

Geographical Feasibility of Plantation of Ashwagandha in Barshi Tahsil of Solapur [MH]

Shyam C. Kagade and Avinash S. Kadam

Research Student & Assistant Professor

School of Earth Sciences, Swami Ramanand Teerth Marathwada University, Vishnupuri, Nanded-431606, Maharashtra India.

shyamkagade@gmail.com; Mobile No:9881514405,9404666430

Abstract: *Withania somnifera*, Dunal. belongs to the family Solanaceae. It is also known as Ashwagandha or Indian Genseng. *Withania ashwagandha* (Solanaceae) is an annual herb of immense medicinal value. In Ayurvedic literature, is a “Rasayana” or rejuvenating drug and hence also traditionally known as Avarada which suggests the application of this plant for enhancing longevity. The seeds of *Withania somnifera*, Dunal. var *somnifera* were selected and used for investigations. The present study was conducted to determine geographical feasibility of commercial plantation of Ashwagandha in Barshi Tahsil of Solapur regions of Maharashtra. Different locations from Barshi Tahsil of Solapur region, Maharashtra showed different response of seed germination and vegetative growth. On the basis of these research results it can be concluded that soil properties from this area were more effective for seed germination, growth and development of *Withania somnifera*, Dunal.

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1. Introduction

India has a rich heritage of natural biodiversity of flora and fauna including medicinal plants for various purposes. Several medicinal plants are naturally grown in Western Ghats and few are being grown commercially as per its demand and commercial value. Ashwagandha (*Withania somnifera*) is a central herb in Ayurveda, the traditional medicine system native to India. It has been used for thousands of years in Ayurvedic medicine and classified as a Rasayana (chemical) herb that promotes body- and brain-health by multiple ways including, increasing the stress tolerance and strengthening the immune system. Ven Murthy et al., (2010). It is an important self-fertilizing medicinal herb growing in small cultivated-populations in limited habitat of subtropical India viz., Madhya Pradesh and Andhra Pradesh (Mir et al., 2013). Therefore, the wild plants of *W. Ashwagandha* are ruthlessly over-exploited to meet the pressing demand of pharmaceutical industry. This unwise random harvesting of medicinal plants on mass scale from their natural habitat, the main source of raw material, is leading to loss of genetic diversity and depletion of plant resources.

Ashwagandha [*Withania somnifera* (L.) Daunal] belongs to the family Solanaceae and is a cross pollinated crop with chromosome number $2n=48$ (Nigam and Kandalkar, 1995). It is also known as Indian ginseng or winter chery (Deshpande, 2005). It is one of the most important medicinal plant species known to ancient Indians for centuries. It is a hardy

and drought tolerant perennial plant. It is a perennial shrub and grows naturally under subtropical dry climate in well drained, sandy loam or light red soils having pH of 7.5 to 8.0 with an average rain fall of 600-750 mm. Investigations on growth parameters with application of different soil nutrients in vitro showed significant changes in productivity (Cheruth et al., 2009). *Withania Somnifera* crop does not require heavy doses of manure and fertilizers; its growth depends on natural dry soil and differs from soil to soil (Atal and Kapur, 1977).

It is native of North-western and Central India as well as Mediterranean region of North Africa. Two species of Ashwagandha, viz., *W. somnifera* (L.) Dunal and *W. coagulans* (L.) are found in India. Ashwagandha (*Withania somnifera* (L.) Dunal.) is a representative of the Solanaceae family, a self-pollinating plant which naturally occurs in subtropical areas. From time immemorial it has been used by folk medicine of African and Asian countries (especially India). Medicinal properties of the species are related to withanosides in roots, applied as an adaptogen (Russo et al., 2001), and withanolides in herb. *Withania somnifera* (L.) Dunal, also known as Indian ginseng and as Indian Winter Cherry is an important ancient plant, the roots of which have been employed in Indian traditional systems of medicine, Ayurveda and Unani.

It grows in dry parts in sub-tropical regions. Rajasthan, Punjab, Haryana, Uttar Pradesh, Gujarat, Maharashtra and Madhya Pradesh are the major Ashwagandha producing states of the country. The

estimated production of Ashwagandha roots in India is more than 1500 tonnes and the annual requirement is about 7000 tonnes necessitating the increase in its cultivation and production. Unquestionably, it has a considerable influence on the health of the people. As matter of fact, climate has a great bearing upon the flora and fauna of a region, which in turn affects the soil condition of a particular region.

Therefore, the aim of the present study was to determine geographical feasibility of commercial plantation of Ashwagandha in different locations from Barshi Tahsil of Solapur region, Maharashtra. And also observed response to germination and vegetative growth of different species, possibility of obtaining high yield of seeds capable of germination. Lastly suggest some noble suitable sites for Ashwagandha plantation in research area. In present paper pH dependent germination and vegetative development in Ashwagandha is mentioned considering natural soil without providing extra nutrient.

2. Material and Methods

2.1. Study Area

Barshi Tahsil in Solapur district has been selected for the present research investigation as the study area. The Barshi Tahsil is situated at Solapur District in Pune Region of Maharashtra state. The Solapur District has a geographical area of 14845 Sq. Km., which forms 4.82 per cent of the total geographical area of Maharashtra State. The district is situated in the Deccan Plateau. Barshi tahsil is one of the 11 tahsils of Solapur District. The Tahsil has a geographical area of 1433.1 Sq. Km., which forms 9.65 per cent of the total geographical area of Solapur district. The headquarter of the tahsil i.e. Barshi town is located on 18°14'33" North latitude and 75°41'42" East longitudes. Barshi Tahsil bounded by 17°8'37" to 18°8'11" North Latitude and 75°30'10" to 76°0'3" East Longitude and at an altitude of 515.62 m above the mean sea level. The Tahsil is situated at drought-prone zone of Maharashtra state, where the climate is dry. Annual average temperature ranges between 15°C and 41°C and annual rainfall is about 657.4 mm with 42.5 rainy days.

On the basis of relief and structure, the physiographic divisions of the region are formed. These physiographic divisions have a profound impact on the economy of the region. To a certain extent, the relief and structure also influence the climate, soil types, and vegetation pattern in a particular region. It is, therefore, necessary to demarcate the district of Solapur, into its physiographic regions, in order to have a precise geographical understanding. There are various landforms as expected in Solapur district. Bhima is the major river flowing through the Solapur district, most of the area in the Bhima river basin is

more or less plain. Most of the area of the district belongs to the Deccan plateau region.

The soils of plateau region are suitable and fertile for the production of various kinds of crops. The central part of the district lies in the plain region. The plain region naturally is found along the both sides of river Bhima and its major tributaries such as river Sina, and river Man. The soil of the plain region is most fertile due to the deposition of eroded material transported by the river Bhima and its tributaries. The Solapur city, the head quarter of district is located at the border of plateau and plain region. The plain area in the district covers about 20 percent of the geographical area of the district.

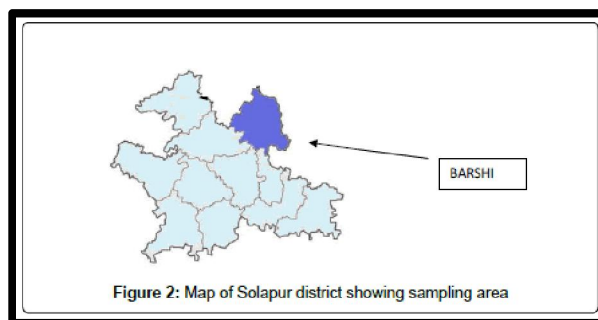


Fig. 2.1 Showing location map of study area of Barshi

2.2 Methodology

The present investigation would be mainly deals with the principal information sources and experimental analysis of soil and climatic conditions in geographical region. Soils samples of would be collected from various sub-regions / villages of the tahsil. The soil samples would mainly be used for actual experiments and laboratory analysis. Different sites selected for studying growth parameters in *Withania somnifera* (L.) Dunal. As investigations plantation site I collage garden of Shri Shivaji Mahavidhayala, Barshi, Solapur. The II Site of plantation was the home of research scholar. The III Site Plantation Site for plantation were the own farmland of research scholar in the Jamgaon (A) village. And the certain farmland including IV, V and VI sites were in the adjacent area of the Barshi tahsil of Solapur respectively. Seed material of *Withania somnifera* Dunal var. nagori were collected from Mahatma Phule Agriculture University, Rahuri.

Sprouting was deliberate in research laboratory in diverse condition of light and temperature in sprout tray with sterile soil and soils from both sites in five trays with 100 seeds per tray. Growth was recorded at the end of 1st week in different soils. Healthy plantlets were transferred to pots with soils from different plantation sites. Vegetative growth parameters like Plant height, Average number of branches, leaves per branch, Total leaf area. Root length was studied after

120 days at the time of fruit setting. Standard methods are used from APHA, Trivedy and Goal (1998).

The actual experiments are carried out for finding the rate of germination, growth and yield of Ashwagandha at various soil types, collected from the Barshi tahsil. Such experiments are carried out for the two years with variety of inputs. According to Singh (1980) it is necessary to classify the region on the basis of natural and human inputs for study of agricultural productivity. Here in the proposed study, the selected study region will be classified as per the natural inputs such as soils, water, FYM, etc.

3. Results and discussion

In this investigation done by using 6 plant samples, are planted and examined in the adjacent area of the Barshi tahsil of Solapur individually. In the present study the data revealed that there were considerable variations in the quality with respect to their characteristics. Physicochemical analysis of soil and vegetative growth parameters was studied in different season (2015-2016). The average value of various parameters had been stated in Table and signified in graphs.

Table: 3.1 Effect of soil on seed germination

Site	% of seed Germination
Sampling Site 1	80.0
Sampling Site 2	72.0
Sampling Site 3	87.0
Sampling Site 4	78.0
Sampling Site 5	83.0
Sampling Site 6	69.0

For each soil type 100 seeds were sown in tray and placed in different conditions of light and temperature, maximum germination was observed in alternating natural light and in high temperature up to 45°C. Soil from Sampling site 3 showed Maximum sprouting and minimum sprouting at Sampling site 6. Vegetative growth parameters were detected as follows at diverse conditions. Soil from site 3 was most favorable for number of branches, leaves per branch and average leaf area. Soil analysis showed that organic content was greater in site 3, values for phosphates and nitrate were more in case of site 3. Water holding capacity of site 6 was weaker than site 3. Overall growth in soil from site 3 was better than other 5 sites. Lastly the pH of all soil sites was varying from 7.4 to 5.2 respectively.

Seed germination in alternating light and temperature above 35°C was 78% and completely dark conditions inhibited germination. Biljana et al., (2010) observed similar result for *Capsicum annum* and *Solanum lycopersicum* with respect to Chloride content in soil and Commander et al., (2008) with

respect to temperature. Similar results were coined by Grasyana et al., (2004) other growth parameters like Plant height, Average number of branches, leaves per branch, Total leaf area.

Table: 3.2 Vegetative growth rate of parameters of Plant at diverse conditions

Soil Site	Plant height (cm)	Root length (cm)	Avg. No. Branches	Avg. no. leaves / Branch	Avg. leaf area / plant (cm ²)
SS1	70	35	19	48	20×50×15
SS2	50	30	10	40	15×40×10
SS3	60	40	15	47	20×50×15
SS4	80	35	20	50	20×50×15
SS5	90	40	22	57	25×50×15
SS6	60	30	15	40	15×40×10

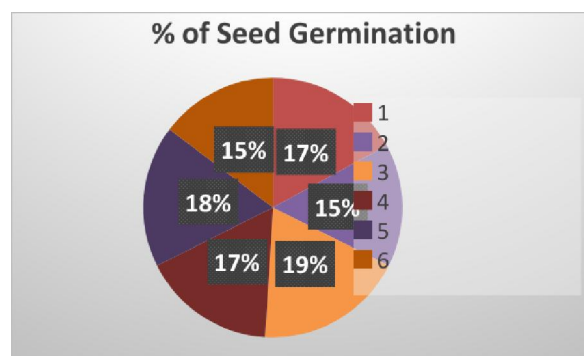


Fig.3.1: shows percentage of seed germination at different sites of Barshi area

The Ashwagandha crop had not been domesticated into regular agriculture until recent past, but considering the important medicinal value of this crop recently a few farmers have started its commercial cultivation. Ashwagandha crop can be cultivated throughout the drier parts and in the subtropical and semi temperate regions extending from 23° N to 33° N latitude and from 180 - 1700 m altitude above sea level, including the States of Maharashtra, Madhya Pradesh, Gujarat, Rajasthan, Uttar Pradesh, Haryana, Punjab, Orisa, Sikim and Assam (Billore, 1989; Chaudhari and Vacharajani, 1992; Pandey and Dixit, 1980).

This research proves or recommends the geographical feasibility of plantation of Ashwagandha in Barshi Tahsil of Solapur. Because this area has great potential for plantation of Ashwagandha. This will be useful to improve the economic status of farmers in this area and it also fulfill the demand of medicinal industry in the India and abroad. Similar consequences have been saw by Bhosale and More (2013); Patel and Desai (2017).

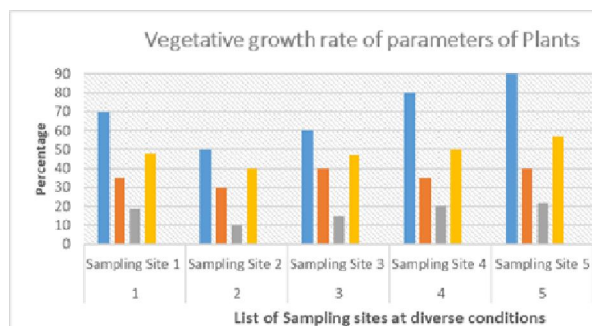


Fig.3.2: Vegetative growth rate of diverse Parameters

Conclusion

Here I find that the, geographical feasibility of plantation of Ashwagandha in Barshi Tahsil of Solapur has satisfactory prove its potential for plantation. This also helps to improve the economic status of farmers in Barshi Tahsil of Solapur region. It also fulfills the demand in India and abroad for its increasing demands in the medicinal industry. So finally, it was concluded that Ashwagandha (*Withania somnifera*), Dunal has recommended for plantation in the Barshi Tahsil of Solapur region of Maharashtra.

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Corresponding Author:

Mr. Shyam C. Kagade

Research Student

School of Earth Sciences,

Swami Ramanand Teerth Marathwada University,
Vishnupuri, Nanded-431606, Maharashtra India.

Mobile No:9881514405,9404666430

Email: shyamkagade@gmail.com

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