxidant activity[41]. Choudhury *et al*. (2017) reported that *Marsilea minuta* (Marsileaceae) showed higher metal chelating activity than *Diplazium esculentum* proving its potential as a natural antioxidant. However both these species showed dose dependent superoxide scavenging activity[42].

CONCLUSION

Thus we find antioxidants are present as a metabolic constituent in numerous Pteridophytic generas which itself is noteworthy to generate curiosity among the researchers for its varied usage in commercial and biological welfare of human beings and other allied organisms. Alkaloids and related compounds, amino acids and peptide derivatives, β carotene, carnosine, chalcones and catechins, curcumin and its derivatives, ergothioneine, flavonoids, free phenolic acids, glutathione, isoflavonoids, hydroquinone and quinine, lignans, lipoic acids, ovothiol, renitol and its derivatives, tetrapyrroles, uric acid, ascorbic acid and tocopherol are common antioxidants found in living organisms. Out of the mentioned natural antioxidants, majority are reported to be present in Pteridophytes starting from the lower Pteridophytic groups like *Selaginella* to the evolved ferns groups of Pterophyta like *Diplazium, Salvinia*. The antioxidants produced by these plants can open new dimensions in the field of medical science and can help in the treatment of several health disorders. *Diplazium, Marsilea* forms a major part of diet among various local people as leafy vegetables which is important to develop immunity against varied infections. The review also helps us to relive the causes of Pteridophytic usage since ancient times in Ayurveda, Unani and Chinese medicines. The Pteridophytic antioxidants can help in bridging the gap between commercial and biological arenas. Various pharmaceuticals formulations and bioinformatic approaches for drug designing in respect of chemical ligand binding and bioactivity assay *in vitro* as well as *in vivo* with reference to these antioxidants can relive disorders whose medicines are not yet available such as cancer. The antioxidant composition Pteridophytic generas also can aid in solving the phylogenetic puzzle and its chemotaxonomic approaches could also contribute in a new and revised system of Plant classification.

Thus, Antioxidants in Pteridophytes are a hot cake in terms of Taxonomy and Plant Systematics, Biochemistry and Molecular Biology, Drug Designing and Commercial aspects and more research outputs are the need of the hour in the current scenario owing to the biological diversity of Pteridophytes.

ABBREVIATIONS

[BHT	**:**	Butylated hydroxytoluene
TBHQ	**:**	Tert-Butylhydroquinone
BHA	**:**	Butylated hydroxyanisole
TPC	**:**	Total polyphenol content
DPPH	**:**	2, 2-α-diphenyl-1-picrylhydrazil
FRAP	**:**	Ferric reducing antioxidant power
AOS	**:**	Active oxygen species
GC-MS	**:**	Gas chromatography-mass spectrometry
EtOAc	**:**	Ethyl acetate
n-BuOH-n	**:**	butyl alcohol
TFC	**:**	Total flavonoid content
HPLC-DAD	**:**	High performance liquid chromatography with Diode-array detection
NO	**:**	Nitric oxide
ABTS	**:**	2,2-Azino-bis [3-ethyl-benzothiazoline-6-sulfonate]
TEAC	**:**	Trolox Equivalent Antioxidant capacity
ORAC	**:**	Oxygen Radical absorbance capacity
MeOH	**:**	Methanol
LPO	**:**	Lipid peroxidation
TBARS	**:**	Thiobarbituric acid reactive substances
GCMS	**:**	Gas chromatography- mass spectrometry

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