ISSN: 2322 - 0902 (P)
ISSN: 2322 - 0910 (O)

International Journal of Ayurveda and Pharma Research

Research Article

ELEMENTAL ANALYSIS OF *PUNARNAVA* (*BOERHAVIA DIFFUSA* L.) AND ITS POTENTIAL BENEFITS IN GERIATRIC CARE

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Article info

Article History:
Received: 19-01-2026
Accepted: 26-02-2026
Published: 26-03-2026

KEYWORDS:
Boerhavia diffusa L., *Rakta Punarnava, Rasayana,* Elemental analysis, Geriatric health.

ABSTRACT

Boerhavia diffusa L. - *Punarnava* (*Rakta* variety), a well-known Ayurvedic herb, has been traditionally employed for its Rejuvenative (*Rasayana*), diuretic, hepatoprotective and anti-inflammatory properties. Recent scientific interest has focused on understanding the herb's pharmacological potential through its elemental composition and bioactive constituents. This study aims to analyse the elemental composition of *Rakta punarnava* and correlate its nutritional and therapeutic value with its *Rasayana* effects, particularly in promoting health and longevity in the geriatric population. Ageing is a progressive physiological process characterised by functional decline and increased vulnerability to diseases. Geriatrics is the branch of medicine which deals with care of aged. Ayurveda describes *Rasayana* therapy as a holistic rejuvenative approach to promote longevity, vitality and resistance to age-related degeneration. The *Punarnava rasayana* mentioned in our Ayurvedic classics will restore youthfulness by improving physical and mental health. The elemental profile of *Boerhavia diffusa* L. (*Punarnava*) revealed a significant presence of essential trace elements- Ca, Mg, Na, K, Fe, Zn, Cu etc. known to support antioxidant defense, enzymatic function and cellular regeneration. These elements contribute to improved metabolism, tissue nourishment and vitality. The herb's medicinal qualities synergistically promote detoxification, rejuvenation and enhanced cellular function aligned with its *Rasayana* attributes.

INTRODUCTION

Boerhavia diffusa L. Nyctaginaceae - *Punarnava* is a well-known medicinal plant in traditional Indian medicine as well as other parts of world. Its various parts and especially roots have been used for GIT, hepatoprotective, and urinary disorder indications[1]. It contains diverse elements which have shown various therapeutic activities. In Ayurveda *Boerhavia diffusa* L. has been classified as *Rasayana* herb which is said to possess properties like anti-ageing, re-establishing youth, strengthening life and brain power and disease prevention.

The term *Punarnava* literally means 'the one which renews the body highlighting its role in promoting vitality and overall well-being, especially in the elderly [2].

Access this article online

Quick Response Code

https://doi.org/10.47070/ijapr.v14i3.4063

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Phytochemical studies reveal that *Punarnava* contains a rich array of bioactive and elemental constituents, including alkaloids (punarnavine), flavonoids, steroids, lignans and essential minerals such as calcium, Iron, Magnesium, Potassium, Sodium etc. These elements and compounds contribute to its antioxidant, anti-inflammatory, diuretic, hepatoprotective and immunomodulatory effects.

The geriatric population refers to individuals aged 60 years and above, often considered the elderly or older adults. Ageing is a natural biological process accompanied by gradual physiological, psychological and social changes that can affect overall health and quality of life. As life expectancy increases societies face new challenges in addressing the complex healthcare needs of older adults, including the management of chronic diseases, mobility issues, cognitive decline and social isolation. Geriatric care emphasizes promoting independence, maintaining functional ability and enhancing the well-being of older individuals [4].

In the geriatric population, *Punarnava* has shown potential benefits in managing age-related disorders such as arthritis, oedema, Urinary problems, liver dysfunction and general debility. Its antioxidant and anti-aging properties help combat oxidative stress– one of the key factors in ageing and chronic disease progression[6]. Moreover, its rejuvenative (*Rasayana*) nature supports energy, metabolism and organ function, promoting healthy and active ageing.

Thus, the elemental composition of *Punarnava* makes it a valuable herb in geriatric care, offering a natural approach to maintaining vitality, delaying degenerative changes and enhancing quality of life among older adults.

AIMS AND OBJECTIVES

This study aims to analyse the elemental composition of *Boerhavia diffusa* L. and correlate its nutritional and therapeutic value with its *Rasayana* effects, particularly in promoting health and longevity in the geriatric population.

Methodology

Good quality *Boerhavia diffusa* L. (*Punarnava*) plant was collected from a reputed raw drug shop in Trivandrum. The plant material was botanically identified and confirmed at the Pharmacognosy Unit of Government Ayurveda College Panchakarma Hospital, Poojappura. After authentication, the samples were cleaned, dried in the shade and stored under appropriate standard conditions.

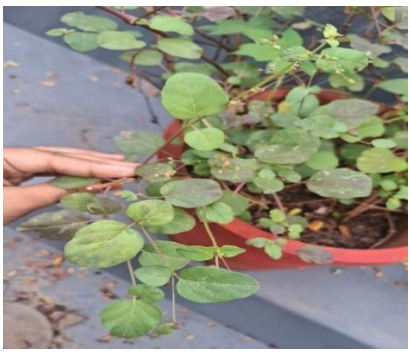

Figure 1: Fresh *Punarnava* plant

Figure 2: Sample for drying

The dried samples were finely powdered and passed through an IS Sieve No.44 to achieve uniformity. The resulting powder was stored in sealed, airtight containers to prevent exposure to light and moisture.

Figure 3: Powdered *Punarnava*

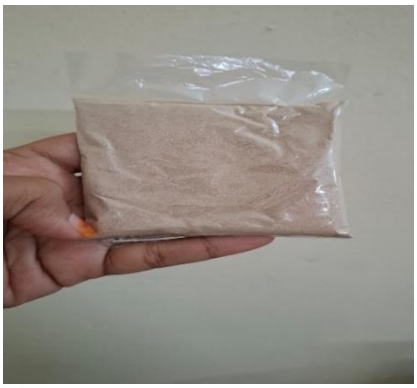

Figure 4: *Punarnava* Powder Sachet

Authenticated *Rakta Punarnava* powder sample was subjected to elemental analysis using Inductively Coupled Plasma-Mass Spectrometry (ICP-MS). Essential macro and micro elements such as K, Mg, Cu, Fe, Ca, Na, Mn etc were quantified. Trace elements/ heavy metals such as Hg, Pb, As etc. which can cause toxicity were also quantified for ensuring the safety of the drug. The results were interpreted and analysed with the contemporary evidence of geriatric health benefits.

Table 1: Pharmacological properties and actions of *Punarnava*[3]

Rasa	*Madhura*, *Tikta*, *Kasaya*
Guna	*Ruksa*
Veerya	*Usna*
Vipaka	*Madhura*
Karma	*Vatasleshmahara, Mutrala, Sothahara, Anulomana*

Chemical Constituents[7]

Boerhavia diffusa L. contains Punarnavine an Alkaloid, Beta-Sitosterol, Hexacosanoic acid, Tetracosanoic acid, Stearic acid, Hentriacontane, Ursolic acid, Myristic acid, Potassium nitrate, Oxalic acid and Asparagine.

Therapeutic uses[5]

Pandu, *Shotha, Amavata, Kasa, Jwara, Nidranasha, Raktha shtivana, Asmari*

Inductively Coupled Plasma Mass Spectroscopy (ICP-MS)[8]

ICP-MS is technique used to detect trace amounts of heavy metals and certain non-metal elements in their atomic form. It is used to measure Mercury, Lead, Cadmium, Arsenic, Magnesium, Iron, Copper, Zinc, Calcium, Aluminium, Chromium, Sodium, Potassium, Vanadium, Manganese, Nickel, Barium levels (in ppm) in the study drug, following standard procedures at CSIR, Pappanamcode, Thiruvananthapuram.

Raw drug powder is treated with hydrogen peroxide and concentrated nitric acid. After 30 minutes of pre-digestion, Milli-Q water was added to the acid – treated mixture, and the containers were sealed and shaken. A Mars Protein Analyzer Microwave Digester was then used to further break down the plant material. The digested solution was transferred to a volumetric flask and topped off with Milli-Q water. Blank samples were also prepared in the same way. These solutions were then analysed using the ICP-MS technique to determine the elemental composition.

Both the standard and sample solutions were analysed using ICP-MS system. A freshly prepared 5% acidifying solution was added, followed by standard solutions with varying concentrations for calibration. After another addition of the acidifying solution, a blank sample was introduced. The analysis was performed using the Agilent 7700 Series ICP-MS instrument and the Mass Hunter Workstation data analysis program (132). Test results are shown below.

ICP-MS Test Results

Sl.No.	Parameter	Result	Method
1.	Magnesium Mg (mg/l)	2066	NIIST-SOP-ICP-01
2.	Aluminium Al (mg/l)	516.5	
3.	Chromium Cr (mg/l)	1.05	
4.	Iron Fe (mg/l)	591	
5.	Copper Cu (mg/l)	4.45	
6.	Arsenic As (mg/l)	0.12	
7.	Cadmium Cd(mg/l)	0.25	
8.	Lead Pb (mg/l)	0.78	
9.	Zinc Zn (mg/l)	25.31	
10.	Mercury Hg (mg/l)	0.05	
11.	Calcium Ca (mg/l)	1469	
12.	Sodium Na (mg/l)	390	
13.	Potassium K (mg/l)	7106	
14.	Vanadium V (mg/l)	1.48	
15.	Manganese Mn (mg/l)	25.67	
16.	Nickel Ni (mg/l)	1.02	
17.	Barium Ba (mg/l)	27.94	

DISCUSSION

In old age, the body undergoes many physiological changes that can lead to health problems. Common issues include decreased muscle strength, reduced bone density (osteoporosis), joint stiffness and arthritis, slower metabolism, and decreased balance, which increase the risk of falls. The cardiovascular system may weaken, leading to high blood pressure and heart disease, while lung capacity declines, causing breathlessness. Sensory impairments such as poor vision and hearing loss are frequent, along with weakened immunity that makes infections more likely. Digestive problems, urinary incontinence, sleep problems such as insomnia and frequent night awakenings, Benign Prostatic Hyperplasia (BPH) in men, electrolyte imbalances and chronic conditions like diabetes are also common affecting overall independence and quality of life.

Pathological changes in old age refer to disease-related alterations that occur due to ageing and long-term wear of body systems. These include degenerative disorders such as osteoarthritis, cardiovascular diseases like hypertension and atherosclerosis, and metabolic conditions such as diabetes. Neurological changes may lead to dementia, Alzheimer's disease, and Parkinson's disease. There is also reduced immune function, increasing susceptibility to infections and cancer, all of which contribute to reduced functional ability and quality of life.

The elemental analysis of *Boerhavia diffusa* L. provides important insight into its therapeutic value, particularly in geriatric care. Ageing is associated with nutritional deficiencies, metabolic disturbances and increased vulnerability to chronic diseases, where essential and trace elements play a vital role in maintaining physiological balance. The presence of biologically important elements in *Boerhavia diffusa* L. supports its traditional use as a rejuvenative herb, contributing to bone health, renal function, antioxidant defense, and overall vitality in the elderly. Discussing its elemental profile helps establish a scientific basis for its role in promoting healthy ageing.

Potassium

Boerhavia diffusa L. is naturally rich in potassium, especially its roots and leaves. This contributes significantly to its diuretic (*Mutrala*) and anti-oedema (*Shothahara*) properties described in Ayurveda[9]. It is a major intracellular electrolyte important for fluid balance, nerve conduction, acid-base balance etc. Potassium helps improve quality of life by supporting heart health, neuro function and muscle strength[10]. It aids in maintaining proper fluid and electrolyte balance which regulates blood pressure and prevents fatigue and cramps. Potassium also enhances *Boerhavia diffusa* L. has diuretic effect, promoting kidney health without causing dehydration. *Boerhavia diffusa* L. increases urine output but maintains potassium due to its own potassium content. Overall, it contributes to better cardiovascular stability, mobility and overall vitality in elderly individuals[11].

Magnesium

It helps improve sleep and gut health by supporting the body's relaxation and digestive functions. Magnesium promotes melatonin regulation and calms the nervous system[12], aiding in better sleep quality and reducing insomnia[13]. In the gut, it helps relax intestinal muscles, enhance bowel movements and maintain a healthy microbiome balance. It helps maintain muscle and nerve function, regulate heartbeat and support bone health. It also aids in energy metabolism and enhances the herb's diuretic and anti-inflammatory effects[14], promoting better cardiovascular and renal function. Thus, magnesium contributes to restful sleep and efficient digestion in elderly individuals.

Calcium

Boerhavia diffusa L. contains moderate levels of calcium. It supports bone and teeth mineralisation, muscle contraction and electrolyte balance[15]. In geriatric people, calcium balance is often disturbed due to lower dietary intake, poor absorption, kidney decline, vitamin D deficiency and risk of osteoporosis. The calcium in *Boerhavia diffusa* L. aids in preventing osteoporosis which further reduces the risk of fractures[16], maintain neuromuscular strength and reduces nerve irritability as well as muscle cramps and promote gentle diuresis without causing mineral depletion[17]. Thus, calcium contributes to overall vitality and age -related health maintenance in the elderly.

Iron

Iron helps prevent and manage anaemia, a common age-related condition. It supports haemoglobin synthesis and energy metabolism[18], improves oxygen transport, muscle strength and enhance cognitive performance[19]. Iron is crucial for mitochondrial energy production and it is beneficial in older adults with chronic fatigue. It also supports neurotransmitter synthesis and myoglobin in the muscles[20]. Thus, iron aids in enhancing energy levels, tissue repair and overall vitality in elderly individuals.

Sodium

Sodium is essential for maintaining extracellular fluid volume and osmotic balance. In geriatrics, dehydration, poor thirst perception and electrolyte imbalance are common[21]. The natural sodium content of *Boerhavia diffusa* L. helps maintain electrolyte equilibrium, while its diuretic action prevents abnormal fluid accumulation. It supports normal blood pressure, prevents dehydration and weakness and aids in overall cellular function. Sodium is essential for nerve impulse transmission and muscle contraction also[22]. Thus, sodium helps promote better energy levels, cardiovascular stability and overall vitality in elderly individuals.

Zinc

Zinc act as an antioxidant, reducing age-related oxidative stress and inflammation. Zinc is vital for kidney tissue repair, maintaining tubular function and prevents oxidative damage. It also aids in maintaining appetite, skin integrity and hormonal balance, which are vital for healthy ageing. Zinc is necessary for detoxification of enzymes in the liver[23]. Older adults commonly have marginal zinc deficiency due to reduced dietary intake, poorer absorption, medications affecting absorption, chronic inflammation and kidney or liver dysfunction. Zinc deficiency in geriatrics contributes to reduced immunity, delayed wound healing, poor appetite, increased infection risk, cognitive decline and muscle loss[24]. *Boerhavia diffusa* L. help compensate for these zinc-related vulnerabilities by supporting immune function, reducing oxidative stress, improving kidney and liver function and supporting musculoskeletal health[25].

Copper

It helps support antioxidant defence, red blood cell formation and immune function. It aids in iron metabolism, thereby helps prevent anaemia and fatigue[26]. Copper also contributes to collagen and

elastin synthesis, promoting healthy skin, joints and connective tissues, improves blood vessel elasticity, reduces risk of atherosclerotic changes and supports circulation in chronic heart disease. which are vital for ageing individuals[27]. Copper is necessary for neurotransmitter synthesis and supports cognitive and nerve function[28]. Thus, copper helps maintain energy, tissue repair, and overall vitality.

Manganese

It supports normal carbohydrate and energy metabolism and helps in bone mineralization. It is essential for the formation of bone matrix and synthesis of cartilage and connective tissue formation, thus supports bone density, helps in osteoarthritis and age -related degeneration. In elderly individuals, it improves metabolic efficiency, supports energy levels and helps in age-related metabolic slow-down[29].

Nickel

Nickel is present in *Boerhavia diffusa* L. only in trace, physiological amounts. Nickel supports the enzyme activities involved in metabolism and kidney function. Helps in carbohydrate and lipid metabolism. Also aids in iron absorption and red blood cell formation. Nickel act as a cofactor or activator for certain enzymes and helps maintain cellular energy metabolism also[30].

Chromium

Chromium present in *Boerhavia diffusa* L. is only in trace amounts and may contribute to improved quality of life in older adults by supporting metabolic and physiological functions. Chromium enhances insulin sensitivity, help in stabilizing blood glucose levels, which can reduce fatigue and improve energy. It also supports lipid metabolism, contributing to better cardiovascular health. Chromium enhances overall metabolic balance, reduce oedema, support organ function, and promote better mobility and vitality[31]. These effects can help improve daily functioning and overall wellbeing in the geriatric population.

Vanadium

Vanadium is a trace mineral with insulin-mimetic, enzyme-modulating and anti-inflammatory actions. So, it is beneficial for older adults with type 2 Diabetes, impaired glucose tolerance or metabolic syndrome. Vanadium may inhibit key enzymes in lipid synthesis, potentially reducing LDL, Improving HDL and lowering the triglycerides. Vanadium stimulates osteoblast activity and enhances bone mineralisation also[32]. It also supports reduced systemic inflammation which is common in geriatric populations.

Heavy metals (Hg, Pb, As, Al, Ba, Cd)

The elemental composition of heavy metals such as mercury (Hg), lead (Pb), Arsenic (As), Aluminium (Al), Barium (Ba), Cadmium (Cd) etc. is present only in trace amounts. These minimal levels are generally considered safe and fall within permissible limits established by regulatory bodies. If these elements were present in concentrations higher than trace levels, they could pose significant health risks, as heavy metals known to cause toxicity and adverse physiological effects when accumulated in the body. Therefore, the safety of *Boerhavia diffusa* L. largely depends on maintaining these elements at extremely low levels through proper sourcing, processing and quality control measures.

CONCLUSION

The elemental analysis of *Boerhavia diffusa* L. reveals the presence of essential macro and trace elements such as sodium, potassium, calcium, iron, zinc, copper, manganese, chromium, nickel and other micro-minerals, all occurring in physiological, non-toxic amounts. Overall, the elemental composition of *Boerhavia diffusa* L. strengthens its *Rasayana* effect, offers a safe, holistic, and multi-system supportive role in geriatric care. When used judiciously, *Boerhavia diffusa* L. serves as a valuable and therapeutic and supportive herb for improving quality of life, functional capacity and metabolic balance in the ageing population.

Boerhavia diffusa L. produces a significant positive difference in the geriatric population by improving overall physiological balance, supporting organ function, and enhancing quality of life in old age due to its rich elemental profile.

REFERENCES

1. Kirtikar KR, Basu BD. Indian medicinal plants. Vol 3. Dehradun: International Book Distributors; 1999. p. 2045-2048.
2. The Ayurvedic pharmacopoeia of India. Part 1, Vol 1. New Delhi: Government of India, Ministry of AYUSH; 2001. p89-92.
3. Sharma PV. Dravyaguna vijnana. Vol 2. Varanasi: Chaukhambha Bharati Academy; 2012. p.749-752.
4. Park K. Park's textbook of preventive and social medicine. 26th ed. Jabalpur: Banarsidas Bhanot; 2021. p.679-685.
5. Pandey GS. Bhavaprakasha Nighantu. Varanasi: Chaukhambha Bharati Academy;2010. p.295-297.
6. Fillit HM, Rockwood K, Young J, editors. Brocklehurst's textbook of geriatric medicine and gerontology. 8th ed. Philadelphia: Elsevier; 2017. p.3-15
7. Rawat AKS, Mehrotra S. Phytochemical investigation of Boerhavia diffusa Linn. Indian JPharm Sci. 1997; 59(6): 243-245. (Alkaloids including punarnavine, flavonoids, steroids)
8. Thomas R. Practical guide to ICP-MS: a tutorial for beginners.3rd ed. Boca Raton: CRC Press; 2013. (ICP-MS operation, calibration, detection limits, trace and heavy metal analysis)

9. Ujowundu CO, Igwe CU, Enemor VHA, Nwaogu LA, Okafor OE. Nutritive and anti-nutritive properties of *Boerhavia diffusa* leaves. J Food Technol. 2008; 6(5): 216-220. (Mineral content including potassium)
10. 10.Soetan KO, Olaiya CO, Oyewole OE. The importance of mineral elements for humans, domestic animals and plants: A review. Afr J Food Scie.2010; 4(5): 200-222. (Physiological role of potassium in fluid balance, nerve conduction and muscle function.
11. Palmer BF, Clegg DJ. Physiology and pathophysiology of potassium homeostasis. Adv Physiol Educ.2016; 40(4): 480-490. (Renal handling of potassium and diuretic relevance)
12. Grober U, Schmidt J, Kiskers K. Magnesium in prevention and therapy. Nutrients. 2015; 7(9): 8199-8226. (Role of magnesium in nervous system, muscle function, energy metabolism and ageing)
13. Abbasi B, Kimiagar M, Sadeghniiat K, Shirazi MM, Hedayati M, Rashidkhani B. The effect of magnesium supplementation on primary insomnia in elderly: A double-blind placebo -controlled clinical trial. J Res Med Sci. 2012; 17(12): 1161-1169. (Sleep quality, melatonin regulation and elderly population)
14. Nielsen FH. Magnesium deficiency and increased inflammation: current perspectives. J Inflamm Res. 2018; 11: 25-34. (Anti- inflammatory role of magnesium)
15. Weaver CM, Gordon CM, Janz KF, Kalkwarf HJ, Lappe JM, Lewis R, et al. The National Osteoporosis Foundation's position statement on peak bone mass development and lifestyle factors. Osteoporosis Int. 2016; 27(4): 1281-1386. (Calcium role in bone mineralisation and fracture prevention)
16. Barbagallo M, Domingues LJ. Calcium homeostasis and ageing. Endocrinol Metab Clin North Am. 2010; 39(2): 377-391. (Age-related calcium imbalance and neuromuscular effects)
17. Soetan KO, Olaiya CO, Oyewole OE. The importance of mineral elements for humans, domestic animals and plants: A review. Afr J Food Sci. 2010; 4(5) :200-222. (Physiological functions of calcium including muscle contraction and nerve transmission)
18. Camaschella C. Iron-deficiency anaemia. N Engl J Med. 2015; 372(19): 1832-1843. (Iron metabolism, haemoglobin synthesis and systemic effects)
19. McCann JC, Ames BN. An overview of evidence for a causal relation between iron deficiency during development and deficits in cognitive or behavioural function. Am J Clin Nutr. 2007; 85(4): 931-945. (Iron and cognition, applicable to ageing populations)
20. Barbagallo M, Dominguez LJ. Iron metabolism and ageing. Ageing Res Rev. 2012; 11(2): 225-234. (Iron balance disturbances and geriatric relevance)
21. Guyton AC, Hall JE. Textbook of medical physiology. 13th ed. Philadelphia: Elsevier Saunders; 2016. p.299-312.
22. Morley JE. Dehydration, hypernatremia, and hyponatremia in the elderly. Clin Geriatr Med. 2015; 31(3): 389-399.
23. Prasad AS. Zinc in human health: effect of zinc on immune cells. Mol Med. 2008; 14(5-6): 353-7.
24. McCall KA, Huang C, Fierke CA. Function and mechanism of zinc metalloenzymes. J Nutr. 2000; 130(5S Suppl): 1437S-46S.
25. Haase H, Rink L. The immune system and the impact of zinc during ageing. Immun ageing. 2009; 6:9.
26. Linder MC, Hazegh-Azam M. Copper biochemistry and molecular biology. Am J Clin Nutr. 1996; 63(5): 797S-811S.
27. Turnlund JR. Human whole-body copper metabolism. Am J Clin Nutr. 1998; 67(5 Suppl): 960S-964S.
28. Johnson MA, Fischer JG, Kays SE. Copper deficiency and cognition in older adults. Nutr Rev. 2002; 60(5 Pt1): 161-5.
29. Aschner JL, Aschner M. Nutritional aspects of manganese homeostasis. Mol Aspects Med. 2005; 26(4-5): 353-62.
30. Nielsen FH. Ultra-trace elements in nutrition: current knowledge and speculation. J Trace Elem Exp Med.1998; 11(2-3): 251-74.
31. Anderson RA. Chromium as an essential nutrient for humans. Regul Toxicol Pharmacol.1997; 26(1 Pt 2): S35-41.
32. Nielson FH. Vanadium. In: Bowman BA, Russell RM, editors. Present knowledge in nutrition.9th ed. Washington (DC): ILSI Press; 2006. p.382-394.

Cite this article as:
Shehanas Shukoor, Jyothi. R. Elemental Analysis of Punarnava (Boerhavia Diffusa L.) and its Potential Benefits in Geriatric Care. International Journal of Ayurveda and Pharma Research. 2026;14(3):15-20.
https://doi.org/10.47070/ijapr.v14i3.4063
Source of support: Nil, Conflict of interest: None Declared

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