INTRODUCTION

The grain legumes, particularly pulses have special significance in the nutritional dietary for the people in India, where major dependence for protein is on vegetable origin.

Pulses have a pivotal role in conserving natural resource base of agriculture, thus providing long term sustainability to various farming systems prevalent in India. Inclusion of pulses in cereal based cropping system, not only economizes nitrogen to the tune of 30-40 Kg / ha for the succeeding cereal crop but also accrue benefits such as reduction in the use of chemical fertilizers and improvement in environmental quality and soil health. These beneficial qualities have made pulses an integral component in subsistence farming system of the tropics and subtropics.

India is the largest producer as well as consumer of the pulses in the world, accounting for 33 per cent of the world area and 22 per cent of the world’s production. However, for the last few decades the production of pulses in India is almost stagnant, because 90 per cent area under pulses is still rainfed. With an area of 22 to 24 million hectares under pulses, country has the average production of only 12-14 million tones, which is far low than the increasing demand with the increase in population.

In India a variety of pulses such as Pigeonpea (*Cajanus cajan* L Millisp.), Chickpea (*Cice. arietinum* L.), Mungbean (*Vigna radiata*),
Urdbean (*Vigna mungo* L. Hepper), Pea (*Pisum sativum* L.), Lentil (*Lens culinaris* L.) and many others are grown.

On global basis, Chickpea (*Cicer arietinum* L.) is the third most important pulse crop. It is needless to emphasize the importance of chickpea among the grain legumes. The world area under this crop is 12.03 million hectares with an average production of 9.24 million tonnes and average productivity as 786 kg/ha (Fig.1) (FAO production year book 1999). It is grown in 31 countries in Asia, Africa, Central America and Europe. India has nearly 52.4 per cent of the world’s area and 54.9 per cent of the world’s production of chickpea. The other countries where the crop is important in descending order are Pakistan, Ethiopia, Mexico, Burma, Spain, Morocco, Turkey, Iran and Tanzania.

Chickpea although predominantly consumed as a pulse, dry chickpea is also used in preparing a variety of snacks, foods, sweets and condiments (Saxena, 1987). Green fresh chickpeas are commonly consumed as a vegetable for a short period before the crop is mature. It is also used as dal (Decorticated dry split cotyledons) and flour. Chickpea blends well with vegetables, meat and sauces and can be used to make a variety of sweets and pastries.

Nutritionally, chickpea is relatively free from various antinutritional factors, has a high protein digestibility and is richer in phosphorous and calcium than other pulses. Because of higher fat content and better fiber digestibility, chickpea holds great promise as a protein and calorie source for animal feed. The amino acid composition of chickpea protein complements that of cereals.

On an average chickpea produces 126 Kg of protein from one hectare. One hundred gram of chickpea provides 358 calories. It
**Fig. 1 World Area, Production and Productivity of Chickpea (1999)**

Source: FAO Production year Book (1999)
contains 17.1 % protein, 0.49 % Lysine, 0.04 % Tryptophane and 0.11 % Methionine. The P.E.R. value of chickpea is one of the highest among the grain legumes (Harvey, 1970).

Chickpea (Cicer arietinum L.) (2n= 16, n=8) Known by the common names chickpea, garbanzobeans, gram, hommes, is one of the principal grain legume in India and is very popular in the food habit. Chickpea belongs to genus Cicer, Tribe Cicereas, family Fabaceae and subfamily Papillionaceae.

Chickpea is the herbaceous annul plant having branching close to the ground with semi erect to semi spreading habit. The plant is covered mostly with glandular or non glandular hairs. Cubero (1975) classified chickpeas in two groups, Kabuli types having large seed size and cream seed coat colour and the other one Desi type, small to medium seed size having seed coat colour as brown, black, yellow and green. Large seeded, Kabuli types are the characteristic of the Mediterranean and Western hemisphere areas of production, while small seeded type of the Indian sub- continent.

It is said to be one of the oldest pulse known and cultivated from ancient times in Asia and Europe. It is not sown in the wild state, but is found as an escape in Mesopotamia and Palestine. In Cicer 39 species exist, Cicer arietinum L., seven other annual, wild or weedy species and 31 perennial ones. It appears to have originated in South Western Asia and have spread at an early date to India and Europe (Ackroyd and Doughty, 1964). Vavilov (1951) indicated the Hindustan, Central Asia, Near Eastern, Mediterranean centers as primary source of origin and the Ethiopian center as secondary. These diverse centers from the nuclei of the area, inhabited by the wild Cicer species. The crop was
known to ancient Egyptians, Hebrews, and Greeks. It has been introduced in recent times to tropical Africa, Central and South America, South East Asia and Australia (Argikar, 1970; Vander Maesen, 1972).

Chickpea is the most important pulse crop of India. It has an area of 7.10 million hectares, production 5.75 million tones and productivity as 806 Kg/ha (Fig 2). It is grown in the wide range of environmental conditions. Chickpea can be grown in a variety of soils, provided they are well drained and pH range of 6.0 to 8.5. As it is usually grown under conserved residual moisture situation, it yields better in soils having high water holding capacity (sandy loam to clay soils). However, it can also be grown in other soils with irrigation. In north India, the crop is grown on light alluvial and clay soils. In the Deccan and Southern India, it is grown on water retentive clay loams and black cotton soils. In northern plains of India, including Uttar Pradesh, Madhya Pradesh, Rajasthan, Haryana, Punjab, Bihar, West Bengal and parts of Maharastra, It is grown as a post monsoon winter season (rabi) crop as that require cool, dry weather for their optimum growth. The major area and production of chickpea is therefore concentrated mainly in Andhra Pradesh, Bihar, Gujrat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Uttar Pradesh, West Bengal and Jharkhand states.

In South central India due to shortness of winter season, the growing period and productivity of chickpea declines. A similar trend is discernible, is the East West direction, in the Gangatic plain. Chickpeas are susceptible to frost, but due to their deep root system can withstand drought to an appreciable extent. It is primarily a crop of
Fig. 2 - State wise Area Production and Productivity of Chickpea in India (1999-2000)

Source: Area & Production of Principal Crops, Division of Economics & Statistics, Krishi Bhavan, New Delhi
low rainfall or rainfed areas, excessive rains are detrimental to the crop. It can be grown from light sandy to heavy loam soils. It is grown either in admixture with cereals and other crops or as a sole crop.

In spite of best efforts made by various researchers in the past, this crop has not gained much in terms of area and productivity. The annual production of chickpea in India is too low as compared to its acreage. Besides other factors, several biotic and abiotic stresses encountered by the chickpea crop adversely affect the yield. Among the several biotic stresses, diseases caused by fungi, bacteria and viruses drastically cut the yield and are of major economic significance.

Of the various economically important diseases such as root rots, grey mould, *Ascochyta* blight and wilt, wilt disease caused by *Fusarium oxysporum* f. sp. *ciceri* alone causes on an average 10 per cent losses in yield annually. These losses are approximately 593 thousand tones annually in the country which accounts to approximate loss of national income of Rs. 11.86 billion.

If the losses caused by wilt alone could be mitigated, country will be benefited substantially. This is only possible if an economic control measure of this disease is made available to the farmers.

Several cultural, biological and chemical methods such as soil amendment with oil seed cake and FYM, soil solarization during hot summer months, deep ploughing during summer months, growing chickpea as mixed or intercrop with wheat, sarson (*Brassica*) or Linseed, seed treatment with Benlate T, Bavistin, Vitavax + *Trichoderma viride* or Vitavax + *Trichoderma harzianum*, or with any other biocontrol agent such as *Bacillus subtilis* or *Pseudomonas*
chlorine dioxide before sowing have been recommended for the management of wilt disease in chickpea. However, economically most viable and socially acceptable control measure appears to be the use of resistant varieties. This is only possible when up to date knowledge about the possible number of pathotypes / races of the chickpea wilt pathogen existing in country, chickpea genotypes having resistance to individual as well as multiple pathotypes / races, distribution of these pathotypes/ races in the country and about the virulence of these pathotypes is made available to the researchers for use in breeding for resistance against wilt. The present studies with main focus on these aspects have enabled to generate information on the existence of pathotypes/ races in the chickpea wilt pathogen, genotypes having resistance to individual or multiple pathotypes/ races, about the comparative virulence of these pathotypes/ races, and about the effect of inoculum level of these pathotypes on the incidence of wilt disease in chickpea.

The informations generated from the present studies are expected to near the goal for economically viable and stable control measure in addition to finding resistant genotypes.

It now appears to solve the ambiguity about the existence of pathotypes / races also in the chickpea wilt pathogen *Fusarium oxysporum* f. sp. *ciceri*.

Scientifically these findings will be helpful in the resistance breeding programme for resistance against wilt in chickpea and in turn will provide an economic, stable, ecofriendly and socially acceptable control measure of the this disease to the farmers.