



## OCCURRENCE AND TOXICITIES OF HEAVY METALS: AMELIORATION BY *ASPARAGUS RACEMOSUS & URTICA DIOICA*

**Mahendra P. Singh<sup>1\*</sup>, Prasoon Priyadarsi<sup>1</sup>, Shafali Jaiswal<sup>1</sup>, Adity<sup>1</sup>, Navdeep Singh<sup>1</sup>**

<sup>1</sup>School of Bioengineering and Biosciences, Lovely Professional University, Delhi-Jalandhar GT Road, Phagwara-144411 (Punjab), India, \*Email: mahendra.19817@lpu.co.in.

### Abstract

Metals are cosmic in nature. Without any exception, metals are the part of almost all advances in the technology and also the important component of our diets consumed directly or indirectly. Metals have the property of malleability, ductility, and electrical conductivity and are lustrous in nature. They are naturally found in earth's crust. Their composition varies according to the localities and surrounding environments. Some heavy metals are very hazardous in nature and toxic to flora and fauna of the surrounding environment and we are consuming them in day-to-day life in small amount through occupational or non-occupational exposure. It vastly affects human life in many ways. So in order to prevent our self from toxic metals we need to maintain our life style and diet. Diet plays major role in our immune system. From centuries herbal plants and bioactive plants are used in our diet. *Asparagus racemosus* & *Urtica dioica* are two commonly used herbs readily available in hilly region and being consuming these herbs in regular diet due to remarkable high health benefits. These herbs are having statistically significant ameliorative effect on heavy metal exposed invertebrate and vertebrate model organisms.

**Keywords:** Heavy metals, Reactive oxygen species, Herbs; Nutraceuticals, Animal models.

### Introduction

The term heavy metal is used for metals and semi metals, which have potential to cause environmental toxicity. Generally heavy metals have high density as compared to water; it also includes metalloids like Arsenic, which are capable of inducing toxicity even at very low levels (Tchounwou *et al.*, 2012; Kumar *et al.*, 2019; Sahoo and Swain, 2020). Since environment is changing due to human activities and it raised the concentration of heavy metals, which are generally non-toxic, but due to its different oxidation state, metals can become toxic and mutagenic (Petrill and Flora, 1977). Being water soluble and mobile, metals leach into the ground water (Megharaj *et al.*, 2003). The concentration of heavy metals has increased significantly through past years due to high use of chemical pesticides. Each day around 2 million tons of sewage, corporate and agricultural wastes are dumped/discharged into water streams globally, causing severe chronic and acute diseases which ultimately may lead to individual's death. Surveys have shown around 14,000 people die every day due to water borne diseases worldwide (Bolisetty *et al.*, 2019). Heavy metals are inorganic pollutants and are polluting a large area due to being present in sewage, industrial discharge, smelting industry effluents and mine wastes (Bolisetty *et al.*, 2017). It is revealed in 50 nations that at least 1.4billion people consume arsenic contaminated water above the prescribed value of 10 $\mu$ g/l. (Bolisetty *et al.*, 2019). Metals are proven beneficial for organisms when they are in lower concentrations, as there concentration varies they become noxious in nature exceeding threshold levels (Jaishankar *et al.*, 2014; Kapoor *et al.*, 2018; Syed *et al.*, 2018). Heavy metals generally have an atomic mass higher than 23 or atomic number greater than 20 (Koller *et al.*, 2018). Most common heavy metals are Hg, Cd, Pb, As, Cr, Cu, Ni, and Zn. Heavy metals are class of toxicants since they cannot be attenuated to non-toxic forms and aren't perishable. Once they contaminate the system, they continue to be a possible threat for several years. Heavy metals and metalloids occur in an exceedingly forms as ions, compounds

and complexes within the atmosphere and has been used by man for different purposes. The main sources of those significant metals are urban industrial soot created by combustion of fuels, metal ore purification and different industrial processes, liquid and solid wastes from animals and man, mining wastes, agricultural pesticides Humans are also getting exposure to heavy metals by using industrially manufactured products, like batteries, paints, wires to cope up their needs (Kaundal., 2015; Kaur *et al.*, 2017). These products require heavy metals as a part of manufacturing processes (Scognamiglio *et al.*, 2016). The presence of noxious significant metal ions in industrial sewer water has become a matter of concern in recent years. The noxious metal ions, that create a possible danger from industrial wastes, include Pb, Cd, Cr, Hg and As etc., which can be either inorganic or organic. The significant metal contents of sludge rely mostly on the nature of the native business and the proportions of commercial and domestic waste (Kumar and Dwivedi, 2018d; Kumar, P.P. *et al.*, 2018e; Kumar and Pathak, 2019f ; Kumar *et al.*, 2019g; Siddique and Kumar, 2018h). Some heavy metals get absorbed into bones and skeletal elements. Their toxicity can vary from cytotoxicity, immunotoxicity, teratogenicity, immune system suppression and reproductively unfitness (Pandey *et al.*, 2014). As per research conducted, the concentration of metals such as iron found to be higher than normal in the groundwater of Brahmaputra flood plain as per dose recommended by WHO (1996), metal such as iron was found to be exceeding as per recommended value of 0.3mg/L in except 20% of the samples (Haloi *et al.*, 2012). The heavy metals tend to deposit in the soil (Oves *et al.*, 2016). Almost 90% of heavy metal uptake in human is through vegetables grown in affected areas. Other sources of metals, in daily routine leakage from household pipelines, cooking utensils are seen to contaminate food and water used by humans. Milk and dairy products (main source of diet for infants and adults) are also affected via grazing of animals in fields contaminated by heavy metals, such as lead, cadmium, copper, chromium, arsenic and zinc, (Kaur *et al.*, 2011; Sharma *et al.*, 2017; Scognamiglio *et al.*, 2016).

## Impact of heavy metals on the environment

Through past two decades the levels of pollution are continuously rising, indicating an increase in anthropogenic activities, industrialization, and technological deficiency. Various types of pollution and pollutants exist today but having a outlook at global scenario heavy metal pollution has become one of the major concern. Any metal or metalloid having density greater  $4\pm1 \text{ g/cm}^3$  is termed as heavy metal (As *et al.*, 2011; Jaishankar *et al.*, 2014). These metals and metalloids are found naturally in earth's crust, rocks, sediments but are also emitted due to human activities, industry discharges, industrial products such as batteries, sewage etc (As *et al.*, 2011). Heavy metals are persistent, bio-accumulative and thus cannot be degraded further (Morcillo *et al.*, 2016). Some of the heavy metals are thought

to play important roles in biological functioning/ activities of the body/biological systems such as enzyme functioning but are proven toxic above threshold limits Siddique *et al.*, 2018i; Pathak *et al.*, 2017j; Prakash and Kumar, 2017k; Kumar and Mandal, 2014L; Kumar *et al.*, 2014m; Kumar *et al.*, 2014n; Kumar, 2013o). Heavy metals are inorganic pollutants and are polluting a large area due to being present in sewage, industrial discharge, smelting industry effluents and mine wastes (Uddin *et al.*, 2017). As per environment is changing due to human activities it is raising the concentration of heavy metals, which generally are non-toxic, but due to oxidation, metals can become toxic and mutagenic (Petrill and Flora, 1977). Being water soluble and mobile the metals leach into the ground water (Megharaj *et al.*, 2003).

**Table 1:** Permissible limits of some commonly used heavy metals (Kumari *et al.*, 2016).

Heavy metals =>	Cr	Zn	Cu	Ni	Pb
FAO/WHO permitted limit for soil $\mu\text{g/L}$	50	300	100	50	100
WHO permitted limits for vegetables	2.3	20	0.2	6.5	0.3

The concentration of heavy metals has increased significantly through past years due to high use of chemical pesticides. Each day around 2 million tons of sewage, corporate and agricultural wastes are dumped/discharged into water streams globally, causing severe chronic and acute diseases which ultimately may lead to individual's death. Research had shown around 14,000 people die every day due to water borne diseases worldwide (Bolisetty *et al.*, 2019). Heavy metals are found to effect body in two ways:

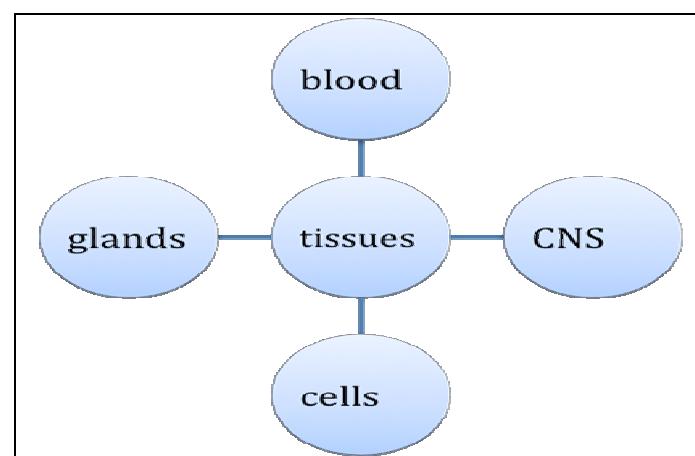
**1. Bioaccumulation:** heavy metals get accumulated in various body tissues, organs and ultimately interfere with working of glands and organs such as heart, brain etc.

2. Heavy metals displace important nutrient minerals from their original working site hampering their biological activities (Singh *et al.*, 2011)

Metals enter body via food, water, air and are poisonous at even low doses, when concerned about high doses they cause bioaccumulation. Only the soluble forms of metal are proven toxic, degree of toxicity depends on oxidation state.

Cr (VI) > Cr (III) Heavy metals can get absorbed into bones and skeletal elements inducing cytotoxicity, immunotoxicity, teratogenicity, immune system suppression

and reproductively unfitness and are able to cross blood brain barrier (Pandey *et al.*, 2014).



**Fig. 1:** Distribution of heavy metals in the organism.

Heavy metals have been proven toxic and caused severe problems such two concerns reported in Japan where cadmium and mercury metal exposures caused devastations to Japanese populations.

**Table 2:** List of hazardous heavy metals in the environment, their sources and health effects with permissible limits (WHO, 1996; EPA)

Metals	Sources	Effects	Limits
<b>Arsenic</b>	Naturally occurring, Anthropogenic sources, leaching activities, pesticides, rock corrosion, dyes and mining activities	Carcinogenic Can cause skin, lung, liver, bladder In low levels nausea, vomiting, death may result in high amount intake, RBC, leucocyte decrement	EPA: 0.01ppm for portable water OSHA: $10\mu\text{g/m}^3$ for 8 hours and 40 hours work intervals/week
<b>Barium</b>	Abundantly present in nature, used in industries	Non- carcinogenic, short term exposures can cause vomiting, respiratory problem, gastric pains, blood pressure problems and diarrhea Large exposures include cardiac rhythm changes, and death	EPA: 2.0 ppm for portable water OSHA: $0.5\text{mg/m}^3$ in air for 8 hours working day and 40 hours work intervals/week.
<b>Cadmium</b>	Hazardous metal, rocks, soils, batteries, coal area main sources of Cadmium, used extensively in electroplating	Carcinogenic, causes lung destruction, stomach upsets (irritation), vomiting. Long term subjections can damage kidneys and bones	EPA: 5.0 ppb for portable water FDA: for packaged water should be less than 5ppb

			OSHA: 5µg/m <sup>3</sup> air for 8 hours working day and 40 hours work intervals/week EPA: 0.1ppm in potable water
<b>Chromium</b>	Hazardous metal, rocks, soils, batteries, coal area main sources of Cadmium, used extensively in electroplating	Cr (VI) is considered as toxic as well as carcinogenic. Whereas Cr (III) is consumed along with dietary supplements. Exposures can cause respiratory disorders, ulcers, and redness of skin. Long term subjections damage liver, kidney and neural tissues.	EPA: 0.1ppm in potable water FDA: presence should be less than 1mg/L for bottled water.
<b>Lead</b>	Result of anthropogenic activities, fossil fuel combustion, industrial processes, products like batteries, paints etc.	Affects nervous system, kidneys, embryo development, brain functioning, alveolar damage, short term exposures can cause nausea, vomiting, blood pressure elevations, visual and auditory dis-functions, memory problems,	EPA: up to 15ppb in potable water. 0.15µg/m <sup>3</sup> air
<b>Mercury</b>	can combine with other elements to form complexes, thermal power plants are main source of Hg production, used in medical instruments, batteries.	Affects nervous system, kidneys, embryo development, brain functioning, alveolar damage, short term exposures can cause nausea, vomiting, blood pressure elevations, visual and auditory dis-functions, memory problems,	EPA: 2ppb in potable water.

Metals can be cancerous or non cancerous, they affect body in a variety of ways. Metals are proven cancerous due to being accumulative, persistent, and non-degradable in nature (Uddin *et al.*, 2017). Consumers and prey both are affected with heavy metals (Morcillo *et al.*, 2016). The populations were being exposed to both cancerous and non-

cancerous metals having mainly Cadmium, Mercury and lead, arsenic, chromium, nickel respectively (Chen *et al.*, 2015). Similarly another study conducted in Ranipet industrial area, the heavy metal concentrations of various metals were found to be above the normal levels:

**Table 3:** Concentration of heavy metals in a typical industrial area (values are expressed in ppb)

Metal	Value present µg/l or ppb	Average µg/l or ppb
Cadmium	(0.2-401.4µg/l)	(21.1 µg/l)
Chromium	(2.4-1308.6 µg/l)	(247.2 µg/l)
Copper	(2.1-535.5 µg/l)	(95.5 µg/l)
Nickel	(1.6-147.0 µg/l)	(36.7 µg/l)
Lead	(6.4-2034.4 µg/l)	(467.8 µg/l)
Zinc	(20.8-12718 µg/l.0 µg/l)	(3760.4 µg/l)

The value of metals was much high than prescribed levels in surface water, due to contamination poor people around the area was suffering with diseases such as Asthma and Skin problems (Gowd *et al.*, 2008). The global scenario of cancer is becoming enlighten day by day, many cases have been reported to occur by heavy metal toxicity Arsenic, Chromium, Cadmium and Nickel have enlisted by IARC (International agency for research on cancer) as group 1 (category1) carcinogens. Various reports stated subjective potential of metals to cause disruptions in tumor suppression genes, enzymatic activities and DNA repair methods. Various cancerous metals are known till date and Hexavalent chromium is one of the best-known carcinogenic compounds causing alveolar cancer in humans but mechanism to cause cancer is still unrevealed. Cr has been found abundantly on earth surface and has been used extensively in leather tanning, paint and car industries. Salts of chromium are called chromate and are produced by mining, smelting,

extraction and roasting; during manufacturing toxic dust is released causing severe toxicity (Kim *et al.*, 2015). Recent studies demonstrated that chronic Cr (VI) subjection induced cancer in stem cells (Wang *et al.* 2019). The degree of toxicity of metals is highly dependent on its state of oxidation (Pandey *et al.*, 2014). Chromium exists in various oxidation states being Cr<sup>2+</sup> to Cr<sup>6+</sup>. The most commonly found are Cr<sup>3+</sup> to Cr<sup>6+</sup> (Jaishankar *et al.*, 2014). Depending on its concentrations of exposure Cr (VI) is considered carcinogenic as well as mutagenic too (De Flora *et al.*, 1977). The inhalation of chromites ore dust was characterized as insoluble chromium might be an important factor in the induction of lung cancer. None case of lung cancer deaths was reported in workers being exposed hexavalent chromium compounds (Norseth *et al.*, 1981). Cr (VI) can enter cells via sulfate/ phosphate anion transport mechanism, undergoes reduction to form pentavalent, tetravalent and Cr (III) via cellular reductions (Kumar, P., Dwivedi, P. (2018a), Kumar,

P., Kumar S. et al. (2018b), Kumar, P., Misao, L., et al., 2018c.) These intermediate forms can directly or indirectly cause DNA- damage. Chromium trivalent, Cr (III) is consumed with dietary substances to lower down blood glucose levels but have restricted efficacy (Costello *et al.*, 2016). Cr (III) complexes were earlier used as insulin enhancers for type 2 diabetes. As Cr (III) complexes are not permeable through plasma membranes, tend to gather near outer surface causing alterations, eventually entering the cells and oxidizing to Cr (V). This process involves oxidative stress and hydroxyl radicals, which attack proteins and damage DNA (Wang *et al.*, 2017).

### **Amelioration of heavy metals through *Asparagus racemosus* & *Urtica dioica***

Metals are highly toxic in nature and we are consuming them in day-to-day life. It vastly affects human life in many ways. So in order to prevent our self from toxic metals we need to maintain our life style and diet. Diet plays major role in our immune system. From centuries herbal plants and bioactive plants are used in our diet. They have enormous number of benefit in our body. Recently global trend shifted from allopathic to ayurvedic system. Basically it means 'return to nature'. From centuries herbal plants have been used for medical purposes. In Ayurveda, *Asparagus racemosus* lies among the most beneficial herbal plant having enormous number of medicinal benefits. It is commonly known as Shatavari or Satmuli according to local language (Veena *et al.*, 2015). *Asparagus* species belong to liliaceous family found in temperate Himalayan zone. The genus *Asparagus* include more than 300 species around the world (Negi *et al.*, 2010). *Asparagus racemosus* generally have long roots whose extract is used for medicinal purpose. It is generally used to promote fertility, decreases menopausal symptoms. It has ability to cure cough and gastric ulcer (Potduang *et al.*, 2008). It has enormous number of biological activities inclusive of anti-inflammatory, antioxidant, antibacterial, anti-oxytocic and reproductive agents (Negi *et al.*, 2010). In this Modern era, stress has deep roots in present day societies. Due to this modern day person are frequently affected with psychological, physical, and physiological issues. *Asparagus racemosus* is used to treat female reproductive health disorders. Basically stress disturbs the female reproductive health by inducing reactive oxygen species , which is able to cause oxidative stress mechanisms in human body. It directly affects physiology of female reproductive health. That's why in Ayurveda, Shatavari is recommended to overcome stress level in body. It is suggested that it is able to cure polycystic syndrome (PCOS), follicular growth and can raise oocyte quality (Pandey *et al.*, 2018). Due to influence of fast lightning food deliveries gastric ulcer become one of the common diseases globally. Treatment of ulcer by allopathy drastically strikes the human body by causing enormous number of side effects. In this scenario *Asparagus racemosus* can treat the ulcer by ulcer-neutralization, anti-inflammatory and antioxidant properties of herbal plants (Singh *et al.*, 2018).

### ***Asparagus racemosus* on Parkinson's disease**

Globally Parkinson's disease is the most occurring neurodegenerative disease after Alzheimer's. Throughout the world 6 million people are suffering from Parkinson's disease. A prediction says that this number will double by 2030. That result has a drastic economical burden of a

country. Basically Parkinson's disease decreases in dopaminergic neurons. Which give rise to depression, disturbance in biological clock, disrupt taste bud and smelling ability and the most fatal is the non-motor symptoms. *Asparagus racemosus* is tested over Parkinson's disease. Powder of *Asparagus racemosus* is taken in 12g dose with milk twice in a day. Interestingly it intensifies physical and mental health. It further surpasses immune power and increases longevity. Its main characteristics are the free radical scavenging property along with the neurotropic modulating property for diseases integrated with neuron damage. To improve oxidative stress rats were treated with tert- Butyl hydro peroxide. In 1mmol/kg of its body weight of t-Bhp. Which surpass the rigidity of rats limbs (Banjari *et al.*, 2018).

### ***Asparagus racemosus* on Alzheimer disease**

Globally 35 million people are suffering from Alzheimer disease and out of which 5. 5 million people belong to North America. This number will increase to 115 million till the end of 2050. Nature is the one of the best chemist and use to treat most of the medical issues of mankind. Globally 75% of bioactive or herbal plants are able to use in pharmaceuticals. World health organization study shows that 80% population of Asian and African countries use herbal and bio active plants in primary health care. Herbal plants are used to cure Alzheimer diseases because it progressively decreases its affects. In mice root extract of *Asparagus racemosus* enhance the memory activities. Root extract of *Asparagus racemosus* have notable neuro-protective activities. That's why its root extract are used to cure several diverse cognitive dysfunction and neurodegenerative diseases primarily *Asparagus racemosus* (Uddin *et al.*, 2016)

### ***Asparagus racemosus* consider as female tonic**

In Ayurveda *Asparagus racemosus* is considered as female tonic. It is favorable in female infertility, heal swelling of sexual organs, increase libido drive, and help in ovulation, worm preparation so that female can conceive. It intensify folliculogenesis, help in controlling various hormones. It increases the weight of ovaries by increasing serum follicle stimulating hormone in female rats. Saponin is in *Asparagus racemosus*, which have oxytocic activity in uterus that is helpful in curing irregular bleeding and premenstrual syndromes (Sharma *et al.*, 2010)

### **Aphrodisiac activity of *Asparagus racemosus***

*Asparagus racemosus* shows aphrodisiac activity because of high saponins content. Plant extract of *Asparagus racemosus* is used to check photochemical Constitution and aphrodisiac activity. Photochemical components of *Asparagus racemosus* contain carbohydrates, saponins, glycosides and mucilage. Saponins show the highest number of aphrodisiac activities. When hydro-alcoholic extract of *Asparagus racemosus* is given to mice then it increases its genitalic grooming. Dose of plant extract is 400mg/kg body weight. It increases the sexual behavior of treated animal. It also suggests that *Asparagus racemosus* is safe drug to use. It is able to cure varies sexual problems like erectile failure, lack of sexual desire and premature ejaculation (Wani *et al.*, 2011).

### ***Asparagus racemosus increase life span in Drosophila melanogaster, an invertebrate alternate to animal model***

Ageing is a gradual process. This can be characterized by maturing cellular, tissue and organ level. Give rise in slow functional reduction. Main reason behind ageing and its linked diseases are the free radicals. Antioxidant defense system is present in our body, which neutralized free radicals. Ageing and its linked diseases can be delayed by diminishing the oxidative damage. Gradual process of ageing is difficult to evaluate *in vitro* conditions because it contemporaneously takes place in all system of an organism. There are number of model organisms investigated on ageing process and linked diseases (Gogia, N., Kumar, P., Singh, J., Rani, A. Sirohi, Kumar, P. 2014q. Kumar, P., 2014r. Kumar, P., Dwivedi, P., Singh, P., 2012s. Mishra, P.K., Maurya, B.R., Kumar, Pp. 2012t. Kumar, P., Mandal, B., Dwivedi, P. 2011u. Kumar, P., Mandal, B., Dwivedi, P. 2011v. Kumar, P., Pathak, S. 2016w, Pathak, S., Kumar, P., Mishra, P.K., Kumar, M. 2016x). Some of them are nematodes, *C. elegans*, *Drosophila melanogaster* and mouse (Lovleen *et al.*, 2018; Kaur and Singh, 2019). Out of this entire organism everyone have some limitations except *Drosophila melanogaster* (Singh, 2015). It proved perfect model for drug researchers due to its virtuous characteristics like cost effective, fast model system, short life span, and huge mutation changes and less genomic content. Antioxidant system and reactive oxygen species counteract with each other. Addition of antioxidant in direct increase the lifespan and other fitness parameters investigated on *Drosophila melanogaster* (Kumar *et al.*, 2015; Sharma *et al.*, 2018; Singh and Himalian, 2018, Singh *et al.*, 2020a., Singh *et al.*, 2020b., Sood *et al.*, 2020; Bhadrecha *et al.*, 2020; Singh *et al.*, 2020c; Sharma *et al.*,

2020; Singh *et al.*, 2020d; Bhati *et al.*, 2020; Singh *et al.*, 2019; Sharma *et al.*, 2019)

### **Chemical constituent of *Asparagus racemosus***

Asparagus belongs to liliaceous family. It includes more than 300 species. Roots of *Asparagus racemosus* are bitter and sweet in taste (Gaikwad *et al.*, 2018; Bashir *et al.*, 2019).

**Table 4:** Nutritional content of *Asparagus racemosus* (Somani *et al.*, 2008).

Serial number	Chemical constituent	Amount
1	Protein	2.95%
2	Saponins	5.44%
3	Carbohydrates	52.89%
4	Crude fibers	17.93%
5	Inorganic matters	4.18%
6	Oil	5%

### **Indigenous herbal plants are used to cure skin diseases**

Indigenous herbal plants are used to cure various skin problems. According to world health organization (WHO) study 80% of developing nation population uses herbal and bioactive plants in their primary health care system. *Asparagus racemosus*, *Argemone mexicana*, *Acorus calamus*, *Aegle marmelos*, *Datura metel* are used to cure dandruff, leprosy, rashes, swelling etc (Chaudhary *et al.*, 2018; Rajeshkumar *et al.*, 2019). Rural communities uses herbal plants in varies ways. It increases their economy as well. Traditionally, Indian system of medicine is related to herbal, bioactive plants and its diversity. They have great potential to cure number of skin diseases. Eighty percent of Indian population uses them in their day-to-day life to cure skin problems.

**Table 5:** List of herbs and their efficacy to cure diseases (Kingston *et al.*, 2009)

S.No	Plant species	Family	Potential Cure
1	<i>Acorus calamus</i>	<i>Acoraceae</i>	Eczema
2	<i>Aegle marmelos</i>	<i>Rutaceae</i>	Scarbius
3	<i>Anacardium occidentale</i>	<i>Anacardiaceae</i>	Leprosy
4	<i>Asparagus racemosus</i>	<i>Liliaceae</i>	Skin disease
5	<i>Datura metel</i>	<i>Solanaceae</i>	Reduce swelling

### **Nettle leaf**

*Urtica dioica* known as common nettle, stinging nettle and meaning of nettle is ‘textile plant’ it belongs to family Urticaceae. It mainly found in temperate zones of Asia, America and Europe. *Urtica dioica* is a herb growth up to 0.6m and propagated by seeds or vegetative by divisions (Bisht *et al.*, 2012). *Urtica dioica* has been considered as wealthy source of natural products and extensively used for human welfare (Bisht *et al.*, 2012). *Urtica dioica* have great medicinal value and has great economic potential due to its multi-utilitarian nature. It is mainly found growing in old field rich soils in forest clearings, and wasted places. *Urtica dioica* use as medicinal herb due to anti-hyperlipidemic, antihypertensive and anti-diabetic activities (Ahangarpour *et al.*, 2012). It is also reported that *Urtica dioica* have various pharmacological activities such as antibacterial, antimicrobial, cardiovascular effects, anticancer activity and anti-diabetic activity (Joshi *et al.*, 2014). It also functions as an anti-inflammatory agent due to existence of active chemical agent’s formic acid (methanoic acid) and histamine (Bisht *et al.*, 2012). *Urtica dioica* (Stinging nettle) is also

effective in the blood glucose lowering (Farzami *et al.*, 2003). It increases the flow of urine, shrinks inflamed tissues, helps blood circulation and purifies the blood (Bisht *et al.*, 2012). It carry vitamins, amino acids and minerals in its seeds and leaves and also have useful effects such as curing some illness like rheumatism, and prostate cancer, anemia, diabetes, eczema, liver inflammation, hemorrhoid (Aksu and Kaya, 2004). Commercial use of nettle is it can be used in hair shampoos to control dandruff, eczema and can bring back the natural color of hair. It helps to stimulate hair growth (Bisht *et al.*, 2012). There is estimation by the International Agency for Research on Cancer mortality and prevalence from major types of cancer (Kumar, P., Harsavardhan, M. *et al.*, 2018y. Kumar, P., Yumnam, J. *et al.*, 2018z). In 2012 there were 14.1 million new cancer cases, 32.6 million people living with cancer and 8.2 million deaths were there. It is predicted that there will be 26 million new cancer cases and per year there will be 17 million deaths because of cancer (Solowey *et al.*, 2014).

## Botanical description

*Urtica dioica* grows up to 0.6m tall and bears opposite, deeply serrate, cordate and pointed leaves, June and July is the time for fruiting and flowering of nettle. Individual flowers are either female or male but both sexes can found in same plant of nettle (monoecious). Wind is a pollinator agent of nettle Kumar, P., Pandey, A.K., et al., 2018aa., Kumar, P., Kumar, S. et al., 2018bb., Kumar, P., Krishna, V., et al., 2018) Stinging trichomes cover stem and leaves of plant. Trichome of nettle leave contains fluid, which has histamine, acetylcholine, 5- hydroxyl tryptamine, small amount of formic acid and leulotrienes that cause blistering when enters in the skin (Bisht et al., 2012).

## Commercial uses of *Urtica dioica*

*Urtica dioica* have ability to bring back natural color of hairs and also can control dandruff and eczema because of these properties it used as shampoos. Seed of nettle used as illuminant (oil extract of seeds). Nettle is also use in industrial purpose currently silky fabric produce from nettle known as 'ramic'. In Italian fashion houses this currently available. Paper rope and cloths produced from this fiber that is obtained from nettle plant (Bisht et al., 2012).

## Medicinal uses of *Urtica dioica*: Anti-inflammatory & anticancer activities

Brain lesion is induced by The N-Methyl-D-aspartate (NMDA) injection and following inflammation in wistar rats notably decreasing the nuclear factor kappa B (NFkB) binding activity to DNA on direction of *Urtica dioica* leaf supplementation that shows a significant anti-inflammatory effect. Cytotoxic activity against MDA-231 breast cancer, MCF-7 cell lines by using the XTT cell cytotoxicity assay has been investigated with help of the aqueous extract of *Urtica dioica* root (aqueous extract) of the plant roots show a dose dependent inhibition of the globulin binding to its receptor and cell proliferation of HeLa cells inhibits by it and block binding of epidermal growth factor to its receptor (Aksu and Kaya, 2004).

## Cardiovascular Effect of *Urtica dioica*

Plant have antihypertensive property, 0.1 mg/kg fraction causes a decrease of MAP mean arterial pressure (79.59/0.5 mmHg) in contrast to basal value (96.59/0.5 mmHg). Concentration of KCL (40-60 mm) is increase that is by elevated of the level of depolarization membrane due to decrease in the vaso-relaxation action of plant. These effects proposed suggest the involvement of hyper polarization factors, probably bound to potassium channels opening.

## Anti-diabetic Activity of *Urtica dioica*

The leaf extract of plant was manage in per fused islets of Langerhans in normal induced diabetic rats which showed a notable enhancement of insulin secretion thereby decreasing the blood sugar level (Joshi et al., 2014).

## Conclusion

Due to urbanization, modernization, and regular development of the residential environment (surrounding environment/place where we live), we have to face a certain level of heavy metals through occupation or non-occupational exposure. It is pertinent to have consequences due to heavy metals in the environment and it is always better to reduce their effects through our diet. We can

significantly alter the harmful effects of these heavy metals by using more herbs/nutraceuticals in our daily diet particularly *Asparagus racemosus* & *Urtica dioica*.

**Conflicts of interest:** None

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