WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 14, 1256-1268. Review Article ISSN 2277–7105

PHYTOCHEMICALS AND PHARMACOLOGICAL ACTIONS OF *SHATAVARI (ASPARAGUS RACEMOSUS WILLD)*: A REVIEW

Dr. Anjali Shantaram Patil[1*], Dr. Pravin Kumar Joshi[2], Dr. Rajesh Kumar Singh[3] and Dr. Nilesh S. Thorat[4]

[1*]Post Graduate Scholar, Dept. of Dravyaguna Vigyan, Shri N.P.A. Govt. Ayurved College, Raipur, Chattisgarh, India.

[2]Professor & HOD, Dept. of Dravyaguna Vigyan, Shri N.P.A. Govt. Ayurved College, Raipur, Chattisgarh, India.

[3]Lecturer, Dept. of Dravyaguna Vigyan, Shri N.P.A. Govt. Ayurved College, Raipur, Chattisgarh, India.

[4]Lecturer, Dept. of Shalyatantra, Govt. Ayurved College, Jalgaon, Maharashtra.

Article Received on
04 June 2025,

Revised on 24 June 2025,
Accepted on 12 July 2025,

DOI: 10.20959/wjpr202514-37655

***Corresponding Author**
Dr. Anjali Shantaram Patil
Post Graduate Scholar, Dept. of Dravyaguna Vigyan, Shri N.P.A. Govt. Ayurved College, Raipur, Chattisgarh, India.

ABSTRACT

Asparagus racemosus, also known as *Shatavari*, is a medicinal plant extensively used in Ayurvedic and traditional medicine systems, acclaimed for its wide-ranging therapeutic benefits. This review examines the phytochemical components and pharmacological effects of *Shatavari*, highlighting its potential as a natural therapeutic option. The root of *Shatavari* is rich in steroidal saponins (especially shatavarins I–IV), alkaloids, flavonoids, tannins, phytosterol, carbohydrates, fats, and mucilage, all of which contribute to its bioactive properties.[1] Research has shown a broad range of biological activities, including immunomodulatory, antioxidant, anti-inflammatory, galactagogue, anti-ulcer, anti-diabetic, antidepressant, and support for reproductive health. Its historical application in addressing female reproductive issues, supporting lactation, and treating gastrointestinal problems is increasingly validated by scientific findings. The wide-ranging pharmacological benefits of Shatavari, linked to its various phytochemicals, position it as a promising plant for further research and development in *Ayurveda*.

KEYWORDS - *Asparagus racemosus*, *Shatavari*, Pharmacological Action, Phytochemicals material.

INTRODUCTION

Ayurveda is the oldest and most sophisticated herbal system globally. Plants and their derivatives play a crucial role as a source of medicines. *Ayurvedic* texts mention several well-known herbal treatments, and their use is increasing among both Ayurvedic practitioners and the general public. *Shatavari* stands out as one of the most commonly utilized Ayurvedic remedies. There are more than 300 species of Asparagus found worldwide, with 22 species noted in India. *Asparagus racemosus* is distributed globally, including in tropical Africa, Java, Australia, Sri Lanka, southern China, and India, though it is predominantly cultivated in India.[2]

Classification[3]

Kingdom: Plantae

Order: Asparagales

Family: Asparagaceae

Sub family: Asparagoideae

Genus: Asparagus

Species: racemosus

Synonyms[4]

Durmara- Climber hard to eliminate.

Abhiru- Resistant to external attacks.

Adharkantaka- Characterized by the presence of curved spines.

Sukshmpatra- Slender linear leaves like cladode.

Phanijivhaparni- Leaves resembling a snake's tongue.

Satavari, Pivari, Bahusuta, Satpadi- Multiple succulent tuberous roots.

Narayani- Due to the dominance of the water element.

Svadurasa- Tasteful.

Shatvirya- Effective for various diseases.

Vari- Considered one of the best medicinal drugs.

Vernacular names[5]

Sanskrit: Shatavari

Hindi: Satavari, Shatawar or Satmuli

Bengali: Shatamuli

Marathi: Shatavari or Shatmuli

Gujarati: Satawari

Telegu: Toala-gaddalu or Pilli-gaddalu

Tamil: Shimaishadavari or Inli-chedi

Malayalam: Chatavali

Kannada: Majjigegadde or Aheruballi

Madhya Pradesh: Narbodh or atmooli

Kumaon: Kairuwa

Rajasthan: Norkanto or Satawar

Habitat

Shatavari is a plant that grows wild in India, Nepal, Sri Lanka, Australia, Africa, and Eastern Europe. Found in all over India but found mostly in North India.[6]

Cultivation

Climate and Soil: *Shatavari* is a plant native to the Indian subcontinent that thrives in various habitats, ranging from the humid tropical rainforests of Sri Lanka to the Himalayan peaks. This climbing plant features slender branches and feathery leaves that emerge from shrubs and trees to support its growth and access sunlight. While it favours wet rainforest conditions, *Shatavari* can also adapt to drier environments. Its capacity to capture and store moisture in arid soils mirrors its function of filling fluids in the human body and restoring balance to a stressed system.[7]

Harvesting: The months of May and June are ideal for planting. *Shatavari* crops are often resistant to pests and illness. Harvesting begins 1.5-2 years after transplantation and lasts for 10-15 years.

Botanical Description

It is a creeping plant. Its stem has thorns and grows upright. The branches are triangular, oily, and marked with striations. The leaves are quite small, resembling the leafy vegetable Shepu (in Marathi). The thorns measure between 0.62 and 1.25 cm in length and usually appear in clusters of 2 to 6. The flower stalk features numerous branches and sub-branches, adorned with abundant flowers that are white, pink, and aromatic. The fruit resembles berry and

contains 1-2 seeds. There are several thick, oblong rootlets near the main root, which are somewhat curved.[8]

Fig. 1.

Fig. 2.

Fig.1: Photographs of *Asparagus racemosus* showing shoot, leaves and roots. Fig.2: Photographs of *Asparagus racemosus* showing tuberous roots.

Microscopic Description

Microscopic examination of the tuberous roots reveals an outer layer of piliferous cells, which are occasionally ruptured, along with unicellular root hairs that can be seen sporadically. The outer cortex is made up of 6 or 7 layers of polygonal, thick-walled, lignified cells, while the inner cortex contains 20 to 23 layers of oval to polygonal, thin-walled cells. This region also features stone cells and raphides of calcium oxalate. Surrounding the endodermis are 2 or 3 layers of stone cells, and the endodermis itself consists of a single layer of thin-walled parenchymatous cells. Below the endodermis lies the pericycle, which is formed by a single layer of closely packed cells. The stele is organized in an exarch and radial manner. The xylem is composed of vessels, tracheids, and parenchyma, with xylem vessels exhibiting pitted thickening. Patches of phloem can be observed alternating with the xylem vessels.[9]

Phytochemicals of *Shatavari* (*Asparagus racemosus*)[10-12]

Table No. 1: Phytochemicals and their pharmacological activity.

Compound Class	Phytochemicals	Pharmacological Activity
Steroidal Saponins	Shatavarin I–IV, Asparanin A, Shatavaroside A & B, Sarsasapogenin	Galactagogue, Adaptogenic, Immunomodulatory
Alkaloids	Asparagamine A	Neuroprotective, Antioxidant
Flavonoids	Quercetin, Kaempferol, Rutin, Isoflavone derivatives	Antioxidant, Anti-inflammatory, Hepatoprotective
Isoflavonoid Glycosides	8-methoxy-5,6,4′-trihydroxyisoflavone-7-O-β-D-glucoside	Phytoestrogenic, Antioxidant
Phenolic Compounds	Racemosol, Racemofuran	Anti-inflammatory, Antioxidant
Tannins	Hydrolyzable & condensed tannins	Astringent, Antioxidant
Sterols	β-sitosterol, Stigmasterol	Hormone regulation, Cholesterol-lowering
Polysaccharides	Mucilage, Starch	Demulcent, Immunomodulatory
Essential Oils	Trace monoterpenes and sesquiterpenes	Antimicrobial, Aroma-contributing
Vitamins & Minerals	Vitamin A, C, E, Zinc, Calcium, magnesium, potassium and selenium, Cobalt etc.	Antioxidant, Nutritional support
Furan compound	Racemofuran	Antioxidant Activity, Antimicrobial Effects
Essential fatty acids	Gamma linoleinic acids ,diosgenin, quercetin 3-glucourbnides	Anti-inflammatory, Neuroprotective
Cyclic hydrocarbon	Racemosol, dihydrophenantherene	Antioxidant, anti-inflammatory

Pharmacological Actions

1. Anti-diarrheal activity: In developing nations, diarrhoea accounts for three-quarters of mortality in infants and young children. The rates of mortality were observed to be elevated in children under the age of five. Although the application of oral rehydration therapy has decreased mortality rates, chronic diarrhoea remains a serious health threat in areas where malnutrition is a common contributing factor. The antidiarrheal effects of ethanol and aqueous extracts from the root of *Asparagus racem*osus were assessed using a castor oil-induced diarrhea model in rats. The anti-diarrhoeal effect of flavonoids is attributed to their capability to reduce intestinal movement and regulate hydro-electrolytic secretion, which are both known to be affected in this gastrointestinal issue. Both in vitro and in vivo studies have demonstrated that flavonoids can suppress the intestinal secretory response triggered by prostaglandins E2.[13]

2. Anti-bacterial activity: Urinary infections are the most prevalent condition that impacts the urinary system. Urinary Tract Infections rank as the second most frequent type of infection after those of the respiratory system. Annually, around 10% of women indicate experiencing a UTI, and over half of all women will have at least one such infection during their lifetime.[14] The antibacterial effect of *Shatavari moola choorna* (tuberous root powder of *Asparagus racemosus Willd*.) was observed by using agar well diffusion method. The antibacterial properties were evaluated by assessing the diameter of the zone of inhibition surrounding the well. Streptomycin served as a positive control. The extract from the tuberous roots of *Shatavari (Asparagus racemosus Willd*) exhibited a notable zone of inhibition against all the selected uropathogens in the antibacterial study and demonstrated nearly half the effectiveness compared to the standard medication, Streptomycin chosen as standard drug for the antimicrobial investigation.[15]

3. Anti-Inflammatory activity: Inflammatory diseases, including various rheumatic conditions, are a significant contributor to the health issues faced by the workforce worldwide. This phenomenon has been referred to as the 'King of Human Misery.' In this vivo study, healthy albino rats of both genders, weighing between 100 and 160 grams, were chosen and given standard rat food and water ad libitum. The acute hind paw edema in the rats was induced by locally injecting 0.05 ml of carrageenan (prepared as a 1% w/v solution in 0.9% w/v NaCl) into the sub plantar area of the left hind paw. Administration of the hydroalcoholic extract of *Asparagus racemosus* (at dosages of 200 and 400 mg/kg, orally) resulted in the greatest decrease in paw volume.[16]

4. Anti-fungal activity: The in vitro antifungal properties of Asparagus racemosus root and tuber extract were examined against Candida albicans, Candida tropicalis, Candida krusei, Candida guillermondii, Candida parapsilosis, and Candida stellatoidea, all isolated from patients with vaginal thrush. The extract of *Asparagus racemosus* demonstrated significant activity against all Candida strains. The extract's inhibitory effects on all tested Candida species were found to be comparable to those of standard antibiotics.[17]

5. Anti-lithiac activity: The ethanolic extract of *A. racemosus* was assessed for its ability to inhibit lithiasis (stone formation) caused by the oral administration of 0.75% ethylene glycolated water to adult male albino Wistar rats over a period of 28 days. The ionic composition of urine was altered by ethylene glycol, which increased the urinary levels of key ions such as calcium, oxalate, and phosphate, thus contributing to the formation of renal

stones. Nevertheless, the ethanolic extract significantly lowered the heightened levels of these ions in the urine. Additionally, it increased the urinary concentration of magnesium, which is known to act as an inhibitor of crystallization.[18]

6. Antioxidant activity: The potential antioxidant properties of crude extract and a purified aqueous fraction of *Asparagus racemosus* were investigated in relation to membrane damage caused by free radicals produced during gamma-radiation in rat liver mitochondria. Gamma-radiation, at doses ranging from 75 to 900 Gy, led to lipid peroxidation, which was evaluated through the production of thiobarbituric acid reactive substances (TBARS) and lipid hydroperoxides (LOOH). Using a specific dose of 450 Gy, the antioxidant effects of *A. racemosus* extract were assessed regarding its ability to protect against oxidative damage characterized by preventing lipid peroxidation, protein oxidation, the depletion of protein thiols, and the levels of the antioxidant enzyme superoxide dismutase.[19]

7. Anti-depression activity: Depression is the most prevalent psychiatric disorder found in many community-based studies. It is also identified as one of the most frequent psychiatric disorders among outpatient clinic populations and individuals seen in different medical and surgical environments. Additionally, it has been noted as the most common psychiatric condition in elderly individuals across various contexts. Further investigation is required into aspects such as expense, perception of treatment, adherence, compliance, and neurobiological factors.[20] In a study, the administration of methanolic extract (50, 100, and 200 mg/kg per os) of *Asparagus racemosus* for 14 consecutive days resulted in a notable antidepressant-like effect in mice, as demonstrated by the TST and FST. The methanolic extract of *Asparagus racemosus* demonstrated considerable antidepressant-like effects, likely by inhibiting MAO-A and MAO-B, as well as interacting with the adrenergic, dopaminergic, serotonergic, and GABAergic systems. Therefore, the methanol extract of *Asparagus racemosus* could be investigated further for the treatment of mental depression.[21]

8. Anti-autistic activity: Autism spectrum disorder (ASD) is a multifaceted neurobiological condition marked by deficits in neuropsychological functions and behaviours. Key symptoms of autism include cognitive challenges, difficulties with social interaction, and repetitive behaviours, which typically become apparent after a certain age. This condition is one of the fastest increasing disabilities. According to estimates from the Centres for Disease Control and Prevention, its prevalence rate in the United States is currently 1 in 68 births.[22] A study was conducted to investigate the role of acetylcholine, catecholamines, and oxidative stress in

the development of autistic behaviors triggered by valproic acid in rat pups, as well as the effects of Asparagus racemosus (Shatavari) on these symptoms. Pregnant Wistar female rats received a single intraperitoneal dose of sodium valproate (500 mg/kg) on the 13th day of gestation to induce autism in their offspring. The administration of Asparagus racemosus root extract (100 and 200 mg/kg, orally) significantly alleviated oxidative stress induced by valproic acid, evidenced by a reduction in plasma nitrite levels, an increase in brain GSH levels, and enhanced catalase activity in the brains of the autistic rat pups. Additionally, Shatavari reduced the activity of acetylcholinesterase and monoamine oxidase-A enzymes in the autistic pups. In this study, Shatavari effectively reversed the biochemical impairments caused by valproic acid in the rat pups. The autism spectrum disorder, which likely stems from atypical foetal development, may be most effectively addressed through the utilization of this herb.[23]

9. Anti-cancer activity: Chemotherapy often targets and damages DNA, leading to mutations or genomic instability, which are significant characteristics of both cancer and the aging process. There is a wide variety of chemotherapeutic agents that are genotoxic and affect DNA metabolism in various ways, each exhibiting distinct bio distributions, kinetics, and biological results. The consequences of cancer treatment can vary significantly based on the type of DNA damage caused (e.g., disruption of DNA replication or RNA transcription), the specific organ or cell type impacted (e.g., cell cycle phase or differentiation status, metabolic condition, efficiency of clearance and detoxification processes, cellular state or microenvironment), and the level of exposure. Using *Ayurvedic* herbs is better to avoid chemotherapy side effects.[24] The isolated Shatavarin IV (84.69%) and the Shatavarins-rich fraction labeled AR-2B, which contains 5.05% Shatavarin IV, exhibited strong cytotoxic effects. In this study it administered orally to mice with tumors at doses of 250 and 500 mg/kg body weight for a period of 10 days, AR-2B resulted in a significant decrease in the percentage increase in body weight, tumor volume, packed cell volume, and viable tumor cell count, while also leading to an increase in non-viable cell count compared to the untreated mice in the EAC control group. Furthermore, there was a notable restoration of hematological parameters towards normal levels.[25]

10. Antisecretory and Antiulcer activity-The efficacy of *A. racemosus* was assessed in 32 patients by giving them 12 g/d of root powder in four doses over an average period of 6 weeks. *Shatavari* was observed to alleviate most symptoms in the majority of the

participants. The ulcer healing properties of the drug were believed to be due to a direct effect, likely through enhancing intrinsic protective factors. It does not possess antisecretory properties or antacid capabilities, by extending the lifespan of mucosal cells, increasing the secretion and viscosity of mucus, and decreasing H+ ion back diffusion. It has been shown to preserve the continuity and thickness of gastric mucosa treated with aspirin, resulting in a significant increase in mucosal mass. Since *A. racemosus* is effective in healing duodenal ulcers without suppressing acid secretion, it may exert a cytoprotective effect similar to that of prostaglandins and other bile salt interactions.[26-28]

11. Anti-diabetic activity- The extract from the *Asparagus racemosus Willd* plant has been utilized for both gastronomic and medicinal purposes. Findings indicate its inhibitory effects on α-amylase and α-glucosidase, along with a significant presence of phytochemical compounds (such as total flavonoids and triterpenoids). Therefore, the extract from *Asparagus racemosus Willd* could potentially be applied in managing type 2 diabetes mellitus with minimal or no adverse effects.[29]

12. Galactogogue effect -The assessment of the galactogogue properties of *Asparagus racemosus Willd*. roots in a clinical trial involving lactating mothers experiencing insufficient milk production shows significant galactogogue effects compared to the control group, with no notable acute toxicity observed. One potential explanation for this galactogogue effect may be the presence of steroidal saponins found in the plant. This herbal remedy has received scientific support for its galactogogue properties through modern measures, including the evaluation of the prolactin hormone, which is biochemically linked to lactation and related symptoms.[30]

13. Immunomodulatory effect -The methanol extract of *Asparagus racemosus* root demonstrates significant immunomodulatory effects both in vitro and in vivo. This extract promotes the proliferation of immune cells, influences cytokine production, boosts phagocytosis, enhances the delayed-type hypersensitivity (DTH) response, increases the humoral antibody response, and alters the population of splenocytes. These findings support the use of *A. racemosus* as an immune system enhancer in traditional medicine and suggest its potential therapeutic role in treating immune-related disorders. Further research is required to identify the specific bioactive compounds responsible for these effects and to investigate the clinical application of *A. racemosus* as an immunomodulator.[31]

14. Aphrodisiac activity-Lyophilized aqueous extracts derived from the roots of *Asparagus racemosus* impact sexual behaviour in male albino rats. The administration of these extracts shows a significant anabolic effect on the treated animals, evidenced by increases in body weight and reproductive organ size. A marked alteration in sexual behaviour was noted in the subjects, reflected by reduced post-ejaculatory latency.[32]

CONCLUSION

Asparagus racemosus, known as *Shatavari*, contains a wide variety of phytochemicals, such as steroidal saponins (including shatavarins), flavonoids, alkaloids, tannins, phenolic compounds, and essential fatty acids, which enhance its extensive pharmacological profile. These compounds have shown considerable therapeutic potential through a range of pharmacological effects, including antioxidant, anti-inflammatory, immunomodulatory, gastroprotective, antidiabetic, and benefits for reproductive health.

Scientific evidence increasingly supports the use of Shatavari in Ayurvedic medicine, confirming its significance as a medicinal plant. Nevertheless, to establish its clinical effectiveness and safety fully, more research is needed, especially regarding standardized phytochemical analysis, mechanistic studies, and large-scale clinical trials. Ongoing investigation into its bioactive compounds may also cover the way for the creation of new plant-based therapeutic options. Therefore, *Shatavari* stands out as a promising option for incorporation into contemporary pharmacological approaches.

ACKNOWLEDGEMENT

Authors would like to express their gratitude to the Department of Dravyaguna Vigyan, Shri N.P.A. Government Ayurved College Raipur, C.G. India, for their support, encouragement, and motivation in writing this review article.

REFERENCES

1. Shashi Alok, Sanjay Kumar Jain, Amita Verma, Mayank Kumar, Alok Mahor, Monika Sabharwal. Plant profile, phytochemistry and pharmacology of *Asparagus racemosus (Shatavari*): A review. Asian Pacific Journal of Tropical Disease, 2013; 3(3): 242-251.
2. Nutan Sharma, Omprakash Sharma and Naresh Garg. Shatavari *(Asparagus racemosus Wild)*: a review on its cultivation, morphology, biological activities & pharmacological importance. WJPMR, 2021; 7(9): 41–48.

3. Ramit Singla and Vikas Jaitak. Shatavari (*Asparagus racemosus Wild*): a review on its cultivation, morphology, phytochemistry and pharmacological importance. IJPSR, 2014; 5(3): 742-757.
4. P.V. Sharma Namarupajnanam Chaukhambha Visvabharati Varanasi, 2011; 178.
5. Bishen Singh Mahendra Pal Singh , Bopana N and Saxena S. *Asparagus racemosus* Ethnopharmacological evaluation and conservation needs. Ethnopharmacol, 2007; 110: 1-15.
6. Prashant Sakharam Bhokardankar, Sandeep Gorakh Mane, Bhupendra Prakash Khairanar. An overview of *Shatavari (Asparagus racemosus)* an ayurvedic drug. Int. J. Ayur. Pharma Research, 2019; 7(7): 60-65.
7. C.V. Panchal, S.D. Dhumal, S.S. Patil. A Comprehensive Review on: *Shatavari (Asparagus racemosus).* International Journal of Novel Research and Development, 2022; 7(8).
8. Vd. V.M. Gogte. Ayurvedic Pharmacology & Theurapeutic Uses of Medicinal Plants. Chaukhambha Publication New Delhi, 2020; page no.491.
9. Arya. R.H, Shincymol.V.V., Sara Monsy Oommen. An insight to the pharmacognosy of *Shatavari (Asparagus racemosus Willd*.). Int. J. Ayur. Pharma Research, 2018; 6(9): 49-52.
10. Akshaya. P, Mrs. Anusree. S, Mrs.Rupitha. N S, Ms. Liya S Saji, Dr. Kiran K J, Dr. Prasobh G.R . Therapeutic application of Asparagus racemosus in depression: a review, Indo Am. J. P. Sci, 2025; 12(04).
11. K. Dalvi, R. Vaykos, Dr. G. Sanap, S. Nikam. Plant Profile, Phytochemistry and Pharmacology of Asparagus Racemosus (Shatavari): A Review. IJRASET, 2013; 2321-9653.
12. Tarun Kumar Sinha, Saurabh Sharma, Khushboo Gupta, Sandip Prasad Tiwari, Pranjul Shrivastava. A review on *Shatavari churan:* Pharmacological actions and therapeutic applications. Asian Journal of Pharmaceutical Education and Research, 2024; 13(3-s): 95-104.
13. Venkatesan N, Thiyagarajan V, Narayanan S, Arul A, Raja S and Gurusamy S. Anti-diarrhoeal potential of *Asparagus racemosus Wild* root extracts in laboratory animals. J Pharm Pharm Sci., 2005; 8: 39-46.
14. Salvatore et al. ”Urinary Tract Infection’. European Journal of Obstetrics, Gynecology and reproductive Biology, 2011; 156(2): 131.

15. Arya. R.H, Shincymol.V.V, Sara Monsy Oommen .In-vitro Antimicrobial analysis of root powder of *Shatavari (Asparagus racemosus Willd*.) against common Uropathogens. Journal of Medical Science and Clinical Research, 2018; 06(09): 411-414.
16. Mittal S, Dixit PK. In vivo anti-inflammatory and antiarthritic activity of ethanolic extract of *Asparagus racemosus roots.* Int Res J Pharm., 2013; 4(4): 167-72.
17. Uma B, Prabhakar K, Rajendran S. Anticandidal Activity of *Asparagus racemosus*. Indian J Pharm Sci., 2009; 71(3): 342-3.
18. Christina AJ, Ashok k, Packialashmi M. Antilithiatic effect of *Asparagus racemosus Willd* on ethylene glycol-induced lithiasis in male albino Wistar rats. Exp Clin Pharmacol, 2005; 27(9): 633- 63.
19. Kamat JP, Boloor KK, Devasagayam TPA and Venkatachalam SR. Antioxidant properties of *Asparagus racemosus* against damage induced by γ-radiation in rat liver mitochondria. J Ethnopharmacol, 2000; 71: 425-435.
20. Iyer K., Khan Z.A, Depression – A Review. Research Journal of Recent Sciences, 2012; 1(4): 79-87.
21. Dhingra D, Kumar V. Pharmacological evaluation for antidepressant-like activity of Asparagus racemosus wild in mice. Pharmacology online, 2017; 3: 133-152.
22. Bhat, S., Acharya, U.R., Adeli, H., Bairy, G.M., Adeli, A. Autism: cause factors, early diagnosis and therapies. Rev Neurosci., 2014; 25(6): 841-850.
23. Priya Joon, Dinesh Dhingra and Milind Parle. Biochemical Evidence for Anti-autistic Potential of *Asparagus racemosus.* Int-J-Plant-Sci., 2020; 15(1): 42-51.
24. Winnie M.C.van den Boogaard, Daphne S.J. Komninos, Wilbert P.Vermeij. Chemotherapy Side-Effects: Not All DNA Damage Is Equal, 2022; 14(3).
25. Mitra, Shankar K., Prakash, Neswi S., Sundaram, Ramachandran. Shatavarins (containing Shatavarin IV) with anticancer activity from the roots of *Asparagus racemosus*. Indian Journal of Pharmacology, 2012; 44(6): 732-736.
26. Singh KP, Singh RH. Clinical trial on *Shatavari (Asparagus racemosus Willd*.) in duodenal ulcer disease. J Res Ay Sid, 1986; 7: 91-100.
27. Bhatnagar M, Sisodia SS. Antisecretory and antiulcer activity of *Asparagus racemosus Willd.* Against indomethacin plus phyloric ligation-induced gastric ulcer in rats. J Herb Pharmacother, 2006; 6(1): 13-20.
28. Sairam K, Priyambada S, Aryya NC, Goel RK. Gastroduodenal ulcer protective activity of *Asparagus racemosus:* an experimental, biochemical and histological study. J Ethnopharmacol, 2003; 86(1): 13-20.

29. R Vadivelan, R Gopala Krishnan, R Kannan. Antidiabetic potential of *Asparagus racemosus* Willd leaf extracts through inhibition of α-amylase and α-glucosidase J Tradit Complement Med., 2018; 9(1): 1–4.
30. Mradu Gupta, Badri Shaw. A Double-Blind Randomized Clinical Trial for Evaluation of Galactogogue Activity of *Asparagus racemosus Willd*. Iranian Journal of Pharmacological effect, 2011; 10(1): 167–172.
31. Jyoti Mahajan, Pragya Shrivatava and Manik Sharma.Immunomodulatory Activity of Methanol Extract of *Asparagus racemosus*. IJRIAS, 2025; 10(5).
32. Thakur M, Chauhan NS, Bhargava S, Dixit VK. A comparative study on aphrodisiac activity of some ayurvedic herbs in male albino rats. Arch Sex Behav, 2009; 38(6): 1009–1015.