Chapter - I

INTRODUCTION
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Plant diseases are the greatest hazards amongst the others in crop production. No agricultural commodity in world has exercised such an intensive influence on men. Vegetable crops have a prominent place in human diet as they not only adorn the table but also enrich the health of rural and urban population and save cereal and grains for maintaining the price line of food stuffs. They form the most himalyan health, resplendent redness, which is unfailing symbol of health, life cheerfulness and ecstasy. Vegetables are essential for a balanced diet and maintenance of good health. They supply carbohydrates, fats, proteins, vitamins and minerals, which are essential for the body.

India is predominantly being a vegetarian country, therefore vegetable yielding crop viz., *Abelmoschus esculentus* (Lady's finger), *Allium cepa* (Onion), *A. sativum* (Garlic), *Artocarpus heterophyllus* (Jack fruit), *Capsicum annuum* (Chillies), *Carissa carandas* (Karonda), *Citrullus vulgaris* var. *fistulosus* (Tinda), *Cucurbita maxima* (Pumpkin), *Daucus carota* (Carrot), *Dolichos lablab* L. (Bean), *Lagenaria vulgaris* (Bottle gourd), *Pisum sativum* (Pea), *Solanum melongena* (Brinjal), *S. tuberosum* (Potato), *Spinacea oleracea* (Spinach), *Trigonella foenum-graceum* (Fenugreek) and *Brassica* sp. viz. *B. oleracea* var. *capitata* (Cabbage) *B. oleracea* var. *botrytis* (Cauliflower), *B. campestris* and var. *sarson* (Sarson), *B. rapa* (Turnip) etc. have a prominent place in our diet.

*Dolichos bean* (*Dolichos lablab*, L.) is one of the most important vegetable crop of the world. This crop is also known as Kidney bean, hyacinth bean, lab lab bean, Bonavist field bean, Hindi - Sem, Beng.-Shim, Guj. - Val; Mar - Pavta, Tel. - Chikudu, Tam. - Avarai, Kan. - Chapparadaavare and Mal. - Avaraa. Mostly it is used as a vegetable crop but sometimes also consumed as pulse, besides being a rich source of protein, minerals and vitamins for human beings. It also enriches in the soil due to fixation of atomospheric nitrogen by root nodule bacteria and has the unique quality of preventing soil erosion. A large population in India is vegetarian and a sizable part of which is suffering from protein malnutrition due to short supply and high price of pulses and protein rich vegetables, which have gone beyond the reach of poorman. Therefore every effort must be made to boost up the production of this important and common vegetable crop.
Morphology of Dolichos bean (*Dolichos lablab*, L.)
Dolichos bean is a member of sub-family Papilionaceae of family Fabaceae (Leguminosae) and its cultivation can be traced back in the antiquity. Wild species of beans are found in India and probably India is place of origin (Choudhary, 1967). It is called as a sub-tribe Euphaseolae under one of the main tribes viz., Phaseolae. It is a perennial, twinning of creeping herb and generally cultivated as annual leaves are pinnately trifoliate. Flowers are of various colours but generally are pink and white borne on axillary racemes. Pods are flat or inflated; linear or broad; 1-5 inch long with globose; ovate or flattened seeds varying in colour from white to dark black as given in Plate No. 1.

Plant is considered to be Asian in origin and distributed throughout the tropical and temperate regions of Asia, Africa and America. Two varieties are distinguished, one as annual commonly cultivated as a garden crop and other a perennial in varying degrees cultivated as a field crop. These varieties are indistinguishable in India and there has been a great difference in respect of characters and composition of the cultivated beans. The former is most common in Rajasthan, while later is most important pulse crop in parts of Madras and Mysore states.

Dolichos bean can be grown in both sub-tropical and tropical climate conditions. It is relatively a cool season crop but can be kept alive in summer to provide pods in the next season. However perennially, it gives poor pod yield and is advisable to grow only as annual. It is grown almost in all the States as dry crop. It can be grown in wide range of poor soils and is hardy and drought resistant. It may be grown on any type of soil except highly alkaline types. It thrives best on light sandy soil and is extensively grown on red loams, black cotton soils and stony and gravelly upland soils of Deccan. It is oftenly grown as preparatory crop on reclaimed lands. Optimum sowing is done between July and August. Seeds are sown in broadcast or in rows. It is grown as a Kharif crop mixed with Bajra and a rabi season crop in rice fields. The sowing time for pods is October - November in Bengal, for fodder is June, August or November or three times in the same field.

The seed rate is variable The rate is 40.0 lb per acre in South India, sown mixed with Brassica nigra, 20-25 lb. per acre in North India.

It is also grown as green manure crop particularly on lands newly borned under cultivation.

Seeds may be sown along the fringes of gardens and vines may be allowed
to trial on herbaceous plants. Copious and frequent irrigation is necessary. Flowering generally begins in November and pods are collected from December onwards up to March-April (Friminger, 1947).

Unlike many vegetables Dolichos bean, has variable practice of cultivation. It is grown as a field crop in Andhra Pradesh, Madras, Madhya Pradesh and Maharashtra. Contrary to this garden varieties are rarely found in Southern India, although common in Central, Eastern and Southern India. In North India particularly in U.P., it is mostly grown in kitchen gardens or thatches in the cities and villages.

India is the second largest producer of vegetables next to China. In India total area under cultivation of vegetable crops is 5.24 million hectares with production of 50,000 million tonnes (Anonymous, 2005). By the year 2000 A.D. Indian population is expected to one billion requiring more than 1000 million tonnes of vegetables. During 1991-1992 daily per capita consumption of vegetables in India was only 135.0 gms., which is much lesser than 285.0 gms. for a balanced diet (Majeed Gowda Nage, 1992).

In the world as a whole beans are french bean, cow pea, dolichos bean, sem, cluster bean and broad bean. They are cultivated almost in all the countries with an average production of 6.30 tonnes/ha., while the local varieties yield only 2-10 tonnes/ha (Anonymous, 1988).

Of the different types of beans, Dolichos bean is specially appreciated due to its flavour, colour and other characteristics. The pods in most types retain their tenderness, until they attain full size, when the seeds alone can be used. Flavoured types are those, which have a good flavour and thick fleshy skin with no fibre. Young pods may be salted or steamed and sun dried for preservation. Pods and seeds are also used as cattel feed (Burkill, 1935).

Dolichos bean surpasses most of the vegetables in its nutritive value. Fresh pods contains moisture 82.40 per cent; protein 4.50 per cent; fat 0.10 per cent; mineral matter 0.10 per cent; fibre 2.0 per cent; carbohydrates 10.0 per cent; Ca 0.05 per cent; phosphorus 0.60 per cent; iron 1.67 mg. and nicotinic acid 0.80 mg./100 mg. The vitamin content varies from 7.33 to 10.20 mg./100 mg. for uncooked samples and 0.77 to 1.12 mg./100 mg. for cooked samples as well as riboflavin 0.60 mg. (Anonymous, 1951 and Chaudhary, 1967).

Seeds contain moisture 11.80 per cent; protein 22.0 per cent; fat 0.50 per cent; mineral matter 3.10 per cent; fibre 5.30 per cent; carbohydrates 57.30 per
cent; calcium 0.28 per cent; phosphorus 0.39 per cent; iron 7.60 mg., nicotinic acid 1.50 mg. and carotene 119.0 per 100 gm. The globulins contain arginine 6.0-7.0 per cent; tyrosine 6.68 per cent and lysine 6.0 per cent, but are deficient in cystine and tryptophane. Germinated seeds and seedlings are a source of \( l \)-asparagine. They are also a rich source of urease.

The seeds are considered as febrifuge, antispasmodic and aphrodisiac (Nadkarni, 1927 and Kirtikar and Basu, 1935). The seeds are astrigent, diuretic and tonic (Chopra 1935).

The plant is a rich source of high nutritive and palatable fodder to cattle. The average composition of green feed and hay on dry matter basis is as follows. The green fed contains fibre 28.08 per cent; ether extract, 3.50 per cent; total ash, 14.80 per cent; CaO, 2.77 per cent; P\(_2\)O\(_5\), 0.60 per cent; MgO, 0.97 per cent; Na\(_2\)O, 0.55 per cent and K\(_2\)O, 3.52 per cent. Hay on dry matter basis is made up of fibre 36.12 per cent; ether extract, 2.25 per cent; total ash 12.50 per cent; CaO, 3.78 per cent; P\(_2\)O\(_5\), 0.60 per cent; MgO, 0.30 per cent; Na\(_2\)O, 0.75 per cent and K\(_2\)O, 2.40 per cent.

It is extensively used in South India as feed for cattle and horses in North India. The seeds are cooked before feeding. Stems, leaves and split husks are also used as cattle feed. It is used mainly as green pods but in dry form. The immature and mature pods are eaten and cooked as vegetable.

Seeds are consumed by poor classes after cooking or frying. They are eaten whole or after grinding into a meal. They are consumed as pulses after splitting. The foliage of the crop is also used for green manure, silage and hay in forage particularly for horses.

The facts narrated above reveal that Dolichos lablab, L. can play a dramatic role in the Indian agriculture economy by boosting the production and much of foreign exchange can be saved by eradication of diseases.

Among the various factors for such a poor yield plant diseases of varied origins taking away or heavy toll of the crop every year caused by pathogenic organisms (leaf spots), affected the germination, plant health, productivity and quality, which carry the inoculum rendering it unfit for consumption and affecting national economy. The foliar diseases are known to cause up to 20.0 per cent reduction in yield (Dastur and Asana, 1960). The production of Dolichos bean has become so much pampered, which presently requires to be set by increasing array of ills and pests by both skilled and persistent attention of the
agents causing diseases. Out of which fungi, bacteria, nematodes, mycoplasma and viruses are important. More lethal diseases and other pathogenic and no-pathogenic fungi associated with the seeds may cause serious damages.

The eradication of diseases, shall have to be given a prima importance through use of chemicals and genetic manipulations. If the ever burgeoning population of this country is to be stemmed out of malnutrition, suitable protection and production technology must be evolved to augment the production of this important vegetable crop.

The cultural practices for disease control can also be adopted. Evolution of cheap and efficient pest and disease control measures based on integrated approach including genetic, chemical and biological methods can also be employed.

A keen intention of Plant pathologists, has been given on the fungal bacterial and viral diseases of this crop but inadequate information is available about the leaf spot disease of Dolichos bean (Dolichos lablab, L.) caused by Alternaria alternata (Fries.) Keissler. During the survey made in the year 2001 and 2002, the different varieties of Dolichos lablab, L., were recorded adducing symptoms of leaf spot caused by Alternaria alternata.

In view of seriousness of disease and being destructive in reducing productivity and importance of the crop as well as complete lack of detailed knowledge, it was thought necessary to take up the detailed study of the "Leaf spot disease of Dolichos bean (Dolichos lablab, L.), caused by Alternaria alternata (Fries), Keissler, it is imperative to work out the detailed study of disease and its pathogen as well as to suggest control measures to get rid off the disease, the present investigation was therefore undertaken with the following objectives -

1. Survey and collection of diseased material from the different locations of U.P. and to study the prevalence, severity and symptoms of disease.

2. Isolation, purification and pathogenicity test of pathogen.

3. Identification of the pathogen on the basis of morphological and cultural characters.

4. Production of cell wall degradation enzymes in vivo and vitro by the pathogen.

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5. Studies on the nutritional requirement of the pathogen and effect of temperature, pH and N.P.K. on it.

6. Susceptible growth period of host and study of climatic conditions influencing the development of the disease.

7. To find out the effect of pathogen on certain biochemical constituents of diseased parts of host.

8. Investigations on mode of perpetuation and spread of diseases.

9. Screening of Dolichos bean germplasm on disease resistance.

10. Studies on host range of the pathogen.

11. Bio-assay of different fungicides against the pathogen in *vitro* and efficiency of the effective ones in controlling the disease in *vivo*.