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## THERAPEUTIC POTENTIALS OF SATAWAR-A UNANI MEDICINE

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**ABSTRACT:** The use of herbal medicine is increasing nowadays to find out alternate ways to treat diseases that have no cure in modern medicine or have a risk of side effects. Satawar is an important medicinal plant in Unani Medicine, which has been used from thousands of years for its therapeutic efficacy. In Unani Medicine it has been used for its pharmacological actions like *Mughallize mani* (Insiessant to semen), *Muwallide labn* (Galactagogue) and *Muqawwie bah* (aphrodisiac), *Mufatteh sudad* (Antiobstruent), *Qate balgham* (Mucolytic), *Muqawwi-e-Kabid* (Liver Tonic), *Muqawwi-e-Kuliya* (Renal Tonic), *Mohallile warm* (anti-inflammatory) etc. in diseases like *Jiryan* (Spermatorrhoea), *Zauf-e-Bah* (Sexual Debility), *Riqqat-e-Mani*, *Sailanur reham* (Leucorrhoea), *Suzak* (Syphilis), *Qillat Labn* (*Oligo galactorrhoea*). An effort has been made in this article to highlight important aspects of Satawar in Unani classical literature in light of the recent research, so the researchers can undertake further studies to find out the effective economic and safe solutions for many diseases. After reviewing various research, it can be concluded that many claims of Unani scholars have been proven by modern research like galactagogue, anti-inflammatory, aphrodisiac, hepatoprotective and nephroprotective effects besides its anticancer, antidepressant, immunomodulatory, antigastric ulcer, antidiabetic, antibacterial activities.

**INTRODUCTION:** Satawar is an important medicinal plant in Unani Medicine, including other traditional medicines of India, i.e., Ayurveda and Siddha, which has been used from thousands of years for its therapeutic efficacy. In Ayurveda, it is known as *shatavari* or *shatamull* <sup>1</sup>. The word *Asparagus* is taken from a Greek word and means 'stalk' or 'shoot' <sup>2</sup>. Satawar is derived from tuberous roots of *Asparagus racemosus* Willd.

In this article, an effort has been made to highlight important pharmacological and therapeutic aspects of Satawar in Unani classical literature in light of recent research. The researchers can undertake further studies as per the claims of Unani classical literature to find the effective economic and safe solution for many diseases like *Oligo galactorrhoea*, Sexual debility, Hepatic and Renal dysfunctions, etc.

Based on the *in-vitro* and *in-vivo* studies, more clinical trials are needed to prove the more potentials of Satawar as per the classical Unani literature

**Habitat:** It grows wild and is cultivated through tropical and subtropical parts of India up to 40,000

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feet in Himalayas from Kashmir eastward including tropical Africa, Java and Australia<sup>3,4</sup>.

**Morphology:** *A. racemosus* is a woody climbing plant growing to 1-2 m in length. The leaves are small, like pine needles, uniform, and shiny green; the flowers are white and have small spikes; the

fruits are blackish purple in color and are of globular shapes. The roots are tuberous, fascicled, fleshy, spindle-shaped, light ash-colored externally and white internally, more or less smooth when fresh, but on drying, develop longitudinal wrinkles and lack any well-marked odour<sup>5</sup>.



FIG. 1A: SATAWAR PLANT



FIG. 1B: FLOWERING PART OF SATAWAR



FIG. 1C: ROOTS OF SATAWAR

**AFAL (Actions):** In Unani Medicine classical literature *Satawar* has been described as having pharmacological activities like *Muhallile warm* (anti-inflammatory), *Mughallize mani* (Inspissant to semen), *Muwallide labn* (Galactagogue), *Muqawwie bah* (aphrodisiac), *Mufatteh sudad* (Antioabstruent), *Qate Balgham* (Mucolytic), *Muqawwi-e-Kabid* (Liver Tonic), *Muqawwi-e-Kuliya* (Renal Tonic) etc.

**Mawaqe Istemal (Therapeutic Uses):** *Jiryān* (Spermatorrhoea), *Zauf-e-Bah* (Sexual Debility), *Riqqat-e-Mani*, *Sailanur reham* (leucorrhoea),

*Suzak* (Syphilis), *Qillat Labn* (*Oligo galactorrhoea*)<sup>6,7,8,9</sup>.

**Temperament:** Cold 2<sup>0</sup> Moist 20(5), Cold 2<sup>0</sup> Moist 1<sup>0</sup> 8.

**Therapeutic Dosage:** 5-7 gm<sup>6</sup>, 7-12 gm<sup>8</sup>.

**Muzir Asrat (Side Effects):** Loss of appetite, Headache<sup>7</sup>.

**Musleh (Corrective):** Honey<sup>9</sup>.

**Murakkabat:** Safoof-e-Sailan, Safoof-e-Salab<sup>9</sup>.

**Shelf Life:** Four years <sup>7</sup>.

**Classification:**

**Kingdom:** Plantae

**Division:** Magnoliophyta

**Class:** Liliopsida

**Order:** Asparagales

**Family:** Asparagaceae, Liliaceae

**Genus:** Asparagus

**Species:** Racemosus

**Botanical Name:** *Asparagus racemosus* Willd <sup>4,5</sup>.

**Chemical Constituents:** *Satawar* possess a wide range of phytochemical constituent, which are as follows.

**Steroidal Saponins:** The plant contains four saponins, viz. Satavarin I to IV, Sarsasapogenin adscendin (A, B, C), asparanin (A, B, C) <sup>10</sup>. Satavarin-I is the major glycoside with 3 glucose and rhamnose moieties attached to sarsasapogenin <sup>1</sup>. Shatavarin IV is a glycoside of sarsasapogenin having 2 molecules of *Asparagus rhamnose* and 1 molecule of glucose. Sarsasapogenin and shatavarin I-IV are present in roots, leaves and fruits of asparagus species <sup>7,9</sup>. Recently Shatavarin V, aspariginins, curillins, curillosides have also been reported. Other constituents are oligospirostanoside, known as Immunoside <sup>10,12</sup>, polycyclic alkaloid: Aspargamine. Isoflavones: 8-methoxy - 5, 6, 4'- trihydroxyisoflavone - 7 - O -  $\beta$  - d - glucopyranoside <sup>9,10</sup>. -dihydrophenanthrene derivative: Racemosol and kaempferol were isolated from ethanolic extract of *Asparagus racemosus* <sup>1,10,11</sup>.

**Carbohydrates:** Polysaccharides, mucilage.

**Flavonoids:** Glycosides of quercetin and rutin, hyperosides are present in flower and fruit.

**Sterols:** The dried roots yield sitosterol; 4, 6-dihydroxy-2-O-(2'-hydroxyisobutyl), benzaldehyde, and undecanylecetanoate.

**Trace Minerals:** The roots contain Fe, Ca, P, Cu, Na, K, Mg, Mn, Ni and Zn. Kaepfrol: Kaepfrol and

Sarsapogenin are derived from a woody portion of tuberous root <sup>1,10</sup>.

**Miscellaneous:** The plant also contains Vitamins A, B<sub>1</sub>, B<sub>2</sub>, C, E and folic acid <sup>9</sup>, essential fatty acid, gamma linoleic acid, diosgenin, quercetin 3-glucourbnides <sup>1,9</sup>, arginine, tyrosine, resin and tannin <sup>12</sup>.

**Pharmacological Studies:** *Asparagus racemosus* root extract have a variety of pharmacological properties, i.e., adaptogenic, antioxidant, antibacterial, galactogogue, antiulcer, phytoestrogenic, aphrodisiac, antidepressive, anti-inflammatory, anticancer, antidiabetic, immunomodulatory, hepatoprotective, nephroprotective.

### 1. Adaptogenic Effects:

**In-vivo Studies:** The present randomized, placebo-controlled clinical study was conducted to examine the ergogenic efficacy of supplementation with 500 mg·d<sup>-1</sup> of *A. racemosus* during bench press training. After eight weeks, the results demonstrated greater mean percentage (14.3 ± 7.7% vs. 7.8 ± 4.5%;  $p = 0.048$ ) and individual (80% vs. 50%) increases in 1RM, mean (17.5 ± 2.2 repetitions vs. 15.2 ± 2.2 repetitions;  $p = 0.044$ ) and individual (80% vs. 38%) increases in repetitions to failure and a greater rate of increase in training loads for the *Asparagus racemosus* group than the placebo group. In conjunction with bench press training, supplementation with *A. racemosus* provided ergogenic benefits compared to placebo <sup>13</sup>.

### 2. Antioxidant Effect:

**In vitro studies:** The evaluation of antioxidant properties of ethanolic root extract of *Asparagus racemosus* Linn (EEAR) was undertaken. No toxicity was observed after treatment with 2000 mg/kg of EEAR. The obtained data highlight the potential role of EEAR as a source of natural antioxidants <sup>14</sup>. *Asparagus racemosus* was used as a bioactive ingredient to develop a novel calcium alginate edible film with preservative potential for improved lipid oxidative stability and storage quality of meat products. Products packaged in T<sub>1</sub> and T<sub>2</sub> edible films exhibited significantly ( $P < 0.05$ ) lower values for TBARS (mg malonaldehyde/kg), microbial counts (cfu/g), and



FFA (% oleic acid), indicating the bioactive properties of the developed films. *A. racemosus* added antioxidant and antimicrobial properties to the developed films, improving the lipid oxidative stability and storage quality of the model meat product<sup>15</sup>.

Antioxidant activity of the aqueous (ARA) and ethanolic extracts (ARE) of *Asparagus racemosus* (AR) root were evaluated in a series of *in-vitro* assays, including ROS generation in chemicals and biological model systems. The addition of ARA and ARE root extracts to human serum significantly reduced ( $P < 0.05$ ) the formation of lipid peroxidation in the medium. Compared to ARA extract, the antioxidant activity of ARE is more effective, acting as hydrogen donors, metal ion chelators, reducing agents, radical scavengers, and anti-lipid peroxidative. These effects are attributed to the high lipophilic phenolics content of ARE root extract<sup>16</sup>.

The possible antioxidant effects of crude extract and a purified aqueous fraction of *Asparagus racemosus* against membrane damage induced by the free radicals generated during gamma-radiation were examined in rat liver mitochondria. Both the crude extract as well as the P3 fraction significantly inhibited lipid peroxidation and protein oxidation. The antioxidant effect of P3 fraction was more pronounced against lipid peroxidation as assessed by TBARS formation, while that of the crude extract was more effective in inhibiting protein oxidation. The crude extract and P3 fraction also partly protect against radiation-induced loss of protein thiols and inactivation of superoxide dismutase. The inhibitory effects of these active principles, at the concentration of 10 microg/ ml, are comparable to that of the established antioxidants glutathione and ascorbic acid<sup>17</sup>.

### 3. Teratogenic Effect:

***In-vivo* Studies:** In an animal study the results show that Methanolic extract of *A. racemosus* roots (ARM; 100 mg/kg/day for 60 days) showed teratological disorders in terms of increased resorption of fetuses, gross malformations e.g. swelling in legs and intrauterine growth retardation with a small placental size in Charles Foster rats. Pups born to mothers exposed to ARM for the full duration of gestation showed a higher rate of

resorption and, therefore, smaller litter size. The live pup showed a significant decrease in body weight and length and delay of various developmental parameters compared to respective control groups. AR., therefore, should be used in pregnancy cautiously as its exposure during that period may cause damage to the offspring<sup>18</sup>.

### 4. Phytoestrogenic Activity:

***In-vivo* Studies:** After an animal study, root extract of *A. racemosus* has been reported to increase the weight of ovaries when administered to immature female rats; thus, it enhances folliculogenesis and ovulation in young females<sup>19</sup>.

In a standard randomized control comparative clinical study on 40 patients, 6 grams of *A. racemosus* powder was given twice daily from day 1-14 of cycle. In the control group, clomiphene citrate 50 mg once daily from day 2-6 of the cycle was administered orally for 2 consecutive cycles. After the study was completed, Satawar is effective for ovulation induction, as the ovulatory rate was 25% & 30%<sup>20</sup>. This effect is attributed to phytoestrogens- steroidal saponins in this drug, which exert hormone-like action in the body<sup>12</sup>.

### 5. Anti-Cancer Activity:

***In-vitro* Studies:** An *in-vitro* study of the antiproliferative activity of *A. racemosus* in T47D cancer cell lines indicated that aqueous methanol and methanol extract showed excellent antiproliferative activity as compared to bazedoxifene (standard), ethyl acetate and petroleum ether extract. Furthermore, compound 26 (rutin), which has been earlier reported and isolated from alcoholic extract, exhibited a remarkable binding profile with estrogen receptor  $\alpha$ <sup>21</sup>.

The study was undertaken to assess the anti-cancer activity of root extracts of *Asparagus racemosus* in human lung adenocarcinoma cell line A549. Significant cytotoxic effect of methanol extract (IC 100.5  $\mu\text{g/ml}$ ) in comparison to chloroform: methanol 50 extract (IC 136.5  $\mu\text{g/ml}$ ) was observed. Treatment with the extracts changed the morphology of the cells, as cells became round in shape and migration reduced after treatment with root extracts. A study showed *Asparagus racemosus* root extracts can cause cytotoxic effects,

change the morphology and induce growth inhibition in A549 cells<sup>22</sup>.

## 6. Galactogogue Effect:

**In-vivo Studies:** An on Farm trial was conducted to evaluate the effect of *Asparagus racemosus* on milk production in lactating dairy animals which were parturated 1 to 4 months before the commencement of trial; they were fed 50 gm powder of shatavari roots in concentrates once in a day for a period of 60 days. The overall milk production increased 1.06+ 0.17 kg (11.47%) daily and average milk production in buffaloes and cows were increased 0.8+ 0.34 kg(9.0%), 1.32+ 0.15 kg (12.72%), respectively as compared to their previous production<sup>23</sup>.

Ten dry and pregnant Murrah buffaloes were selected in the study to investigate the effect of *Asparagus racemosus* feeding on hormones, metabolites, milk yield, and plasma cholesterol levels. The treatment group animals were fed with *A. racemosus* (shatavari) @ 150 g/day/ animal during prepartum and @ 300 g/day/animal during the postpartum period. *A. racemosus* feeding significantly ( $P < 0.01$ ) increased plasma prolactin, cortisol ( $P < 0.01$ ), and milk fat cholesterol ( $P < 0.05$ ) without affecting total cholesterol, HDL, LDL, glucose, and NEFA concentrations. The buffaloes of the treatment group produced more milk (@ 0.526 kg/ animal/day), suggesting that *A. racemosus* is galactopoietics<sup>24</sup>.

A randomized, double-blind clinical trial was undertaken to evaluate the galactagogue effect of *Asparagus racemosus* Willd. in 60 lactating mothers by measurement of changes in their prolactin hormone level during the study. The oral administration of the research drug led to more than a three-fold increase in the prolactin hormone level of the subjects in the research group compared to the control group. The primary findings were corroborated by the secondary outcome measures and were found to be statistically significant ( $p < 0.05$ )<sup>25</sup>.

## 7. Anti-Inflammatory Effect:

**In-vitro Studies:** The present study was undertaken to assess the anti-inflammatory, cytotoxic activity, and efficacy of *A. racemosus*-mediated copper nanoparticles. It was concluded that *A. racemosus*

mediated CuNPs can be used as a potent anti-inflammatory drug to treat inflammations and as an anticancer drug for treating tumors and cancers<sup>26</sup>.

The present study was undertaken to evaluate the antioxidant activity of the methanolic extract of *Asparagus racemosus* roots. The antioxidant activity of the methanolic extract of *A. racemosus* was determined by using a method based on the reduction of methanolic solution of coloured-free radical 1, 1 diphenyl-1-2 picrylhydrazyl (DPPH). The study showed that the methanolic extract of roots of *A. racemosus* have moderate free radical scavenging activity<sup>27</sup>. A study was undertaken to develop AR liposomes and assess their physicochemical characteristics and anti-inflammatory activity in the monocytic leukemia cell line THP-1. The maximum anti-inflammatory activities of AR and AR liposomes, evaluated in terms of the percentage inhibition of tumor necrosis factor- $\alpha$  in THP-1 cells, were ~52% at a 1  $\mu\text{g/ml}$  concentration. It can be concluded from the present study that AR liposomes have the potential to be used a formulation for topical and/or transdermal drug delivery to provide anti-inflammatory activity<sup>28</sup>.

**In-vivo Studies:** A study was undertaken to evaluate the anti-inflammatory and anti-arthritis activity of ethanolic extract of *Asparagus racemosus* roots on Carrageenan-induced inflammation and Freund's Complete Adjuvant to induce arthritis. The result of this study revealed that *Asparagus racemosus* show a potent effect on both condition at a dose of 200mg/kg and 400mg/kg, respectively<sup>29</sup>.

A study was undertaken to evaluate the anti-inflammatory and analgesic activity of the aqueous methanolic extract of the root of *Asparagus racemosus* in the Albino mice model. The result showed that aqueous methanolic extract of *Asparagus racemosus*'s root reduced inflammation and pain in experimental models<sup>30</sup>.

## 8. Aphrodisiac Effect:

**In-vivo Studies:** The aqueous extract of the roots of *Asparagus racemosus* Willd rich in 2 $\rightarrow$ 1 type FOS were evaluated for their efficacy against streptozotocin and alloxan-induced diabetes leading to sexual dysfunction in rats. It was observed that

streptozotocin and alloxan-induced hyperglycemic rats showed an overall reduced sexual performance. The deleterious effect was significantly ameliorated in animals treated with a polysaccharide-rich fraction of *A. racemosus*<sup>31</sup>. The present study studied the mounting behaviour of rats treated with AR (3000 mg/kg) with control and Sildenafil Citrate (5 mg/kg). The extracts of the satawar were found to stimulate male rats' mounting behavior and significantly increase their mating performance<sup>32</sup>.

### 9. Antidepressant Effect:

**In-vivo Studies:** The present study was undertaken to evaluate the antidepressant effect of methanolic extract of roots of AR (MAR) standardized to saponins (62.2% w/w). Rats were given MAR in doses of 100, 200 and 400 mg/kg daily for 7 days and then subjected to a forced swim test (FST) and learned helplessness test (LH). MAR has significant antidepressant activity and this effect is probably mediated through the serotonergic and the noradrenergic systems and augmentation of antioxidant defences<sup>33</sup>.

### 10. Immunomodulator Effect:

**In-vivo Studies:** A study evaluated the immunoadjuvant properties of Satawar in animal models that were immunized with the DPT (Diphtheria, Tetanus, Pertussis) vaccine. It was observed that oral administration of 100 mg/kg of test material for 15 days to Swiss albino mice induced a significant increase in anti-*Bordetella pertussis* antibodies when compared to the control animals (untreated). The effect was heightened in the drug-treated group when the immunized animals were challenged with a specific strain of *B. pertussis*. A significant increase in antibody titers was observed compared to animals that were untreated. From the results of this study, it was concluded that *Asparagus racemosus* acts as a potent immunoadjuvant, resulting in reduced mortality and morbidity<sup>34</sup>. A study was undertaken to evaluate the effect of standardized *Asparagus racemosus* root aqueous extract (ARE) on systemic Th1/Th2 immunity of SRBC-sensitized animals. Treatment with ARE (100 mg/(kg b.w. p.o.)) resulted in a significant increase of CD3<sup>+</sup> and CD4/CD8<sup>+</sup> percentages suggesting its effect on T cell activation. ARE-treated animals showed significant up-regulation of Th1 (IL-2, IFN-g) and Th2 (IL-4)

cytokines suggesting its mixed Th1/Th2 adjuvant activity. Consistent with this, ARE also showed higher antibody titres and DTH responses. ARE, combined with LPS, Con A or SRBC, produced a significant proliferation suggesting an effect on activated lymphocytes<sup>35</sup>.

The present animal study was undertaken to investigate the immunomodulatory and antioxidative potential of milk fortified with *Asparagus racemosus* using a freeze-dried aqueous extract of *Asparagus racemosus* using mice. Oral administration of test material with (at 1%) or without milk to mice for 4 weeks resulted in a significant increase (p<.05) in percent phagocytosis, the proliferation of lymphocytes, reduced glutathione content and decreased lipid peroxidation. The immune-enhancing and antioxidative properties may be related to the antioxidant vitamins, saponins, glycosides, polyphenol and flavonoids present in the extract<sup>36</sup>.

In the present study, immunomodulatory activity of two steroidal saponins shatavaroside A (1) and shatavaroside B [2], isolated from *Asparagus racemosus*, have been evaluated using polymorphonuclear leucocytes function test. The activity was further confirmed using more sensitive assays such as nitroblue tetrazolium, nitrous oxide, and chemiluminescence assays. Both steroidal saponins were found active at nano concentration (5 ng/ml) and can act as potent immunostimulants<sup>37</sup>.

Immunomodulatory effects of the white *Asparagus (Asparagus officinalis L.)* skin polysaccharides (WASP) were systematically studied. Physiologically, WASP could modulate the immune response of RAW 264.7 macrophages by increasing the release of immune factors (IL-6, TNF- $\alpha$  and IL-10) and improving mRNA expression<sup>38</sup>. The saponin-rich fractions of *Asparagus racemosus* Willd were tested for immunoadjuvant properties in ovalbumin-immunized mice for the humoral response, quantified in terms of prolonged antibody production up to 56 days. ARS significantly inhibited the pro-inflammatory cytokines, in LPS-stimulated murine macrophages with no intrinsic cytotoxicity. The significant increase in IgG production infers the utility of ARS for a prolonged

humoral response. Further, the antigen-specific response of IL-12 at the early stage and IgE titers also suggest the generation of cellular immune response and low allergic reaction, respectively, compared to conventional adjuvants. IL-6 and TNF fluctuations in LPS-stimulated and non-stimulated macrophages and IgG and IL-12 also confirmed the Th1/Th2 modulating effect of ARS<sup>39</sup>.

### 11. Antigastric Ulcer Activity:

**In-vivo Studies:** The study was undertaken to evaluate the antisecretory and antiulcer activity of *Asparagus racemosus* Willd. (Methanolic extract) and its action against indomethacin (a non-steroidal anti-inflammatory drug) plus pyloric ligation (PL)-induced gastric ulcers in rats. The results show that treatment with *Asparagus racemosus* crude extract (100 mg/kg/day orally) for fifteen days significantly reduced ulcer index when compared with control group. *Asparagus racemosus* was an effective antiulcerogenic agent whose activity can be approximated well with ranitidine hydrochloride. The results of this study suggest that *Asparagus racemosus* causes an inhibitory effect on the release of gastric hydrochloric acid and protects gastric mucosal damage<sup>40</sup>.

### 12. Antidiabetic Effect:

**In-vivo Studies:** The study was undertaken to investigate the antidiabetic and antihyperlipidemic activities of ethanolic root extract of *Asparagus racemosus* (EEAR) in alloxan (ALX) induced diabetic rats. EEAR at doses of 200 and 400 mg/kg showed a significant reduction in blood glucose and lipid profiles compared to the diabetic control group. Based on the experimental results, EEAR possesses antidiabetic and antihyperlipidemic activities<sup>41</sup>.

### 13. Antibacterial Activity:

**In-vitro Studies:** After a study, it was reported that *A. racemosus* plant extracts exhibit antibacterial activity due to the isolation of two nor-lignans and two steroidal triterpenes (compounds 1 to 4). All compounds showed considerable antibacterial activities against *E. coli* and *S. aureus*, while no significant activity was observed against *S. typhi*<sup>42</sup>.

### 14. Hepatoprotective Effect:

**In-vivo Studies:** Present study was undertaken to investigate the effect of *Asparagus racemosus*

Willd root extract in lipopolysaccharide (LPS) induced oxidative stress in rats by measuring oxidative stress markers, nitric oxide, liver function test, and cytokines. The methanolic extract of *Asparagus racemosus* (MEAR) administration significantly (P<0.05) reduced LPS-induced oxidative stress by normalizing liver GSH, SOD, CAT, MDA, NO, cytokines, and liver function markers. MEAR significantly increased ALB and TC levels. Results suggest that MEAR protects the liver against liver toxicity induced by LPS<sup>43</sup>.

### 15. Nephroprotective Effect:

**In-vivo Studies:** This research was undertaken to investigate the protective effect of ethanol fraction of *A. racemosus* roots extract in acetaminophen-induced uraemia and renal failure in rats. Uremic biomarkers significantly decreased, and elevated levels of antioxidant enzymes were found in the animals treated with ethanol fraction of *A. racemosus* compared with acetaminophen-treated uremic animals. HPLC analysis of the ethanol fraction of *A. racemosus* roots extracts eight compounds, out of which one had a retention time near the quercetin standard. It may be concluded that this extract of *A. racemosus* has therapeutically useful nephroprotective potential<sup>44</sup>.

### 16. Toxicity Study:

**In-vivo Studies:** The present study was carried out to evaluate the safety of *Asparagus racemosus* root ethanol extract, isoprinosine, and shatvari syrup by acute and subacute toxicity studies. These results concluded that ARE, STR, and IPR did not cause any mortality and signs of toxicity at a maximum tolerable dose of 2000 mg/kg body weight in mice<sup>45</sup>.

**CONCLUSION:** From the evidence mentioned above, it can be concluded that many claims of Unani scholars have been proven by modern research, like the galactagogue effect, anti-inflammatory effect, aphrodisiac effect, hepatoprotective effect, and nephroprotective effects. Moreover, Satawar has been proven to have antioxidant, anticancer, antidepressant, immunomodulatory, antigastric ulcer, antidiabetic, antibacterial activities. The drug is safe, as no side effects have been reported during in-vivo studies. Satawar has been proven to have teratogenic effects in animal studies so it should be avoided during



pregnancy. So far, very few clinical trials have been undertaken on its clinical efficacy in *Mufatteh sudad*, *Riqqat-e-Mani*, *Qate Balgham*, *Sailanur reham* (Leucorrhoea), *Suzak* (Syphilis), *Muqawwie Kuliya* activities. Based on the in-vitro and in-vivo studies, more clinical trials are needed to prove the more potentials of Satawar as per the classical Unani literature.

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