

## Correlation between morphological/biochemical and molecular characters of *Asparagus racemosus* and *Chlorophytum borivilium*

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**Abstract :** Morphological features are essential for the selection of the best genotype as per the best performance in particular agro - climatic condition. Morphological features like plant height, number of leaves, number of branches, leaf colour; flower colour; shape and size of the plant are the basic for identification and characterization of the planting material. Growth and development of plant is an outcome of several processes.

*Safed musli* is traditionally used for lack of libido male impotency, oligospermia. It is also widely used as a general health promotive tonic and for delaying the ageing process. Varying its common use for health promotion, it is also used for increasing lactation, treating various gynecological disorders, arthritic conditions and to control diabetes mellitus. As such safed musli has no adverse effect if taken in a proper dose while hyper dosing may lead to gastrointestinal disorders.

*Shatavari or Asparagus* is a woody climber growing to 1-2 m in length. The leaves are like pine-needles, small and uniform. The inflorescence has tiny white flowers, in small spikes. The roots are finger-like and clustered.<sup>1</sup> The plant, of the Liliaceae family, is common at low altitudes in shade and in tropical climates throughout India, Asia, Australia and Africa. Shatavari means .who possesses a hundred husbands. It is considered both a general tonic and a female reproductive tonic. Shatavari is the main Ayurvedic rejuvenative tonic for the female, as is Withania for the male. Shatavari is however, used for sexual debility and infertility in both sexes. It is also used for menopausal symptoms and to increase lactation. Shatavari is a soothing and antispasmodic diuretic (although the Western *Asparagus* root, *A. officinalis*, is a stronger diuretic). It is used wherever increased flow of urine is desirable, such as fluid retention and urinary infections. The diuretic and cleansing activities of the roots are of benefit in the treatment of rheumatic pain. It is a sweet and bitter herb which is said to be particularly balancing to Pitta Dosha. Recent research has shown it to be an immunomodulator with antioxidant, healing and adaptogenic properties.

### *Asparagus racemosus*

- **Anti-Inflammatory and Anti-Oxidant Benefits**

It's not surprising to see asparagus being heralded as an anti-inflammatory food because it provides a truly unique combination of anti-inflammatory nutrients. Among these anti-inflammatory nutrients are asparagus saponins, including asparanin A, sarsasapogenin, protodioscin, and diosgenin. One of these saponins (sarsasapogenin) has been of special interest in relationship to amyotrophic lateral sclerosis (ALS), also known as "Lou Gehrig's Disease." Even though ALS is classified as a chronic, neurodegenerative disease and is not currently accepted as an autoimmune disorder, excessive, unwanted inflammation may play an important role in the death of certain nerve cells (motor neurons) in ALS. Other anti-inflammatory nutrients in *Asparagus* include the flavonoids quercetin, rutin, kaempferol and isorhamnetin.

Alongside of these anti-inflammatory phytonutrients, *Asparagus* provides a wide variety of antioxidant nutrients, including vitamin C,  $\beta$ -carotene, vitamin E, and the minerals zinc, manganese, and selenium. In addition to the antioxidant nutrients above, this much-loved vegetable may also contain a valuable amount of the antioxidant glutathione (GSH). GSH is one of the body's best-studied antioxidants; it consists of three amino acids — glutamic acid, glycine, and cysteine — combined into one molecule. At least one published study has estimated the amount of GSH in fresh asparagus to average 28 milligrams per 3.5 ounces. Several studies have compared the overall antioxidant capacity of asparagus to the antioxidant capacity of other vegetables, and the results for asparagus have been impressive. *Asparagus* compares favorably with many of the cruciferous vegetables like cabbage and cauliflower, and while it ranks lower than some of the green leafy vegetables like spinach, it is still very high on the list of antioxidant foods.

Anti-inflammatory and antioxidant nutrients are some of the best risk reducers we know for common chronic health problems including type II diabetes and heart disease. These nutrients are also special risk reducers in the case of certain cancer — a special area of asparagus health benefits that is covered in the following section.

- **Digestive Support**

As described earlier in our "What's New and Beneficial about *Asparagus*" section, *Asparagus* is unusual as a digestive support food. One key factor in this regard is its inulin content. Like chicory root and Jerusalem artichoke, asparagus contains significant amounts of the nutrient inulin. Inulin is a unique type of carbohydrate called a polyfructan, and in practical terms, healthcare practitioners often refer to it as a "prebiotic." Unlike most other carbs, inulin

doesn't get broken down in the first segments of our digestive tract. It passes undigested all the way to our large intestine. Once it arrives at our large intestine, it becomes an ideal food source for certain types of bacteria (like Bifidobacteria and Lactobacilli) that are associated with better nutrient absorption, lower risk of allergy, and lower risk of colon cancer. While approximately 5% lower in inulin than chicory root and Jerusalem artichoke, *Asparagus* is a food that contains a valuable amount of this unique carb and can help support our digestive health in this unique way.

Alongside of its unusual inulin content, asparagus is rich in fiber (about 3 grams per cup, including about 2 grams of insoluble fiber and 1 gram of soluble fiber) and also contains a noteworthy amount of protein (about 4-5 grams per cup). Both fiber and protein help stabilize our digestion and keep food moving through us at the desirable rate. (By contrast, too much fat can slow down our digestion rate more than desired, and too much sugar or simple starch can speed it up more than desired. We're not surprised to see species of asparagus like *Asparagus racemosus* (commonly known as Shatavari) having a long history of use in treatment of digestive problems in certain healthcare traditions (like ayurvedic medicine), and it makes sense to us that *Asparagus* be considered as a great food for improving digestive support in most diets.

- **Heart Health and Blood Sugar Regulation**

While we have yet to see large-scale dietary studies that examine chronic diseases in humans and asparagus intake, we would expect asparagus intake to show reduced chronic disease risk in two particular areas, namely, heart disease and type II diabetes. While there is some preliminary research in both areas, both areas need more attention from *Asparagus* researchers. Our desire to see more research in these areas is based on several factors.

First is the amazing B-vitamin content of asparagus. In our food rating system, asparagus emerges as an excellent source of folic acid, vitamin B<sub>1</sub>, and vitamin B<sub>2</sub> as well as a very good source of niacin, choline, vitamin B<sub>6</sub>, and pantothenic acid. Because B vitamins play a key role in the metabolism of sugars and starches, they are critical for healthy blood sugar management. And because they play a key role in regulation of homocysteine, they are critical in heart health as well. (Homocysteine is an amino acid, and when it reaches excessive levels in our blood, it is a strong risk factor for heart disease.)

Second, along with its impressive list of B vitamins, *Asparagus* provides us with about 3 grams of dietary fiber per cup, including more than 1 gram of soluble fiber. Intake of soluble fiber has repeatedly been shown to lower our risk of heart disease, and our risk of type II diabetes can be significantly lowered as our intake of dietary fiber increases.

Finally, there is the anti-inflammatory/antioxidant factor. Heart disease and type II diabetes are both considered chronic diseases that evolve in relationship to chronic, excessive inflammation and oxidative stress. The outstanding antioxidant and anti-inflammatory nutrient composition of *Asparagus* would seem to make it a no-brainer for inclusion as a risk reducer in both of these chronic disease areas. We expect future studies to establish *Asparagus* as a standout for lowering our risk of cardiovascular and blood sugar problems.

- **Anti-Cancer Benefits**

As a result of its very strong anti-inflammatory and antioxidant nutrient composition, we would definitely expect to see a food like *Asparagus* showing up as a risk reducer for certain cancers. Chronic, excessive inflammation and chronic oxidative stress are risk factors for a variety of cancer types, and both unwanted phenomena are related to deficient dietary intake of anti-inflammatory and antioxidant nutrients—exactly the kind of nutrients that are especially plentiful in *Asparagus*. Most of the studies we've seen on the anti-cancer benefits of *Asparagus* have been studies on rats and mice, or studies on specific types of cancer cells. For this reason, we would describe *Asparagus* cancer research as preliminary, and not yet validated by large-scale studies involving humans and dietary intake. But the trends in animal studies and cell studies are clear - *Asparagus* and asparagus extracts can change the metabolic activity of cancer cell types, and these changes are protective in nature and related to better regulation of inflammation and oxidative stress. Cancer cells from the liver are best-studied in this regard.

One confusing area of research on *Asparagus* and cancer involves leukemia. And while this arena has focused upon enzymes related to an amino acid in *Asparagus*, rather than *Asparagus* itself, we thought to include information on it here to clarify this arena for you in case you had come across information on this topic.

Leukemia is a type of cancer involving the bone marrow and its production of white blood cells. In leukemia, white blood cells are not produced in a normal way and do not behave in a normal way, and for these reasons are called leukemia cells. One unusual aspect of leukemia cells is their need to obtain a specific amino acid called asparagine from other cells or from the fluid portion of the blood. If leukemia cells can be prevented from obtaining asparagine, they can sometimes have difficulty surviving. In the mid-1950's and 1960's, researchers discovered that the injection of an enzyme called asparaginase into persons diagnosed with leukemia could sometimes result in decreased levels of blood asparagine in the blood and selective destruction of leukemia cells through asparagine deprivation. Prescription injection of asparaginase enzymes is still used in treatment of acute lymphoblastic leukemia (ALL).

Asparagus has become entangled in this fascinating set of events involving leukemia because the name of the amino acid "asparagine" and the name of the enzyme "asparaginase" clearly imply a connection with *Asparagus*. Both the amino acid and the enzyme are present in *Asparagus*, just as their names imply. However, we are not aware of any research showing a treatment connection between leukemia and dietary intake of *Asparagus*. The only research we've seen involves injection of the purified, prescription enzyme medication. In addition, we know that pharmaceutical companies do not use *Asparagus* as a source of the asparaginase enzyme, but rather, rely on bacteria as their enzyme production source.

***Chlorophytum borivilium* or safed musli:**

The species name comes from a suburb in Mumbai called Borivili. Safed Musli is an herb with sub-erect leaves and tuberous root system. It can grow upto a maximum height of 1.5 ft. Tubers can grow upto a depth of 10". The plant sports a rosette of long, slender leaves, growing from a thick, fleshy rhizome. The flowers are small, white, produced on sparse panicles. Leaves are slightly yellowish and white flowers with 6 petals are arranged on the flowering stalk which emerges from the centre of the plant. About 20-25 flowers on the flowering stalk appear in July. The seed is very small, black and enclosed in the holes. In one hole, there are about 10-12 seeds. The seed is very light in weight.

It is cultivated and eaten as a leaf vegetable in some parts of India, and its roots are used medicinally as a sex tonic under the name safed musli. The medicinal value is thought to derive from its saponin content, up to 17 percent by dry weight. It has also recently been suggested that it may produce an aphrodisiac agent. As medicinal demand has increased, the plant has been brought under cultivation. The saponins and alkaloids present in the plant are the source of its alleged aphrodisiac properties. In traditional Indian medicine it is used as 'Rasayan' or adaptogen.

In the Ayurvedic literature, Safed Musli is celebrated as a Divya Aushad with unparalleled medicinal properties. It is a chief ingredient in the preparation of over a hundred Ayurvedic formulations. Safed Musli is also gaining increasing acceptance as a Vitalizer and health-giving tonic, a curative for pre-natal and post-natal problems, a restorative for immunity-improvement and as a remedy for diabetes and arthritis.

The recent discovery of Safed Musli as a natural and safe aphrodisiac agent has also opened up new channels of application and new demand for it. By virtue of being an herb, Safed Musli has been found to be an ideal aphrodisiac with no negative side-effects associated with chemical-based aphrodisiac.

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