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#### **4. Discussion**

**"Swasthasya Swasthaya Rakshanam, Atursya Vikar Parimoksham"** is the main object of Ayurveda. Ayurveda is the healthy life style designed by our great Rushi-Munis to make life suitable according to eco-climatic condition of our country.

Ancient Indian science has described in details the use of herbs in treating various diseases of plants and animals. The field of Indian medicine dealing with plant health is termed as Vrikshayurveda. As the principals of Ayurveda are effectively applicable in today's lifestyle in treating human disease, it is interesting to study the effects and practical applicability of herbs in cultivating practices about plant health, plant yield and their pharmacological actions.

The demand for herbal medicine is fast growing globally. To fulfill these demands, the medicinal plants are collected from various and unknown sources.

In order to achieve high yield and greater cash value a lot of inorganic compounds in the form of fertilizers, pesticides and insecticides are widely used in modern agricultural practices. But, it has been noticed that these practices have significant adverse effects on human health, soil grade and environment.

The Medicinal plants should be cultivated in such a manner that they can be easily available in pure form at any time. Collaboration of Agriculture universities and Ayurveda will help the farmers to grow proper varieties of medicinal plants. It will also help to get fresh, genuine and effective medicine. The cultivation of medicinal plants by methods described in Vrikshayurveda will also be very useful for mankind as it is free from harmful inorganic products. This will save the human from ill effects of fertilizers, pesticides and insecticides and also improve soil grade and there by the environment.

So, the comparative study in respect of cultivation, health of plant and pharmacological action was taken up for present work. Since,

Ashwagandha and Shatavari are the most important drugs of Ayurveda, these two drugs were selected.

### **Natural Flora of Aurangabad District -**

The eco-climatic conditions, soil grade, irrigation facilities in Aurangabad district were suitable for the cultivation of Ashwagandha and Shatavari. These two drugs are naturally found in Aurangabad district. About 400 medicinal plants were found in Aurangabad district along with Ashwagandha and Shatavari.

### **Vrikshayurveda -**

The branches of Ayurveda dealing with plant health, animal health were well developed in ancient times. They were called as Vrikshayurveda, Hastayurveda, Gavyayurveda and Ashwayurveda.

Vrikshayurveda is an ancient science related to the plant life.

'Varahmihir' the great astrologer of 6<sup>th</sup> century, dealt with widely ranging subjects such as astrology, physics, geology, horticulture, archeology etc. It contains a chapter entitled 'Vrikshayurveda'. In this chapter, he quoted about soil preparation for plantation, Ropan kal, Law regarding Ropan, Ropan Vidhi, Watering time, Pathology in plants and their remedies, sterility treatment in plants, Experiments for plant growth.

Vrikshayurveda of Surpala and Upavana vinoda of Sharangdhara are the main two books available on Vrikshayurveda. These books share all most all the topics i.e. importance of trees, Types of soils, Selection and preparation of soil for sowing, Plant diseases and their remedies, Ground water sources, preparation of different kinds of manures.

Varahmihir, Surpala, Sharangdhara had admitted that it is a compilation in which, information from various texts on Vrikshayurveda culled together. So, we can say that the science of Vrikshayurveda was well developed prior to 6<sup>th</sup> century. Unfortunately not a single text has been preserved. It is preserved by tradition only. A subject so widely spread into so many branches of knowledge and so continuously preserved by tradition through a period spread over thousands of years must have a

deep rooted and firm foundation in the culture itself in the form of a systematic and independently developed branch of science.

Vedic Literature is said to be world's first ever literature. Vedic era is said to be 6000 B.C. to 600 B.C. Ashwagandha and Shatavari were used to cure many diseases and they were stated to be Garbhaprada. In 'Brihatrayi' i.e. Charak samhita, Sushrut samhita and Ashtang sangraha / hriday are the three main treatise of Ayurveda. Classification of Ashwagandha and Shatavari was found in very well manner.

In Botany, Ashwagandha is classified under the family Solanaceae and its Latin name is 'Withania somnifera' where as Shatavari is classified under the family Liliaceae and its Latin name is 'Asparagus racemosus'.

Synonyms for Ashwagandha and Shatavari were reviewed from various Nighantus. About 33 of Ashwagandha and 59 of Shatavari and 22 of mahashatavari were found.

Morphological characters of both plants-both Macroscopic and Microscopic characters were described as per Botany.

All Nighantus had described Guna-karma of *Ashwagandha* and *Shatavari*. While reviewing the Guna-karma, it was found that, Laghu, Snigdha guna, Madhur rasa was not mentioned in any Nighantu. Charak and Vagbhata had included Ashwagandha in Madhur Skandha. Its Vrishya [Atishukral], Balya, Vata shamak karma suggest its Laghu, Snigdha guna, Madhur rasa, Madhur Vipak. It was also seen in Panchbhoutik Parikshana that Ashwagandha had Madhur, Tikta rasa. While in case of Shatavari it was stated that it has Guru, Snigdha Guna, Madhur, Tikta Rasa, Madhur Vipak and Shita Virya.

Both *Ashwagandha* and *Shatavari* are said to be Shreshtha Brihan Dravyas. *Ashwagandha* is Shreshtha Rasayan Dravya for Mansa Dhatu. Mansa Dhatu gives strength to whole body, with its Laghu, Snigdha Guna, Madhur, Tikta Rasa, Madhur Vipak and Ushna Virya of *Ashwagandha* helps to produce best quality of Rasadhatu and specially Mansa Dhatu and there by subsequent dhatus.

*Shatavari* is shreshtha Rasayan Dravya for Rasa Dhatu. Rasa Dhatu is the first among the Sapta Dhatus. Saratwa of other dhatus depends only on Rasa Dhatu. With its Guru, Snigdha Guna, Madhur, Tikta Rasa, Madhur Vipak and Shita virya *Shatavari* helps to produce best quality of Rasadhatu and there by subsequent dhatus.

‘Prashasta Bheshaja’ is that many kalpas can be made from it. Sharangdhra samhita, Bhaishajya Ratnawali, Yog Ratnakar are the main treatise on Bhaishajya Kalpana.

Kalpas used in Vandhyatwa, in Vajikaran chikitsa, Prameha, Vatavyadhi, in Garbhasthapak yog, Manas rog, and mainly Balya, Brihan, Rasayan yog are prepared from Ashwagandha.

Kalpas used in Vandhyatwa, in Vajikaran Chikitsa, Prameha, in all types of Vatavyadhi, in Garbhasthapak yog, in various Strirogas like Raktapradar, Shwetapradar, Kshaya, Rajyakshma, Raktapitta, Amlapitta, Pittaj Shoola, Parinam Shoola, Pandu and Balya, Brihan, Rasayan Yog are prepared from Shatavari. 263 kalpa were reviewed, out of which about 22 kalpa of Ashwagandha were used only for Balya, Brihan karma and 11 kalpa of Shatavari were used only for Balya, Brihan karma.

### **Soil and Water -**

Soil is the most important factor. Charak and Sushrut considered the efficacy of vegetable drugs depending on the nature of soil in which they grow. The type of soil from which drugs should be collected was very well described. Soil classification was based on various criteria like fertility, the specific crops grown in soil, nature of soil and climate, colour, rasas and many other criteria.

Vrikshayurveda by Surpala and Upavana vinoda had described various types of soil.

The commonly known soil is the shallow upper layer and is the friable material in which plants find foot hold and nourishment. Soil is classified on the basis of partical size.

Various sources of water were described in Vedic literature. They are all useful for plants. According to modern Agricultural science, the quality of irrigation water is determined by the concentration and composition of dissolved constituents like soluble salts, sodium, boron, bicarbonate, calcium and magnesium.

### **Karshya and it's Chikitsa**

Krishata has been included in Rasa Pradoshaja Vyadhi. Vriddha Vata may lead to Karshya. Rasa, Rakta, Mansa, Meda, these dhatus are involved in the samprapti of karshya. Charakacharya had suggested Brihan chikitsa for karshya. He had included both Ashwagandha and Shatavari in Brihaniya Mahakashaya.

### **Soil and Water testing –**

Soil in which the both drugs were cultivated and water for the irrigation were tested in the laboratory. [Katpur, Tal – Paithan, Dist - Aurangabad]. The soil is suitable for the cultivation of Ashwagandha and Shatavari.

### **Cultivation by Vrikshayurveda**

The special methodology of cultivation of Ashwagandha and Shatavari was not given in the text of Vrikshayurveda. So, the general method of cultivation was adopted for the cultivation of Ashwagandha and Shatavari.

'Vrikshayurveda' the science of plant life had discussed all the topics from selection of soil, Types of Soil, preparation of farm before sowing, treatment to seeds before sowing, treating roots before transplanting, plant diseases and their treatment.

It is most significant that various methods of treatment, adopted today, were conceptualized and practiced centuries ago.

Varamihir in his Brihat samhita and Sarangdhar in Upavan vinoda mentioned that when the land was brought under crop, Sesame (Til) and Black gram (Masha) should be planted when they were fully grown up, chopped down and incorporated into soil. On the other hand Surpala

suggested no planting should be done after growing Sesame and Black gram.

Even today farmers take crop of legumes for ex. Mudga, Masha, before taking next crop; they are digged at the same place. Today we know that leguminous plants maintain the nitrogen cycle in the soil and Nitrogen fixation is done.

The incorporation of sesame would reduce biomass of obnoxious weed. Therefore, Varahmihir had good reasons to recommend sesame and masha for fallow field.

Seed treatment prior to sowing to ensure successful and vigorous germination was given a lot of importance. Before sowing, seeds were besmeared with ghrita (Clarified butter) and sprinked with milk. It was kept in this condition for five days.

Both milk and ghrita are known to be Brihan dravyas in Ayurveda. Milk has Madhur Rasa, Madhur Vipak, Sheet Virya and Guru, Snigdha Guna. It gives vitality, it enhances strength, power of brain, very aphrodisiac in nature. It inhibites process of ageing, i.e. 'Vayasthapana' and 'Rasayan'. It is good source of protein, calcium, phosphorus and in small quantity iron, which is very important factor for the development of roots and protein content in the plant.

Milk is virus inhibitor, excellent sticker / spreader, and good for saprophytic bacteria. Casein of milk gives spreader, sticker properties. Saprophytic bacteria can promote antibiosis against pathogens.

Ghrita is said to be Rasayan, Medhavaradhak, and Vayasthapana, Balya. Its main property is 'Rakshoghna' that is, it inhibites the microbes.

They both must be enhancing the power of germination of seeds. After five days, before sowing the seeds were fumigated with Vidang choorna and ghrita. Vidanga is known to be 'shreshtha krimighna' dravya, (Antihelmentic, germicidal). It must be protecting seeds from harmful bacteria, fungus in the Soil.

The seeds watered with water, mixed with milk at the time of sowing and thereafter weekly.

Before transplanting saplings from seed beds to the pits, firstly they were watered with water mixed with milk. Then they were uprooted and again washed with water and milk and the paste of Vidanga, Ushira and Ghrita was applied on the roots and then they were transferred to the pits. Again they were watered with water mixed with milk.

As seen before, Vidang is antihelmintic, antibacterial, insecticidal. Ushira is also known as "Jantughna" in Ayurveda. Ghrita is also 'Rakshoghna' that is, it inhibites the microbes.

So the paste of these three dravyas must be Jantughna, antibacterial and Brihan. No insects and other infection were seen to the plants.

All the plants were watered with Kunap Jal. It contains the whole goat, boiled throughly in water, then cooked pulses were mixed in it and then honey and milk were mixed. So it was very nutritious. And as the plants were treated with Vidang, Ushir and ghrita paste prior to transplanting, there was no infection by attraction of insects, was seen even after watering with Kunap jala.

The Kunap Jala contains bones, which is good source of Calcium, various pulses which are rich in proteins, also milk again good source of calcium, proteins and phosphorus, "mansa" i.e. flesh is also rich in Calcium, phosphorus, proteins, which are responsible for good development of roots.

In traditional old proven practice of cultivation, to improve soil fertility, the animal bones are buried in the basin area of the crops to improve phosphorus and calcium availability in the soil.<sup>24</sup>

The mixture of cow's ghee, cow's urine, honey and fym is used for control of insects and diseases.<sup>24</sup>

In the cultivation by modern agricultural method, Nitrogen, Super phosphate was applied to the both crops. It was observed that after the application, vigorous growth was seen. Though there was no considerable

difference in the yield of Ashwagandha by both methods, the thickness of roots was less than the roots of Ashwagandha cultivated by Vrikshayurveda method.

In the case of Shatavari after application of fertilizers, vigorous growth was seen. The yield of Shatavari by modern agricultural method was nearly twice the yield by Vrikshayurveda method.

### **Standardization**

In microscopic examination no morphological difference was found in both species cultivated by both methods. As, the species is same, there was no difference in morphological structure. The thickness of roots was due to the nutrients, plants got from various treatments.

As per the aim and objectives of the study identification, authentication and standardization of both Ashwagandha and Shatavari were done. For this procedure, samples of Ashwagandha and Shatavari cultivated by Vrikshayurveda method and modern agricultural method were collected and the granules of all four samples were standardized by applying various tests. The values are compared with the standards given A.P.I. It was observed that all the values were within standard limits except the Ash values of all samples. Ash value may vary because of inorganic material in the soil and the absorption of this material by the plants.

As per the chemical analysis it was observed that the extractive values are less in sample of Vrikshayurved method of both species. It may be due to the fertilizers given in modern method, may stimulate the phyto hormones which may result into the quantitative increase. This is seen in the yield of Shatavari. The yield of Shatavari cultivated by modern method is near about twice the yield of Shatavari cultivated by Vrikshayurveda method.

In Ashwagandha, the active principle i.e. the total withanoloids percentage was seen more in Sushkavastha and in the sample of Vrikshayurved method. In both kalpas i.e. Shatavari and Ashwagandha by

both methods the values of all tests were less as the concentration the drug was less in kalpas.

Though there was quantitative increase in some values in both drugs by modern method, the clinical results suggest, that both drugs cultivated by Vrikshayurved Method were qualitatively superior than the drugs cultivated by modern method.

### **Clinical Trials -**

To study the efficacy of Ashwagandha and Shatavari cultivated by modern method and method mentioned in Vrikshayurveda, the clinical trials were conducted at C. S. M. S. S. Ayurveda College and Hospital, Aurangabad, O. P. D. The whole procedure of clinical trials was described in chapter of Clinical trials.

For the results of clinical trials, 't' values given in tables can be referred.

After starting the treatment it was observed that upto one month, no considerable change was seen after giving sample **Am**. Mid arm circumference [Rt.] was increased by 0.5 to 1 cm in 8 patients and Mid arm circumference [Lt.] was increased by 0.5 to 1 cm in 10 patients. The weight gain by ½ kg to 1 kg was observed in 11 patients whereas after giving sample **Av**; Mid arm circumference [Rt.] was increased by 0.5 to 1 cm in 23 patients and Mid arm circumference [Lt.] was increased by 0.5 to 1 cm in 25 patients. The weight gain by ½ kg to 1½ kg was observed in 24 patients. So overall weight gain observed was more by **Av** sample.

From first month to second month, maximum patients responded to treatment. After giving sample **Am** Mid arm circumference [Rt. and Lt.] was increased by 0.5 to 1 cm in 27 patients. In 26 patients, the weight gain was observed by ½ kg to 1 kg.

After giving sample **Av**, Mid arm circumference [Rt.] was increased by 0.5 to 1 cm in 26 patients and mid arm circumference [Lt.] was increased by 0.5 to 1 cm in 28 patients. In all patients weight gain was more after one month of treatment. i.e. about 1kg to 1½ kg.

After giving sample **Sm**, Mid arm circumference [Rt.and Lt] was increased by 0.5 to 1 cm in 28 patients. The weight gain by ½ kg to 1 kg was observed in 12 patients whereas after giving sample **Sv**; Mid arm circumference [Rt.and Lt] was increased by 0.5 to 1 cm in 29 patients, maximum of 0.5 cm. The weight gain by ½ kg to 1 kg was observed in all the patients.

From first month to second month, after giving sample **Sm**, Mid arm circumference [Rt.and Lt] was increased by 0.5 to 1 cm in 29 patients. In all patients, the weight gain was by ½ kg to 1½ kg was observed.

In about 27 patients increase in Mid arm circumference [Rt.and Lt] by 0.5 to 1 cm, maximum of 0.5 cm. In 27 patients weight gain was from 0.5 to 1½ kg, maximum of 1 kg after giving **Sv** sample.

From the above results, it was observed that there was increase in Agni, Ruchi and bala. After 15 days of treatment there was Agni and Ruchi vardhan, which was reflecting in the above parameters. Bala vardhan was also seen. Both the drugs are having Tikta rasa. Tikta rasa is said to be Agni-varadhaka and Ruchi-varadhaka.

In cultivation practice by Vrikshayurveda, milk and Ghrita were used abundantly. From Bijopti vidhi to Poshan vidhi, at every stage milk and ghrita were used. Both these dravyas have Brihaniya property. So, children consuming **Av** and **Sv** samples showed faster results than children consuming **Am** and **Sm** samples.

As the Regimen provided was regular and the drug was delicious in taste, abscondance rate was negligible. All the patients entitled were potentially benefitted.

With minimal difference Ashwagandha and Shatavari cultivated by both methods were having encouraging results.

