Chapter II
Review of Literature

Plant diseases are more common when a large number of the same kinds of plants are grown together in a cultivated field. Such condition provides ideal factors for the development and spread of a particular pathogen. Repeated growing of crops of the same type in the same field is also responsible for building up a large population of pathogens of one kind or another. These pathogens may remain present inside the seed or contaminate the surface of the seeds. These pathogens associated with seeds in such way are called seed-borne pathogens coming from the crops fields along with the seeds.

It was after the First World War that the significance of seed-borne pathogens was realized. When fungal pathogen transmitted by seeds were studied by many workers they realized the need of seed health testing.

The first case of seed transmission of the fungal pathogen was demonstrated by Frank in1885, he demonstrated that bean anthracnose pathogen, colletotrichum lindemuthiamum was transmitted through seed. these realization o seed transmission of plant pathogen led to organized seed testing, which started in Germany as early as 1869. The first seed health testing laboratory was founded in 1919 at the Government Seed testing stations, wageningen. A plant protection station was opened in Leningrad in 1920 and Dorogin (1923) published a scheme for the detection of seed-borne fungi of various crops in Russia. Seed testing stations were set up in Europe and U.S.A. during the last century. These lead to the establishment of International seed Testing Association (ISTA) in 1924 in Norway. One of the foremost achievements of ISTA is the adoption of International Rule for seed testing. These rules prescribe testing techniques based upon scientific evidences, which are accurate, within stated statistical limits and practicable within everyday operations. These rules are followed in carrying out seed testing work. In India the first seed testing station was established in 1961 and 1976, forty seven such stations had been set up. It became essential to establish common methods of testing, in order to secure uniformity in evaluation and test results. Agarwal, Mathur and Neergaard (1972) did seed health testing with respect to seed borne fungi of black gram a along with wheat, rise, green gram and soybean. They isolated several pathogens which were known to cause economically important diseases.

Seed-born fungi associated with groundnut and gram seeds were studied by various workers.

Orton (1931) from U.S.A., Alcock (1931) from Scotland and Doyer (1938) from Netherlands published tested for seed-borne fungi. amongst those Doyer's manual is a landmark in seed pathology. Boroduline (1941) showed that the natural microflora that exists on the seed coat establishes on the roots of cultivated plants.

Groundnut is the most important oil seed crop. Association of different species of fusarium with the seeds of groundnut have been reported by number of workers. Welty and Cooper (1967) reported unidentified species of *Fusarium* from stored groundnut seeds. Similarly, Gupta and Chauhan (1970) isolated F. oxysporum from groundnut seeds.

Subramanyam and Rao (1976) observed species of *Fusarium* found to be dominant. Moubsher et al. (1979) isolate *F. oxysporum* and *F. moniliforme* from ground seeds. Reddy (1984) reported *F. oxysporum* and *F. solani* on groundnut seeds. Kamble and Gangawane (1987) isolated *F. oxysporum, F. maniliforme, F. dimerum, F. equiseti, F. poae,* and *F. solani* from 40 samples of groundnut seeds. El-maghra by et al. (1988) recorded *F. oxysporum, F. monili* *forme, F. Solani,* and *F. quiseti* from different samples of groundnut seeds. While Ramkrishna and Kolte (1988) found presence of *F. semitectum* on the seed S. Recently vaidehi (1993) reported presence of *F. oxysporum* on groundnut seeds. Toxigenic potential of Aspergillus flavus isolated from different organic substrates, air and soils were evaluated. K. S. Bilgrami, A. K. Choudhari (1993) recorded frequency of occurance of A. flavus ranged from 87% groundnut. Kashinath Bhattacharya and Subrata Raha (2002) observed / recorded fungal infection moisture content, deterioration of groundnut seeds. Different species of Aspergillus (A. candidus, a. flavus, A. niger, A. ruber) were dominant followed by Rhizopus, Penicillium, Curvularia, Fusarium, Alternaria.

Dawar, Ghaffar, Shaukat and Rasheed (2004) studied seed-borne mycoflora of groundnut. They investigated 14 genera and 28 species of fungi associated with groundnut. 18 fungal species i.e. *Absidia corymbifera, Alternaria citri, Aspergillus luchuensis (Aspergillus awamori), Aspergillus panamensis, Aspergillus penicillioides, Aspergillus terricola, Aspergillus terreus, Aspergillus wentii, Chaetomium globosum, Chaetomium indicum, Clodosporium oxysporum, Paecilomyces variotii, Syncephalastrum racemosum, Trichoderma hamatum* and *Trichoderma roseum* were recorded on groundnut seeds. Among these, *Macrophomina phaseolina, Rhizoctonia solani, Fusarium Solani, F. oxysporum, Aspergillus flavus* and *Aspergillus niger* were predominant. Higher number of fungi was isolated with blotter method as compared to the number developed on agar plate and deep-freezing method. The surface sterilization of seeds reduced the incidence of Aspergillus flavus and Aspergillus niger on groundnut. Singh, Rawal and Bhargava (2004) studied the pathogenic potential and control of seed mycoflora of groundnut. Ten fungal species from 7 genera were found to be associated with the seeds. Among these, Aspergillus flavus, A. niger, Fusarium moniliforme, F. oxysporum were found to be dominant and pathogenic, which reduced seed germination and length of root and shoot in seeding.

B.S. Vijaykumar (2004) studied VAM fungi in the roots of Arachis hypogeal nine VAM species have been isolated and identified, out of the nine species, seven of them belong to the general Glomus and two belong to Gigaspora.

S. M. Muley and M. F. Baig (2007) studied the mycoflora of oil seeds. Groundnut are oil seed crops. Seed mycoflora of different cultivars of oil seeds were screened by blotter paper, agar plate, and seed washing methods. The results were obtained from surface sterilized (SS) and unsterilized surface (USS) of seeds, agar plate method was found to be suitable as there was higher percent incidence of seed mycoflora. Aspergillus flavus, A. niger, A. terrus, Alternaria alternate, Fusarium oxysporum, D. N. Jadhav (2008) studies on Indigenous Arbescular mycorrhizae (AM-fungi) Inoculated to groundnut (Arachis hypogaea L.C.U. JL.24) under unsterilized soil condition pot culture experiment was conducted to study the influence of inoculation of Indigenous Arbescular mycorrhizae fungi (AM fungi) i.e. Aculospora karadensis sp. nov, Entrophospora schenckil sieverding and Toro, Glomus fasciculatum (Thaxter) Gerdemann and Trappeemend walder and Koske, Glomus mosseae (Nicol & Gerd.) and Trapp, scutellospora pellucid (Nicol. & Schenck) Walker and Sander in Arachishypogae L. CV. JL-24 under unsterilized soil condition. The effect of inoculation on dry weight (g/plant), of root and shoot, photosynthetic leaf area (cm^2/plant). Percent AM fungal root colonization P, Mg, Fe, (mg/plant) uptake by root & shoot & chloroplast pigments. Pot yield were analyzed at 60 & 90 days of plant growth after sowing. The analysis revealed that there was considerably increase in plant dry weight, two fold increase in photosynthetic leaf area, six fold increase in percent root colonization, four fold increase in P, Mg, Fe, uptake by root and considerably increase in chlorophyll content, & more than increase in pod yield.

Deepali Sabale, R. B. Thoke and B. A. Kore (July 2008 studied seed mycoflora of groundnut (Arachis hypogeal Lin K.) seed samples of groundnut Var. JL-24 ((Arachis hypogeal Link). Fabaceae were collected from different villages near Satara and examined for associated mycoflora, following standard seed health testing methods viz. blotter, agar plate and seed washing. 43 fungal species belonging to 6 general were recorded, among them species of Aspergillus were dominant.

The effect of different factors on the seed borne fungi was also studied by various wokers.

According to Neergaard and Saad, 1962 studied / stated the length of the period of incubation was dependent on the temperature. The optimum temperature requires for the growth of pathogens, but other factors such as competition by saprophytes and sprouting of the seeds might interfere and impose modification in the selection of incubation temperature. Christensen, 1970 stated that favourable humidity stimulated sporulation, spore germination and thus inoculated on the seed deterioration. Neergaard (1977) has dealt with all aspects of seed pathology in his generous reference book. Groundnut seed borne fungi and their control were also studied by various workers.

A. Arjunan and S. Gopalkrishnan (1980) studied the effect of seed treatment on seed borne fungi, viability and seedlings vigour of groundnut / seed treatment with calcium (0,40,80 and 160 kg./ha) and sodium (0,5,10,20 & 40 kg/ha) interaction on the degree of hydration in groundnut. Calcium as gypsum and sodium as sodium chloride. Sodium caused wide variation in the moisture status of leaf in the early development phase. Calcium at restrained the variation in leaf hydration due to sodium. So the effect of calcium and sodium interaction on the degree of hydration in groundnut higher yield per plant.

Krishnasastry, K. S.. Malathi Chari, Prasad T. G., Udayakumar M. and Sashidhar, V. R. (March 1985) studied the flowering pattern and pod development in bunch types of groundnut.

A. L. Singh and Vidya Choudhari (March 1996) showed interaction of sulphur with phosphorus and potassium in groundnut nutrition in calcareous soil. Calcareous soil have shown application of S, along with K and P in the soil, increased the nodulation and pod and haulum yields of groundnut and also the concentration and uptake of these nutrients by groundnut.

Reddy and Sugunakr et al. (1998) studied the effect of seed treatment with fungicides and insecticides on seed borne fungi, storage insect pest, seed viability and seedilng vigour of ground nut. Seed treatment with Thiram C @ 3.og/kg seed) controlled seed borne fungi effectively and also protected seeds of groundnut from the attack of Corcyra cephalonica for a considerable period and maintained seed viability and vigour up to 18 months in polythene bags. (Solanke, Kore and Sudewad (1998) so) Thiram improved the germination percentage and controlled, pre and post emergence mortality caused by fungi.

R. G. Jat, J. P. Goyal and S. C. Jain (2004) showed the effect of fertilizers on leaf blight disease and pod yield of groundnut. Leaf blight of groundnut caused by Drechslera spicifera (Bain). It causes 13, 38 percent pod yield loss in sandy soils of Rajasthan. Fertilizers usually influences the severity of diseases (Singh, 2002) and pod yield of groundnut.

S. N. Sonwalkar, V. K. Thombre, T. S. Bhndre and A. A. Shaikh (2006) studied Effects of various methods of weed control and planting layouts on nutrients uptake by weeds in groundnut. Weed in groundnut crop deplected soil fertility by removing 11.37 kg N/ha, 3.35 kg P/ha and 4.01 kg K/ha under unweeded check, planting groundnut raised bed with premergence application of pendimethalin (a) 75 percent of 1.00 kg a.i /ha plas one hand weeding 40 days after sowing significantly reduced the N, P & K removal by weeds as a result of which significant increase in nutrient uptake by groundnut and consequently higher grain yield was recorded, Shinde M. R. and S. B. Bhamburdekar (2008) studied the Effect of Aluminium toxicity on the activity of enzyme lipase during groundnut (Arachis hypogeal L.) seed germination. Effect of different concentration of aluminium on the activity of enzyme lipase during seed germination of groundnut cultivars. Groundnut cultivar W-55 different aluminium concentrations stimulated the enzyme activity upto 72 hrs. The highest enzyme activity was noticed at 48 hrs and 72 hrs of seed germination under the influence of aluminium which declined in later stages of seed germination. Similar pattern was noticed with CV SB-11 in response to various aluminium concentrations.

R. K. Dutta, N. C. Deka and K. Neog (2007) studied effect of different levels of sulphur on groundnut (Arachis hypogeal L.) in sandy loam soil of Assam. Effect of sulphur application on growth and yield attributing characters of groundnut at different levels in sandy loam soils of Assam revealed significant increase in plant height (41.43 cm), number of branches per plant (7.69), dry matter per plant (28.06 g) total number of pegs per plant (30.31), total number of pots per plant (25.80), number of mature pods per plant (21.16), number of kernels per pod (2.23), 100-kernel weight (30.059), shelling percentage (69.14%), pod yield (21.59 ha^{-1}), stover yield (49.39 lha^{-1}) and kernel oil content (48.05%) at 40 kg ha^{-1} over other levels.

S. T. Girisha[1] and N. S. Raju[2] (2007) studied effect of sewage water on seed germination and vigour index of different varieties of groundnut (Arachis hypogaea L.). The study has been focused on the investigation on groundnut (Arachis hypogeal) fields influenced by sewage water. Sewage water sampled in and around Mysore city and analyzed for physiological parameters. Different concentration such as 1, 5, 10, 25, 50, 70 and 100% of sewage water on seed germination and vigour index of Arachis hypogeae varieties such as DH-2-30, ICJS-11, JL-24, K-134, TMV-2 and VRI-2 were studied from the recorded observation in its concluded that the sewage water dilute to 25% concentration for irrigation of groundnut enhances germination percentage and vigour index in K-134 variety which is more susceptible than other tested varieties.

Efficiency of Trichoderma in management of collar rot of groundnut was studied by Shivaraj S. Patale and Vasant P. Mali (2009). Effectiveness of *Trichoderma viride*, *T. harzianum*, *T. hamatum*, and *Trichoderm* (local) were evaluated against *Aspergillus niger* by dual culture technique. *Trichoderma* (Local) and *T. harzianum* were found to be effective against *A. niger* which is responsible for causing collar rot disease of ground.

GRAM (*Cicer arietinum* L.) is one of the most extensively used pulses in India. The pulses are second only to cereals in their importance as human food, especially in India. Suhag (1973) reported presence of *Fusarium* species on seeds of gram. Iqbal Singh and Choha (1975) recorded *F. equiseti*, *F. moniliforme* and *F. semitectum* on gram seed.

Dwivedi (1987) isolated F. Moniliforme from Gram seeds. Similarly, Om Gupta and Khare (1989) reported successfully association of F. moniliforme alongwith other seed-borne pathogens on ten samples of gram seeds. While, Dhedhi et al (199) reported presence of F. oxysporum on gram seeds. Recently Dwivedi and Shukla (1992) recorded twenty different fungal species among these F. moniliforme and F. Pallidoroseum were found to be present to high incidence on stored seeds of gram.

Arya and Chauhan (1995) observed seed mycoflora of chickpea. They observed that Deuteromycetous fungi and species of Aspergillus were dominant. Four fungal species were reported for the first time on chickpea seeds by them. Singh et al. (2004) detected seed mycoflora of gram. Dawar, Syed and Ghaffar (2007) showed seed borne fungi associated with chickpea in Pakistan. A total number of 21 species belonging to 13 genera of fungi were isolated and Absidia glauca, Rhizoctonia solani, Syncephalastrum sp., and Trichoderma harzianum were new reports from Pakistan.

Gram seed borne fungi control and high yield studied by various workers.

Physiological analysis of yield variation in Gram (Cicer arietinum L.) studied by V. V. S. Prasad, R. K. Pandey and M. C. Saxena (1978). Nine genotypes of gram were evaluated for their NAR, CGR, PAR 400-700 nm and photosynthetic KCO_2 fixation rate in the canopy. The increase in CGR during reproductive phase was accompanied by concurrent increase in NAR. Only three varieties, viz, C235; G130 and JG-30 showed an increase in NAR upto 113-119 days after sowing.

Gurbaksh Singh, Nirmal Sekhon and Majnit K. (1980) studied effect of phenolic compounds on the yield potention of Gram. Phenol compounds increased flower, pod and grain number per plant. Higher concentrations (15 & 25 ppm) of caffeic acid and lower concentrations (5 & 10 ppm) of salicylic acid were found most effective for improvement in yield.

S. Anandhi and M. P. Ramanujam (April – June 1997) studied Effect of salicylic acid on black gram (vigna mungo) cultivars. SA at 10,000 and 500 µm levels affected seed germination and seedling growth of black gram cultivars (0-5 and T-9). The effect on chlorophyll, carotenoid, protein, starch and phenol contents were inconsistent. SA induced more flowering at 10 and 100µm levels only.

Influence of calcium on growth, composition and yield of black gram was studied by R. Jain, L. Chowdhary and C. Chatterjee (July-Sept 1997). Black gram var. T9 was grown in refined sand and six levels of calcium. 0.025 to 6 mm Ca levels supply plant part increased with increased in leaf area, flowering pod formation, reduction in growth. 6 mm Ca levels with reduction in growth and economic yield of black gram.

Integrated nutrient management under black gram wheat cropping sequence was studied by A. A. Shaikh, S. G. Kumbhar and S. M. Jawale (2007).

M. S. Wadikar and A. A. Shinde (2008) was studied by effect of different fungicides on root rot fungi of chickpea. Macozeb Benomyl, Captafol and Thiram completely inhibited the growth of *Fusarium oxysporum, Macrophomia phaseolina* and *Sclerotium rolfsii* causing root rot of chickpea at low concentration of Thiram *Macrophomia phaseolina* and *Sclerotium rolfisii* showed some growth. Thus the four fungicides acted effectively in controlling the root rot diseases of chickpea by *Fusarium oxyporum, Macrophomina phaseolina* and *Sclerotium rolfsii*. It seems that this fungicides act at the molecular level of both the host and pathogen.

The highest number of seeds per pod (7.33), number of pods (68.38) and thousand seed weight (65.709) were observed with the application of recommended does of fertilizer along with FYM and biofertilizer to black gram. 75% recommended dose of fertilizers in combination with FYM and biofertilizers. Similar trend was observed in wheat wherein there was an improvement in length of panicle, weight of grain per plant (9), seed and straw yield (9/ha) in wheat due to the application of biofertilizers