



## CLIMATIC REQUIREMENT OF MEDICINAL PLANTS, THEIR UTILIZATION AND CULTURAL TECHNOLOGY

Vineeta Singh<sup>1\*</sup> and R. K. Singh<sup>2</sup>

<sup>1</sup>Department of Geography, JDVMPG College, Kanpur, UP

<sup>2</sup>Department of Anatomy, SLBSS Govt., Ayurvedic College, Handia, Allahabad, UP

\*Corresponding Author's E-mail: vineeta.kanpur@gmail.com

**ABSTRACT** : In spite of rich heritage of knowledge on the use of herbal drugs, due attention has not been paid to grow these medicinal plants, systematically as field crops. Over 60% of all pharmaceuticals are plant based. Plant growth and development are primarily governed by environmental conditions of the soil and climate. The success or failure of crop growing is intimately related to prevailing weather conditions. As per composition of plant metabolites, medicinal plants have been grouped as alkaloids including morphine (poppy), strychnine and brucine (nuxvomica), quinine (cinchona), ergotamine (ergot), hyociamine (belladonna), scolapormine (datura), emetine (ipecaea), reserpine (rauwolfia), cocaine (coco), aconitine (aconite), lobelin (lobelia) etc.. Soil and climatic requirement of some of the important medicinal plants is discussed hereunder along with their utilization and brief cultural technology so that it may be popularized and progressive growers may take up its cultivation and the supply of raw material is enhanced to the pharmaceutical industries.

**Keywords** : Medicinal plants, climate, soil, useful parts, pharmaceuticals.

Cultivation of medicinal plants is gaining ground because of the sky rocketing prices of allopathic medicines which also have side effect. India is blessed with a rich wealth of medicinal plants. One of the old treatises *Charak Samhita* listed the use of more than 40 drugs of vegetable origin (Gupta, 6). In spite of rich heritage of knowledge on the use of these drugs, due attention has not been paid to grow these medicinal plants, systematically as field crops. Medicinal plants possess curative properties due to presence of complex chemical substances of varied composition under different parts of the plants. Over 60% of all pharmaceuticals are plant based. Plant growth and development are primarily governed by environmental conditions of the soil and climate. The success or failure of crop growing is intimately related to prevailing weather conditions. Climate is a summary of composition of weather condition for a long period. The climate apart from temperature and humidity, wind, frost, heat and cold storm, sunshine etc. assume significance in nearly every phase of plant growing viz. seed sowing to harvest even in storage.

According to the composition of plant metabolites, medicinal plants have been grouped as alkaloids including morphine (poppy), strychnine and brucine

(nuxvomica), quinine (cinchona), ergotamine (ergot), hyociamine (belladonna), scolapormine (datura), emetine (ipecaea), reserpine (rauwolfia), cocaine (coco), aconitine (aconite), lobelin (lobelia) etc. However, our knowledge regarding genetic constitution and physiological make up of most of these medicinal plants is quite poor and we know little about the biosynthetic path ways leading to the formation of constituents for which these plants are valued. After massive screening the *India Pharmacopoeia* has identified 85 drug plants used in various pharmaceutical preparations. Soil and climatic requirement of some of the important medicinal plants is discussed hereunder along with their utilization and brief cultural technology so that it may be popularized and progressive growers may take up its cultivation and the supply of raw material is enhanced to the pharmaceutical industries (Anon., 1).

**Cinchona** (*Cinchona ledgeriana* Linn.) belongs to family Rubiaceae, has 65 species which are mainly cultivated in Peru, Bolivia and Columbia. In India cinchona plantation covers about 8000 ha mainly in Nilgiri hills. India, Indonesia and Zaire are the major suppliers of quinine products to the world market. Cinchona prefers deep well drained loamy to clay loam acidic soil. It grows at the elevation of 800 m to 2800 m on sloppy locations and prefers 13°C to 21°C temperature, high humidity (83%) and well distributed

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rainfall of about 150cm. The variation between minimum and maximum temperature should be lesser during the growing season.

The alkaloids are lesser in twigs, greater in stem and maximum in root bark. The bark has 30 chemically related alkaloids and out of them quinine is most important. Quinine is used in the treatment of malaria. It is used as a Sclerosin agent in the treatment of internal haemorrhoids and internal veins. Quinine sulphate is used against heart troubles such as auricular fibrillation. Quinine protects the skin against sun burn. Cinchona is usually propagated by seed which are very small and light having poor viability. Seeds are sown in the nursery under partial shade in the month of March-April. Germination takes 25-40 days. It requires repeated transplanting. Its fertilizer requirement is 115 : 105 : 115 NPK per ha. In permanent field, planting is done 2 m apart. Debarking is done gradually (Kumar *et al.*, 8). After 6 years 50% of the plants are removed and debarked and a few are debarked after 8 years and finally they are debarked after 12 years. Drying of bark should be done in open. During the first two cropping a yield of 4000 kg/ha dry bark is obtained and at final stage of uprooting it is 6000 kg/ha.

**Isabgol** (*Plantago ovata* Fork.) is a herbaceous plant native of Peru belonging to family Plantaginaceae. Now it is a dollar earner being cultivated as a cash crop in Gujarat covering an area of about 50000 ha with a production of 40000 tonnes under Mehsana, Banaskantha and Palampur districts. India is the largest producer of isabgol and it is exporting husk and seeds worth above ₹ 30 million.

Isabgol thrives in warm temperate regions. It requires cool dry weather. At maturity if the weather is humid, seeds shatter, Heavy dew or even a light shower reduces the yield. For seed germination temperature should be between 20°C and 30°C (Husain, 7)

The husk is rosy white membranous covering of seed and contains mucilaginous substance (30%) which constitutes the drug. It is given as a safe laxative particularly beneficial in habitual constipation, chronic diarrhea and dysentery (Anon., 1). Seeds also contain some amount of glucocide. The husk has the property of absorbing and retaining water and therefore, works as an active anti-diarrhea drug. It is a calorie free food and promote the bowl moving.,

This is grown on marginal, light, well drained sandy loam soil at 7.8 pH. For field preparation, 2-3 ploughings in October is done. Seeds are sown in November, FYM 15-20 cart load /ha is added. Seeds

are broadcast @ 7-8kg/ha; germination takes 6-10 days. In all it requires 6-7 irrigation, fertilizer and manure requirement of isabgol is moderate. N @ 25 kg/ha should be top dressed. The plants are 50 cm tall and each plant produces 25-100 tillers, Flowering start in about 60 days and the spikes mature in the next 2 months. The seeds are collected and the yield of seed is about one ton/ha to separate the husk grinding is done. Yield of husk is about 30%. The plants suffer with damping off. Seed treatment with fungicides is beneficial.

**Opium Poppy** (*Papaver somniferum*) belonging to family Papavaraceal is a native of western Mediterranean region, which was introduced into India in 16<sup>th</sup> century. India produces about 70% of the world's production and 90% of it is exported. Its cultivation is prohibited and allowed under the licence of excise department and therefore, its cultivation is restricted to 24000 ha. The main growers are Neemuch, Mandsaur and Ratlam of MP., Faizabad, Barabanki Bareilly and Shahjahanpur of U.P. and Chitoor, Jhalawar and Kota of Rajasthan covering an area of 18000ha.

The crop is grown on well drained sandy loam soil. It requires long cold season 20° with adequate sun shine in early season for a healthy growth, warm dry weather with a temperature 30-35°C is required during the reproductive period. Cloudy weather, frost, hailstorms and high gusty winds particularly during growth; period causes serious damage in the yield of latex. Dry warm weather during February-March favour good flow of latex resulting in higher yield of latex.

The opium poppy is an outstanding medicinal plant. Its product opium and codeine are important medicines and used for their analgesic and hypnotic effects. A semi synthetic derivative of this drug from morphine known as heroin has led to worldwide social problems. Attempts to investigate a synthetic drug to replace codeine and morphine has not been fruitful so far (Gupta, 6)

Large numbers of races of opium poppy have been named after their floral and capsular characters. Seeds are sown in well prepared field by broadcasting or line sowing. Seeds should be treated with Dithane M-45. Best time of sowing is last October. Four-Five kg of seed is required for one ha. Germination takes 5-10 days. The crop responds favourable to fertilizers and manures which improve both quality and yield of opium. Application of FYM @ 20-30 tonnes/ ha is recommended N and P @80 and 50 Kg/ha is done. K is

not needed as the soils of growing tracts are rich in it. Crop should be irrigated at fortnightly interval. Important varieties of opium poppy are Talia, Ranghatak, Dhola, Chhoti Gathia etc. Cutworm is major insect damaging it, flooding the field and dusting with 2% Carbaryl controls the worms Opium starts flowering in 90-110 days and capsules mature 15-20 days after flowering. Lancing is done with a four equi-spaced pointed knife. The yield of raw opium varies from 50-60 kg/ha. The entire produce goes to excise department.

**Sarpgandha** (*Rauvolfia serpentina* Benth.) belongs to family Apocynaceae. It is indigenous to India and neighboring countries. It grows wild in the Gangetic plains, lower hills of Himalaya in shady, moist, Swampy localities (Chopra *et al.*, 3). Uttar Pradesh, Bihar, Orissa, West Bengal are the main growers and India exports about 4 tonnes of raw drugs worth Rs. 0.43 million annually. There is great demand for the alkaloids as well as raw drugs in the international market (Srivastava *et al.*, 9).

Hot and humid tropical and sub tropical regions with sufficient rainfall (250 cm) are most suited for its cultivation; temperature 10-30°C is favourable. It grows from sea level to places upto 1300m above mean sea level.

The dried roots of serpentine is an important crude drug which has been used in the indigenous system of medicines from ancient time. Importance of root drugs and its alkaloids have been recognized in allopathic treatments for hypertension or for tranquilizing. Important alkaloids isolated from its roots are ajmalicine, recinamine, reserpine etc.

It grows in a wide range of soil. Propagation is done through seeds. However, root and stem cutting are also successful with a little success. Manure requirement is not very high. FYM @ 20 tonnes/ha along with 20 kg N, 30 kg P<sub>2</sub>O<sub>5</sub> and 30 kg K<sub>2</sub>O is added at field preparation. Top dressing with 20 kg N is done at growing season. The crop is irrigated fortnightly during hot season and monthly during winter. Harvesting is done after 2-3 years of planting root bark should not be damaged as it contains higher alkaloids. The roots are thoroughly dried after storage. About 2000 kg/ha dried roots are obtained and their alkaloid content is 2.4%. *Rauvolfia* suffers with many leaf diseases and it may be checked by spraying Z-78 (0.2%).

**Safed Musali** (*Chlorophytum borivilianum*) belongs to family Caesalpiniaceae. It is a small perennial herb. Out of 13 species *borivilianum* is most

important. Its roots fetch an attractive price which is determined by the size of tubers their appearance, colour and cleanliness. It originated in tropical and subtropical Africa. In India it is cultivated in Rajasthan, Gujarat, Madhya Pradesh, Maharashtra and Andhra Pradesh and covers about 25000 ha. The vegetative growth and fleshy roots development is facilitated by warm and humid weather with a sufficient amount of moisture during the growing period. Heavy rains and cloudy weather during growth are harmful. It needs sunny, aerated climate sheltered from strong wind. Day light amount of rainfall are to be considered before taking up its cultivation. These factors inevitably effect tuber development and synthesis of organically active substances (Cristobal *et al.*, 4)

Roots are a well known tonic. It has spermatogenic properties and deemed helpful in curing impotency, diabetes and natal problems. It is considered as an alternative to Viagra. It also cures rheumatism. Saponin content is 2.4%. There are no released varieties selection RC-2, RC-16, RC-20, RC-23 have been made at RAU, Udaipur. Red soil with normal pH is suitable (Biswas, 2). Safed Musali is propagated by seed or by tuberous roots in the second week of June. Seeds are dormant for 10-11 months hence vegetative methods are adopted. FYM @ 10-15 tonnes alongwith 50 : 100 : 150 NPK/ha is required. Being a crop of the rainy season it does not require regular irrigation. To favour healthy growth of tubers deflowering is required. Leaf eating caterpillars and white grubs are the major pests which may be controlled by spraying 0.2% Metacid and Aldrin 50 kg/ha. In India, it covers 25000 ha and the production is 22500 tonnes. About 5000 kg of fleshy roots are obtained which in turn yield 1000 kg/ha dried safed musali.

**Ashwagandha** (*Withania somnifera* Dunal.) belongs to family Solanaceae. It was found wild in the grazing ground of Mandsaur and Bastar districts of Madhya Pradesh. It grows wild on the foothills of Punjab and Himalaya. It is cultivated in about 4000 ha in India (Farooqi and Sreeramu, 5). Ashwagandha prefers a subtropical climate. It is planted in September and does better in dry and sunny weather free from fog. One to two rains are sufficient to develop roots fully. Places with 600-700 mm rainfall are suitable for its cultivation.

The roots contain a number of alkaloids and withanine is most important. *Ayurvedic* and *Unani* drugs are prepared out of it. It possesses antibiotic, anti tumour properties. Roots are used for curing skin diseases, bronchitis, ulcer and arthritis; Roots are also

effective in curing general and sexual disability. Fruits and seeds are diuretic and used for curing chest problems. Leaves are useful in curing piles. Bark is given against asthma.

Ashwagandha is an erect evergreen shrub with excessive branching. The crop can be propagated by seeds or by raising seedlings. Seed sowing is done in second week of July. Seed rate is 10-12kg/ha. Jawahar Asgandh-20 variety has been released. The flowering season is from July-September and the ripe fruits are available in December. It grows successfully in Sandy loam soil. Ashwagandha does not require heavy manuring. In Madhya Pradesh where it is grown commercially the residual fertility suffices. The crop hardly needs any irrigation. In case there are no showers, one or two irrigations may be given. There are no known pests, but the seed rotting, seedling blight and leaf blight are common. Seed treatment with Captan @3g/kg and spraying of Dithane M-45 3g/l is useful. The yield of dried roots is 300-500kg/ha and seed 50-75 kg per ha.

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