

Antioxidant Potential Some Medicinal Plants of Central India

Savita Dixit, Huma Ali

Associate Professor Maulana Azad National Institute of Technology Bhopal, Bhopal, India.
Email: savitadixit1@yahoo.com, sana_soni26@yahoo.co.in

Received April 28th, 2010; revised May 21st, 2010; accepted 24th, 2010.

ABSTRACT

Cellular damage or oxidative injury arising from free radicals or reactive oxygen species (ROS) now appears the fundamental mechanism underlying a number of human neurodegenerative disorder, diabetes, inflammation, viral infections, autoimmune pathologies and digestive system disorders. Free radicals are generated through normal metabolism of drugs, environmental chemicals and other xenobiotics as well as endogenous chemicals, especially stress hormones (adrenalin and noradrenalin). Accumulated evidence suggests that ROS can be scavenged through chemoprevention utilizing natural antioxidant compounds present in foods and medicinal plants. In this review, research on the antioxidant potential of some medicinal plants of origin of Central India is considered.

Keywords: Medicinal Plants, Antioxidant Activity, Chemoprevention, Neurodegenerative Diseases, Central India.

1. Introduction

Considerable evidence have accumulated to implicate cellular damage arising from reactive oxygen species (ROS), at least in part, in the etiology and pathophysiology of human diseases such as neurodegenerative disorders such as neurodegenerative disorders (e.g. Alzheimer disease, Parkinson disease, multiple sclerosis, Down's syndrome), inflammation, viral infections, autoimmune pathologies, and digestive system disorders such as gastrointestinal inflammation, viral infections, autoimmune pathologies, and digestive system disorders such as gastrointestinal inflammation and ulcer [1-3]. In living systems, free radicals are generated as part of the body's normal metabolic process, and the free radical chain reactions are usually produced in the mitochondrial respiratory chain, liver mixed function oxidases, by bacterial leucocytes, through xanthine oxidase activity, atmospheric pollutants, and from transitional metal catalyst, drugs and xenobiotics. In addition, chemical mobilization of fat stores under various condition such as lactation, exercise, fever, infection and even fasting, can result in increased radical activity and damage, in particular, to the immune and nervous systems, while the stress hormones (adrenalin and noradrenalin) secreted by the adrenal glands under conditions of continuation and excessive emotional stress, are metabolized in to simpler, albeit, free radical molecules.

Free radical or oxidative injury now appears the fun-

damental mechanism underlying a number of human neurologic and other disorders [4]. For instance in diabetes, increased oxidative stress which co-exist with reduction in the antioxidant status has been postulated: Oxygen free-radical can initiate per oxidation of lipids, which in turn stimulates glycation of protein, inactivation of enzymes and alteration in the structure and function of collagen basement and other membranes, and play a role in the long term complication of diabetes [5-7]. Similarly, in carcinogenesis, reactive oxygen species are responsible for initiating the multistage carcinogenesis process starting with DNA damage and accumulation of genetic events in one or few cell lines which leads to progressively dysplastic cellular appearance, deregulated cell growth, and finally carcinoma [8]. Hence, therapy using free-radical scavengers (antioxidants) has potential to prevent, delay or ameliorate many of these disorders [9]. Over the past two decades, an expanding body of evidence from epidemiological and laboratory studies have demonstrated that some edible plants as a whole, or their identified ingredients with antioxidant properties have substantial protective effects on human carcinogenesis [3,8,10-15]. Similarly evidence also exit to demonstrate the chemo preventive capacities of ethno botanicals and components of vegetable diets with free-radical scavenging potential on ulcers [16], diabetes [5], memory and cognitive function [17], Alzheimer's disease [17,18], age-related neurological dysfunction [19], cardiovascular

and renal disorders [20].

In the modern word it has been realized the herbal drugs strengthens the body system specifically and selectively without side effects. The importance of traditional herbal medicinal system has now gained vital importance in developed countries has been briefly described. The herbal medicinal practices adopted by traditional medicine-man in Central India for cure of various diseases occurring in tribal pockets. India is blessed with rich and diverse heritage of cultural traditions. These traditions are associated with use of wild plants as medicinal herbs. The use of medicinal herbs is still a tradition adopted by ethnic communities who are living in undulating plains and at foothills of dense forest. The Central India comprises states like Madhya Pradesh, Chhatisgarh, Maharashtra, Orissa and Jharkhand. The ethnic people of this region are Baiga, Bhariya, Bhil, Gond, Hill korwa, Birhor, Khairwar, Rawat and Sahariyas. They use wide

range of wild plants for their health care [21].

The traditional herbal healer therapies contain many medicines for one ailment. Out of the various medicines, one is selected by the herbal healer against a particular disease according to the symptoms and secondary effects. Several plants are identified and used against one disease and are used according to their availability in the region. Some of the plants commonly used by tribal in Central India for prominent diseases are recorded during the various surveys.

2. Central India Plants

In spite of tremendous advances in modern medicine no effective drugs are available, which stimulate liver functions and offer protection to the liver from damage of help to regenerate hepatic cells 1) In absence of reliable liver-protective drugs in modern medicine, a large number of medicinal preparations are recommended for

Table 1. Some medicinal plants of central India having good antioxidant potential

Name of plant	Part Studied	Type of Assay	Active component(s)
Acorus calamus	Rhizomes	In vitro	α -asarone, Alkaloids [25]
Aegle marmelos	Leaves	In vitro	Alkaloids, Terpenoids, Saponins [26]
Aloe vera	Leaf	In vitro	Vitamin A,C,E, Carotenoids [27]
Andrographis paniculata	Whole plant	In vitro/ in vivo	Diterpenes, Lactones, [24]
Carica papaya	Leaves	In vitro/ in vivo	Terpenoids. Saponins, Tannins [28]
Cassia fistula	Bark	In vitro	Flavonoids [29]
Curculigo orchioides	Rhizomes	In vivo	Alkaloids, Flavonoids [30]
Cyperus rotundus	Rhizomes	In vitro	Saponin, Sesquiterpenoids, [31]
Dalbergia sisoo	Leaves and flower	In vitro	Tannins [32]
Emblica officinalis	Seeds	In vitro	Vitamin C, Tannins [33]
Ficus bengalensis	Aerial root	In vitro	Flavonoids, Tannins [34]
Hemidesmus indicus	Stem	In vitro	Alkaloids, Glycosides [25]
Magnifera indica	Stem bark	In vitro	Reducing sugar, Flavonoids [28]
Momordica charantia	Fruit	In vitro	Alkaloids, Saponin [35]
Moringa olifera	seeds	In vitro/ in vivo	Glycosides [34]
Ocimum sanctum	Leaf	In vitro/ in vivo	Carotenoids, Ascorbic acid [33]
Plumbago zeylanica	Root	In vitro	Alkaloids, Glycosides [25]
Psidium guajava	Leaves	In vitro	Flavonoids, Limonoids [28]
Solanum nigrum	Fruit	In vitro	Carotenoids, Ascorbic acid [33]
Syzygium cumini	Leaf	In vitro	Triterpenoids, Ellagic acid [36]

the treatment of liver disorders 2) and quite often claimed to offer significant relief. Attempts are being made globally to get scientific evidences for these traditionally reported herbal drugs. *Amorphophallus campanulatus* Roxb. (ACR) (family: Araceae), is a perennial herb with rounded tuberous root stock (corn). The plant is widely distributed in Central India. The tuberous roots of the plant have been used traditionally for the treatment of piles, abdominal pain, tumors, enlargement of spleen, asthma and rheumatism 3) The tuberous roots of the plant also been possess tonic, stomachic and appetizer properties [22].

In 2002 at the international Aloe Science Council (IASC) Annual Conference, Vinson Joe presented evidence from a human chemical study, that the bioavailability of antioxidant supplement vitamins C and E was increased by over 200 percent when taken Aloe Vera gel.

The decreased activity of antioxidant molecular along with elevated lipid peroxide levels in diabetic rat could probably be associated with oxidative stress and/or decreased antioxidant defense potential. The reversal in their content following treatment may be due to decreased oxidative load. The *Aloe barbadensis* leaf extracts may also act by either directly scavenging the reactive oxygen metabolites, due to the presence of various antioxidant compounds or by increasing the synthesis of antioxidant molecules [23].

Andrographis paniculata is a perennial herb widely cultivated in Central India and traditionally used as febrifuge, tonic, stomachic and anthelmintic. *Andrographis* forms the principal ingredient of several pharmaceutical preparations and household medicines too. Modern pharmacological studies have demonstrated its hepatoprotective, antithrombotic, anti-inflammatory, immunostimulant, antimalarial, antihyperglycemic and cardioprotective properties.

The role of free radicals generated oxidative stress in isoproterenol-induced myocardial ischemic injury is well established. Several herbal drugs possessing antioxidant activity have been demonstrated protective in the isoproterenol-induced ischemic injury of the myocardium. *Andrographis* is one of the plants used as antioxidant and acclaimed to provide benefit in cardiovascular diseases in traditional literature [24].

3. Conclusions

Considering the enormous biodiversity resources of the Central India, and the high incidence of diseases with oxidative damage as their etiological factor in this area, a total 20 medicinal plants investigated from Central India. Active principle responsible for the antioxidant properties were also identified. (Table 1).

REFERENCES

- [1] M. G. Repetto and S. F. Llesuy, "Antioxidant Properties of Natural Compounds Used in Popular Medicine for Tric Ulcers," *Brazilian Journal of Medical and Biological Research*, Vol. 35, No. 35, 2002, pp. 523-534.
- [2] O. I. Aruoma, "Methodological Considerations for Characterizing Potential Antioxidant Actions of Bioactive Compounds in Food Plants," *Mutation Research*, No. 523-524, 2003, pp. 9-20.
- [3] Y. Z. Surh and L. R. Ferguson, "Dietary and Medicinal Antimutagens and Anticarcinogens: Molecular Mechanisms and Chemopreventive Potential-Highlight of a Symposium," 2003.
- [4] S. E. Atawodi, "Antioxidant Potential of African Medicinal Plants," *African Journal of Biotechnology*, Vol. 4, No. 2, 2005, pp. 128-133.
- [5] M. C. Sabu and R. Kuttan, "Antidiabetic Activity of Medicinal Plants and its Relationship with their Antioxidant Property," *Journal of Ethnopharmacology*, Vol. 81, 2002, pp. 155-160.
- [6] J. W. Boynes, "Role of Oxidative Stress in the development of complication in diabetes," *Diabetes*, Vol. 40, 1991, pp. 405-411.
- [7] A. Collier, R. Wilson, H. Bradley, J. A. Thomson and M. Small, "Free Radical Activity in Type 2 Diabetes," *Diabetes*, Vol. 7, 1990, pp. 27-30.
- [8] A. S. Tsa, E. S. Kim and W. K. Hong, "Chemoprevention of Cancer," *CA: A Cancer Journal for Clinicians*, Vol. 54, 2004, pp. 150-180.
- [9] N. Delanty and M. Dichter, "Antioxidant Therapy in Neurologic Diseases," *Archives of Neurology* Vol. 57, No. 9, 2000, pp. 1265-1270.
- [10] E. J. Park and J. M. Pezzuto, "Botanical in Ncer Chemoprevention," *Cancer and Metastasis Reviews*, Vol. 31, No. 3-4, 2002, pp. 231-255.
- [11] L. W. Wattenberg, "Chemoprevention of Cancer," *Preventive Medicine*, Vol. 25, 1996, pp. 44-45.
- [12] P. Greenwald, "Science, Medicine and the Future of Cancer Chemoprevention," *British Medical Journal*, Vol. 324, 2002, pp. 714-718.
- [13] IARC, "Preamble to the IARC handbook of cancer chemoprevention. In principles of chemoprevention. Stewart BW," In: M. C. Gregor and P. Keihues Eds, *International Agency for Research on Cancer*, IARC Scientific Publication, Lyon, No. 139, 1996, pp. 1-12.
- [14] H. Fujiki, "Two Sges of Cancer Prevention with Granm tea," *Journal of Cancer Research and Clinical Oncology*, Vol. 125, No. 11, 1999, pp. 589-597.
- [15] A. D. Kinghorn, B. N. Su, D. S. Jang, L. C. Chang, J. Q. Gu, E. J. Carcache-Blanco, A. D. Pawlus, S. K. Lee, E. J. Park, M. Cuendet, J. J. gills, H. S. Bhat, E. M. Greenwood, L. L. Song, M. Jang and J. M. Pezzuto, "Natural Inhibitors of Carcinogenesis," *Planta Medica*, Vol. 70, No. 8, 2004, pp. 691-705.
- [16] F. Borelli and A. A. Izzo, "The Plants Kindom as a Source of Anti-Ulcer Remedies," *Phytotherapy Research*, Vol. 14, No. 8, 2000, pp. 581-591.
- [17] M. J. Howes, N. S. Perry and P. J. Houghton, "Plants with

- Traditional Uses and Activities, Relevant to the Management of Alzheimer's Disease and Other Cognitive Disorders," *Phytotherapy Research*, Vol. 17, No. 1, 2003, pp. 1-18.
- [18] E. K. Perry, A. T. Pickering, W. W. Wang, P. Houghton and N. S. Perry, "Medicinal Plants and Alzheimer's Disease: Integrating Ethnobotanical and Contemporary Scientific Evidence," *Journal of Alternative and Complementary Medicine*, Vol. 4, No. 4, 1998, pp. 419-428.
- [19] N. Delanty and M. Dichter, "Antioxidant therapy in neurologic diseases," *Archives of Neurology*, Vol. 57, No. 9, 2000, pp. 1265-1270.
- [20] J. W. Anderson, B. M. Smith and C. S. Wasnock, "Cardiovascular and Renal Benefits of Dry Bean and Soybean Intake," *American Journal of Clinical Nutrition*, Vol. 70, 1999, pp. 464-474.
- [21] R. Rai and V. Nath, "Use of Medicinal Plants by Traditional Herbal Healers in Central India," XII World Forestry Congress, 2003
- [22] S. Jain, V. K. Dixit, N. Malviya and V. Ambawatia, "Antioxidant and Hepatoprotective Activity of Ethanolic and Aqueous Extract of *Amorphophallus Campanulatus* Roxb. Tubers," *Aeta Poloniac Pharmaceutica-Drug Research*, Vol. 66, No. 4, 2009, pp. 423-428.
- [23] H. U. Nwanjo, "Antioxidant activity of the exudates from *Aloe barbadensis* leaves in diabetic rats," *Biokemistri*, Vol. 18, No. 2, 2006, pp. 77-81.
- [24] S. K. Ojha, M. Nandave, S. Kumari and D. S. Arya, "Antioxidant Activity of *Andrographis paniculata* in Ischemic Myocardium of Rats," *Global Journal of pharmacology*, Vol. 3, No. 3, 2009, pp. 154-157.
- [25] M. Zahin, F. Aqil and I. Ahmad, "The in Vitro Antioxidant Activity and Total Phenolic Content of Four Indian Medicinal Plants," *International Journal of pharmacy and pharmaceutical Sciences*, Vol. 1, No. 1, 2009, pp. 88-95.
- [26] S. Upadhya, K. K. Shanbhag, G. Suneetha and N. M. Balachandra, "A Study of Hypoglycemic and Antioxidant Activity of *Aegle Marmelos* in Alloxan Induced Diabetic Rats," *Indian Journal of Physiology & Pharmacology*, Vol. 48, No. 4, 2004, pp. 476-480.
- [27] S. Miladi and M. Damak, "In Vitro Antioxidant Activities of Aloe Vera Leaf Skin Extracts," *Journal de la Societe Chimique de Tunisie*, Vol. 10, 2008, pp. 101-109.
- [28] G. A. Ayoola, H. A. B. Coker, S. A. Adesegun, A. A. A. Depoju-Bello, K. Obaweya, E. C. Ezennia and T. O. Atanbayila, "Phytochemical Screening and Antioxidant Activities of Some Selected Medicinal Plants Used for Malaria Therapy in Southwestern Nigeria," *Tropical Journal of Pharmaceutical Research*, Vol. 7, No. 3, 2008, pp. 1019-1024.
- [29] T. Bahorun, V. S. Neergheen and O. L. Aruoma, "Phytochemical Constituent of *Cassia Fistula*," *African Journal of Biotechnology*, Vol. 4, No. 13, 2005, pp. 1530-1540.
- [30] M. R. Venukumar and M. S. Latha, "Antioxidant Activity of *Curculigo Orchioides* in Carbon Tetrachloride Induced Hepatopathy in Rats," *Indian Journal of Clinical Biochemistry*, Vol. 17, No. 2, 2002, pp. 80-87.
- [31] K. R. Nagunlendran, S. Velavan, R. Mahesh and V. H. Begum, "In Vitro Antioxidant Activity and Total Phenolic Content of *Cyperus Rotundus* Rhizomes," *E-Journal of Chemistry*, Vol. 4, No. 3, 2007, pp. 440-449.
- [32] V. Vadlapudi and K. C. Naidu, "In Vitro Bioevaluation of Some Indian Medicinal Plants," *Drug Invention Today*, Vol. 2, No. 1, 2010, pp. 65-68.
- [33] P. Veeru, M. P. Kishor and M. Meenakshi, "Screening of Medicinal Plant Extracts for Antioxidant Activity," *Journal of Medicinal Plants Research*, Vol. 3, No. 8, 2009, pp. 608-612.
- [34] R. K. Sharma, S. Chatterji, D. K. Rai, S. Mehta, P. K. Rai, R. K. Singh, G. Watal and B. Sharma, "Antioxidant Activities and Phenolic Contents of the Aqueous Extracts of Some Indian Medicinal Plants," *Journal of Medicinal Plants Research*, Vol. 3, No. 11, 2009, pp. 944-948.
- [35] N. M. Ansari, L. Houlihan, B. Hussain and A. Pieroni, "Antioxidant Activity of Five Vegetables Traditionally Consumed by South-Asian Migrants in Bradford," *Phytotherapy Research*, Yorkshire, Vol. 19, 2005, pp. 907-911.
- [36] Z. P. Ruan, L. L. Zhang and Y. M. Lin, "Evaluation of the Antioxidant Activity of *Syzygium Cumini* Leaves," *Molecules*, Vol. 13, 2008, pp. 2545-2556.