REVIEW OF LITERATURE

Fruits are valued for their contribution as quick source of available energy and vegetables contains high fibre. Because of these reasons, fruits and vegetables are useful in the diet of the human beings. (Khader, 2004). These fruits and vegetables are subjected to diseases caused by certain types of organisms. More than 100 fungal diseases cause decay in fruits and more than 150 cause serious losses in vegetables during transit and marketing (Ramsey and Smith, 1953).

Flourie and Holz (1995) investigated the infection of unwounded, detached plum and nectarine fruit by *Botrytis cinerea* was studied with light, fluorescence, and electron microscopy.

In 1994, Francisco et. al. studied the influence of culture media, incubation temperature and light on the mycelial growth, sporulation and conidial germination of *Colletotrichum gloeosporioides*, the causal agent of passion fruit anthracnose. In1998, Das and Bora recognized *Colletotrichum acutatum* on guava (*Psidium guajava* L) from Assam during storage. The fruits rotted completely within 7-10 days depending upon climatic condition such as temperature and humidity.

According to Bhagwan and Meshram (2003), temperature and relative humidity play a important role in the development and spread of post-harvest diseases. They also investigated that, in 25^{O}C temperature, majority of fungi responsible for post harvest spoilage of fruits and post harvest rots due to *Gloeosporium mysarium, Fusarium solani and Rhizopus oryzae*.

Zauberman and Schiffmann, (1974) studied the infection of avocado fruit by *Fusarium solani* caused an accelerated softening when compared with uninfected fruit. According to Zauberman and Barkai, (1975), infection of "Valencia" Oranges by '*Diplodia natalensis*' increases the respiratory rate and ethylene evolution than in uninfected fruit kept for 10 days at 23°C.

Naqvi and Dass, (1994) indicated that 43 and 47% of the total losses of mandarins in trunk and train transport, respectively, were due to the post harvest diseases. *Colletotricum gloeosporioides (Glomerella cingulata)* and occasionally *Alternaria citri* and *Phomopsis* (Diaporthe) *citri* contributed to 21 to 26% of losses, while *Geotricum candidum* (13-15%), *Penicillium digitatum* and *P. italicum* (1-4%) in survey of several districts of Maharashtra, during 1988-90. According to Verma and Tikoo (2004), during

the transport of Mandarin oranges (*Citrus reticulata*), Kinnow mandarin and acid lime (*Citrus aurantifolia*) fruits to the market they are subjected to damage such as compression bruises, cut and puncture wounds. These damages are caused because of rough handling, unhygienic storage over-filling, over stacking of bags, vibration. Because of the damages, the variety of fruit rots are caused viz., blue mold rot (*Penicillium italicum*), green mold rot (*Penicillium digitatum, P. chrysogenum*), *Aspergillus flavus, A. fumigatus* rots, black mold rot (*Aspergillus niger*) , core rot (*Alternaria alternata, Absidia corymbifera*), soft rot (*Fusarium moniliforme, Rhizopus stolonifer*), stem-end rot(*Botryodiplodia theobromae*) and sour rot (*Geotrichum candidum*). Among other pathogens *Penicillium spp.* inflicted major fruit losses during winter months whereas *Aspergillus spp.* were responsible for sizeable losses during summer and monsoon months.

Teviotdale and Hendricks (1994), made survey of the mycoflora inhabiting almond fruit and leaves in conventionally and organically farmed orchards. According to him, *Cladosporium* was the most prevalent fungus genus followed by *Penicillium* and *Aspergillus*. Other genera found were *Alternaria, Botryosphaeria, Botrytis, Coniothyrium, Curvularia, Epicoccum, Fusarium, Mucor, Paecilomyces, Phoma, Rhizopus, Stemphylium, Trichoderma, Ulocladium*. Surveys conducted by Sanderson and Spotts (1995) during apple fruit packing seasons, the species of *P. expansum* and *P. solitum* were recorded most frequently. In the survey of fruit market and store houses in India, 14 micro fungi associated with post harvest decay of plum were identified. Of these *Aspergillus niger, A. flavus, A. terreus, Trichothecium roseum, Colletotrichum gloeosporioides* (*Glomerella cingulata*), Geotrichum *candidum* and *Rhizopus stolonifer* had been previously reported in India, but *Aspergillus ochraceus, Penicillium chrysogenum, P. purpurogenus, Alternaria alternata, Lasiodiplodia theobromae, Cylindrocarpon lichenicola* and *Gliocladium roseum* are new host records. All these pathogens were aggressive with *G. candidum* causing maximum fruit rot followed by *A. niger*. While *T. roseum* caused the least amount of damage (Bamba and Sambali, 1999).

According to Jadeja (2000), mango fruits may suffer from post harvest disease by presence of more than one pathogen on the same part. During the survey at Junagadh, *Lasiodiplodia theobromae* (Pat) Griffon and Maul.(=*Botryodiplodia theobromae* Pat.)

and Aspergillus niger Van Tiegh. were found to be major post harvest pathogen causing stem end rot and black rot respectively on Mango fruits cv kesar. Sanders; Korsten; Wehner (2000) conducted the market survey of post-harvest diseases and incidence of *Colletotricum gloeosporioides* on avocado fruit and mango fruit in South Africa.

Jat and Goyal (2003), made survey of the markets of Chomu, Jaipur and Jodpur of Rajasthan, They were yielded a number of fungi such as *Alternaria alternata, Aspergillus flavus, A. niger, Cladosporium cladosporiodes, Fusarium moniliforme, F. equiseti, Penicillium islandicum and Phoma spp.* causing rotting of anola (*Emblica officinalis* G.) fruits during December to March 1998-99 to 2000-2001. In 2005, Kaiser and Saha (2005) conducted survey of West Bengal, India and recorded different kinds of fruit rot incited by species of *Penicillium* on Amla, *Aspergillus* on amra and bael. *Colletotricum* on banana, ber, custard apple, jamun , papaya ; Mango fruit was mainly affected by anthracnose (*Colletotricum gloeosporioides)* and the major pathogen of guava was wilt (*Fusarium solani* f. sp. psidii) and some post harvest fruit rots incited by *Colletotricum spp., Rhizopus spp., Aspergillus spp.* and *Fusarium spp.* were also recorded from different markets in the red and lateritic zones during 1996-2001. Kim and Xiol (2006), conducted survey of post harvest diseases in Red Deliocious apples (*Malus domestica*) in 2003. They discovered previously undescribed new species, *Phacidiopycnis washingtonensis* which was responsible for post harvest fruit rot in Washington State.

Baiyewu et. al. (2007) made survey and collected of the marketed pawpaw fruit (*Carica papaya* L.) with rot symptoms from in the South Western Nigeria in 2000 and 2001 respectively. The most commonly fungi found in rotten pawpaw fruit were *Rhizopus nigricans, Curvularia lunata, Aspergillus flavus, A. niger, Fusarium moniliforme, Colletotrichum capsici, Trichoderma viride.*

Brown and Wilson (1868) worked on mode of entry of *Diplodia natalensis* and *Phomopsis citri* into Florida Oranges during storage. Bugbee (1975) was studied on *Penicillium claviforme* and *P. variable* pathogens of stored sugarbeets.

Pratella (1994) has given notes on the harvesting maturation of Chestnut, and alterations observed during their storage in Italy. Damage to chestnuts is caused by *Ciboria batskiana, Phoma endogena, Penicillium crustaceum, P. expansum, Botrytis*

cinerea and Fusarium roseum, and by species of the *Curculionid curculio*. Sharma (1994) studied the incidence of damage of tomato fruits collected from vegetable markets and stored was 0.5-19.7 out of 81.3% spoilage due to *Fusarium spp.(F. equiseti* and *F. Pallidoroseum), Geotricum candidum, Didymella lycopersici, Alternaria alternata* and *Phytophthora nicotianae* var. *parasitica.*

In 1995, Pratella studied the bio-pathology and techniques of storage-trasport causes of alterations to stored fruits. The most pathogens are *Monilinia laxa, M. fructigena, Botrytis cinerea, Rhizopus stolonifer* and *P. expansum* while others including *Mucor piriformis, Alternaria alternata, Cladosporium spp.* and *Geotrichum candidum*, are less common. Damage originating from pre-harvesting infections of pathogens such as *Sphaerotheca pannosa, Taphrina deformans* and *Coryneum carpophilum* can also affect strored fruits.

Kora; McDonald; Boland (2005) reported, at least 128 and 465 fungal pathogens of carrots in 2001 and 2002, respectively, and were classified into 10 taxonomic groups, including *Alternaria spp. Aspergillus spp., Botrytis cinerea, Fusarium spp., Mucor spp., Penicillium spp., Rhizoctonia carotae, Rhizopus spp., Sclerotinia sclerotiorum and Trichoderma spp.* which cause diseases on carrots.

According to Valiuskaite, Kvikliene, Kviklys and Lonauskas (2006), the effect on apple cultivals Ligol and Lobel. Lobel rot during storage was caused by *Monilinia sp., Gloeosporium spp., Penicillium spp., Alternaria spp.* and *Botrytis sp.* Ligol apples were infected by *Monilinia sp., Gloeosporium spp., Penicillium spp.*

Ghangaonkar (2006) worked on incidence of fungal species during storage, species like *Colletotrichum circinance, Macrophomina phaseolina, Curvularia lunata* and *Chaetomium globosum* were associated with Phule saphed onion bulbs and *Helminthosporium allii* was associated with bulbs of N-2-4-1 veriety. Incidence of *Aspergillus niger, Fusarium oxysporium, Penicillium sp., Aspergillus flavus* and *Rhizopus stolonifer* was found to be severe on N-2-4-1 on both the varieties.

According to Eldon Brown (1975), appressoria of *Colletotricum gloeosporioides* were often very numerous in localized areas on the surface of the citrus fruits. According to Alam; Alam and Zaman (1993), due to the post-infection of *Fusarium roseum* in banana fruit , the changes takes place in protein content and protease activities. In 1994,

Pratella has given the notes on the harvesting and maturation of apricot, and the principle alterations affecting fruit after harvest. The most frequent pathogens are *Monilinia laxa* and *M. fructigena, Botrytis cinerea, P. expansum* and *Rhizopus stolonifer.* Less common pathogens are *Alternaria alternata, Aspergillus niger and Cladosporium herbarum.* According to Gullino; Minuto; Garibaldi (1995), studied fungal diseases of tomato caused by *Verticillium dahliae, Fusarium oxysporium* f. sp. *lycopersici, Fusarium oxysporium* f. sp. rachis-*lycopersici, Slerotinia spp., Phytophthora spp.* (including *P. parasitica(P. nicotianae* var. *parasitica)* and *P. infestans), Pythium spp.*(including *P. aphanidermatum), Didymella lycopersici, Botrytis cinerea, Cladosporium fulvum (Fulvia fulva), Alternaria solani, Erysiphe sp.* and *Colletotrichum coccodes.*

In 1995,Urchida; Aragaki; Ogata identified the pathogen *Leveillula taurica* from bell pepper (*Capsicum annuum*) on the island of Oahu, Hawaii, USA, in Apr. 1995. In 1995, Lesar; Pelser; Schutte were reported a new post-harvest disease of Citrus caused by *Penicillium ulaiense* in Southern Africa in the 1993 and 1994 season. *Monochaetia monochaeta, Penicillium frequentans* and *Colletotricum gloeosporioides* (*Glomerella cingulata*) were identified by Pino; Sanabria de Albarracin (1995) as post harvest diseases of mango grown for export in Venezuela. Tohyama et.al. (1995) studied on *Alternaria* rot of *Abelmoschus esculentus* (Okra) pods caused by *A. alternata* is described as a new post harvest disease in markets of Japan.

According to Sholberg and Haag (1996), the incidence of post harvest pathogens like *Penicillium spp.* and *Botrytis cinerea, Mucor spp., Cryptosporiopsis spp.* of stored apples was surveyed in packinghouse at Oliver, Kelowna and Winfield, BC, Canada, during 1991-93. Leibinger; Breuker; Hahn; Mendgen (1997) selected isolates of *Aureobasidium pullulans, Rhodotorula glutinis*, and *Bacillus subtilis* reduces the size and number of lesions on wounded apples caused by the post harvest pathogens *Penicillium expansum, Botrytis cinerea,and Pezicula malicorticis.* Texido; Usall; Gutierrez and Vinas (1998) isolated the dominant filamentous fungi from apple like *Cladosporium, Alternaria, and Penicillium spp.* which are responsible for major post harvest diseases that were seldom isolated at preharvet stage. Singh and Kumar(1999) studied Scab caused by *Venturia inaequalis* (Cooke) winter *(anamorph Spilocia pomi* Fr.*)* is one of the

most destructive disease of apple *(Malus domestica* Borkh.*)* world wide and leads to significant losses in India.

Alternaria spp., Fusarium spp., Pestalotiopsis spp., and Rhizopus spp., these are the four fungal post harvest pathogens of fruits and vegetables observed after antifungal screening of plants of the State of Morelos, Mexico (Bautista-Banos et. al., 2000). According to Naqvi (2001), the pre-harvest pathogens like *Colletotricum gloeosporioides, C. acutatum, Botryodiplodia theobromae, Alternaria alternata, Phomopsis citri* etc. attack the citrus fruit from fruit set to harvest stage and cause considerable damage to its production and quality. The incipient infection of pre-harvest pathogens subsequently manifest in the form of post-harvest decay besides the attack of other post-harvest wound pathogens viz. *Penicillium digitatum, P. italicum, Geotricum candidum* etc. during post-harvest handling, transport, storage, packing and marketing. Major and minor post-harvest pathogen isolated and diseases of citrus fruits in wholesale and retail markets of Jammu were surveyed from October to April to assess mycopathogenic loss of citrus fruits.

Anthracnose caused by *Colletotrichum capsici* is one of the major post harvest disease during storage and marketing of fresh capsicum (Lakshmesha; Mallikarjun Aradhya and Lakshmidevi, 2002). Zhou,-Ting et.al. (2002) reported, blue mold and gray mold caused by *Penicillium expansum* , *Botrytis cinerea* respectively are the principal post harvest diseases of apples in Ontario. Pathogen like *Lesiodiplodia theobromae, Colletotricum gloeosporioides* , *Pestalotiopsis versicolour, Alternaria alternata* and *Fusarium oxysporium* were responsible for disease of mango, apples, banana, ber, grape, amla, carrot, bhendi and chillies at pre- or post-harvest stage (Reddy, 2003).

Cia,-Patricia et. al. (2003) carried out the identification of causal organisms related to the main post harvest diseases in persimmon fruits, from different producing areas of the State of Sao Paulo. Among the pathogens identified, *Lasiodiplodia theobromae, Pestalotiopsis sp.*, and *Rhizopus stolonifer* had the highest incidence. Muniz et. al. (2003) was identified fungi, *Curvularia eragrostidis, F. equiseti and F. semitectum* which are the causal agents of post harvest diseases on Passion fruit and post harvest diseases on Tomato caused by *Acremonium sp., Fusarium anthophilum, F. semitectum, F. subglutinans and Stemphylium botryosum* and *Acremonium sp., F. anthophilum and F.*

equiseti which are the causal agents of postharvest diseases on Papaya in Alagoas, Brazil. in Alagoas, Brazil. Bandyopadhyay and Chauduri (2004) isolated nine fungal species belonging to different genera viz., *Aspergillus, Fusarium* and *Penicillium* were recorded from post harvest banana fruits collected from the orchard at kalyani. Anthracnose disease observed by Garg; Om Prakash and Pathak (2004), caused by *Colletotricum gloeosporioides,* is the major disease of guava. This disease occurs as lesion on the fruits. In the initial stage fruit shows spots that one in fact light brown superficial discolouration of the skin.

Singh and Majumdar (2004) reported Post harvest disease of Pomegranate (*Punica granatum* L.) incited by *Alternaria alternata* (Fr.) Keissler, appears in varing intensity in Jobner and Jaipur markets. Anthracnose disease observed by Garg; Om Prakash and Pathak (2004), caused by *Colletotricum gloeosporioides,* is the major disease of guava. This disease occurs as lesion on the fruits. In the initial stage fruit shows spots that one in fact light brown superficial discolouration of the skin. Amiri and Bompeix (2005) isolated *Penicillium spp.* from the surface of apple fruit pre- and post harvest, and from the atmosphere of orchards and storage rooms in France, collected regularly from 2001 to 2003. Xiao and Boal (2004) reported *Phacidiopycnis* rot which was a newly recognized post harvest disease, caused by *Phacidiopycnis piri*, in pear fruit (*Pyrus communis* cv. d'Anjou pears) in Washington State. Mango fruits are susceptible to the attack of severe post harvest pathogens and among them *Colletotricum gloeosporioides, Botryodiplodia theobromae and Aspergillus niger* are important that cause rotting in fruits during storage and ripening, resulting into heavy losses (Saxena and Rawal,2004). Late blight of tomato caused by *Phytophthora infestans*. On fruits, dark olivaceous greasy appearing spots are formed (Jarial; Jarial and Thakur, 2005). According to Xu Ling; Wang YanZhang; Toyoda and Kusakari (2006), the involvement of 7 fungi in the post harvest abscission of grape fruit was evaluated. Of the fungi, *Botrytis cinerea, Alternaria spp.* and *Fusarium spp.* were identified as causal agents of post harvest abscission. In 2006, Chillet and Hubert investigated wound anthracnose caused by *Colletotrichum musae* which is the main disease affecting the quality of export bananas from the French Antilles

In 1966, Rao examined fruit rot of *Citrus paradise, Citrus reticulate, Citrus medica* var acida which were caused by *Gloeosporium citri, Penicillium italicum* and *P. digitatum, Fusarium* Rao; Custard apple (*Annona squamosa* L.) by *Phytophthora parasitica, Diplodia natalensis, Macrophoma sp., Rhizoctonia bataticola*; Fruit rot of papaya (*Carica papaya* L.) caused by *Curvularia lunata* (Wakker) Boedijn; fruit rot of Jackfruit (*Artocarpus integrifolia* L.) caused by *Gloeosporium* artocarpi Delacr. And Fruit rot of *Achras Sapota* L. (Sapodilla) by *Phytophthora palmivora* Butler, *Rhizopus nigaricans* Ehr, *Fusarium sp.* in various markets of Poona and Bombay. In (1973), Howard and Albregts were reported fruit rot of Strawberry caused by *Pestalotia longisetula* and *Alternaria tenuissima.* Howard (1973) reported strawberry fruit rot caused by *Dendrophoma obscurans.* During 1985-1987 *Phytophthora cactorum* var. *applanata,* a fruit leather rot, with an incidence of 30.0% and golden or coppery fruit rot caused by *Phytophthora capsici* with a 60.0-70.0% disease incidence on the Tioga variety,in the Tioga variety of strawberry in Villa Guerrero, Mexico (Mendoza and Romero, 1989).

Marziano; Nanni and Noviello (1993) reported fruit rot of melon caused by *Fusarium incarnatum* from Italy for the first time. The infected fruits were discovered in Portici in March 1991. Field studies conducted in Maharashtra, India, to asses losses due to dieback and fruit rot on Capsicum varieties caused by *Colletotrichum capsici* (Patil; Korekar; Peshney, 1993). Kolte and Sapkal (1994) worked on *Colletotrichum capsici* isolates causing fruit- rot and die-back of chilli (*Capsicum annuum*). Lori et. al., (1994), reported *Fusarium spp.* exhibiting different pathogenicity and various rots during storage on the "butternut" type pumpkin (*Cucurbita moschata*) which is the most marketable vegetable in Argentinia.

Xue and Davidson (1995) studied Anthracnose fruit rot of Strawberry caused by *Colletotrichum acutatum.* Elmer (1996) reported *Fusarium* rot of pumpkin caused by *Fusarium graminearum, F. equiseti and F. solani* in Connecticut. Fruit rot on acid lime (*Citrus aurantifolia* Swingle) induced by Bachusakala olivaceo nigra was recorded in the fruit market at Tenali of Guntur district in Andhra Pradesh during survey in December, 1998 (Hymavathi and Subba,2000). According to Xu; Robinson; Berrie and Harris (2001), Spatio-temporal development of brown rot *Monilinia fructigena* on apple and

pear was monitored in an apple (cv. Cox) orchard and a pear orchard of several cultivars over several years. Tomaya and Becerra (2001) isolated *Phytophthora sp.* from diseased figs (Ficus carica L.) in Antioqua, Colombia.

Papaya anthracnose is the one of the most important fruit rotting diseases of papaya in tropical and sub-tropical regions caused by *Colletotricum gloeosporioides* (Penz.) Sacc. The pathogen caused severe fruit losses in the field as well as after harvesting. In papaya, fruit rot caused by *Aschochyta caricae* and *Phytophthora nicotianae* var *parasitica*; anthracnose (*Colletotricum gloeosporioides*) are some of the important diseases and guava is severely attacked by wilt and decline syndrome, Canker (*Pestabtiopsis psidii* and *Colletotricum gloeosporioides*), fruit rots (*Phytophthora nicotianae* var *parasitica, Phomopsis psidii, Guignardia bidwalli, Macrophomina phaseolina and Colletotricum gloeosporioides*) and Citrus, banana, papaya, guava and sapota are the major tropical fruits which occupy a large area. These crops are quite economical to grow but still their yields are much lower than the world average. One of the major reasons for low productivity has been the attack of various diseases at different stages of crop growth. Citrus is seriously attacked by fruit rot, leaf fall and gymmosis caused by *Phytophthora nicotianae* var. *parasitica.* The disease has been studied in detail. Gummosis is caused by *Botrydiplodia theobromae* and *Nectria haematococca.* Powdery mildew due to *Acrosporium tingitanium* is known to be one of the agent s for die-back syndrome. Scab (*Elsionoe fawcetti*) is widely prevalent sour and Sweet orange (Rawal, 2003).

Tomatoes stored at O° and 5°C effectively checked the fruit rot caused by Alternaria spp. viz., *A. alternata, A. solani* and *A. tomato* (Sood and Sharma, 2003). Banana is severely affected by Panama wilt (*Fusarium oxysporium* f. sp. *Cubensis*); Sigatoca (*Cercospora musae*) and anthracnose (*Colletotricum gloeosporioides*) are well known, Fruit scab and rot due to *Botrydiplodia theobromae* is becoming alarming. The tip over by *Erwinia carotovora* is becoming alarming in TamilNadu , Andhra Pradesh, Karnataka and Kerala. (Rawal, 2003).

In 2003, Lees and Hilton studied Black dot (*Colletotrichum coccodes*) which was the economically important disease problem in Potato (*Solanum tuberosum*). It is the silvery lesion on the tuber surface which result in a deterioration of skin quality. The

incidence of post harvest *Aspergillus* fruit rot of Lime (*Citrus aurantifolia* Swingle L.) were reported by Jain; Sharma; Jain and Jat (2004) from Vegetable Markets of Allahabad. Verma (2004) reported rot of guava fruits caused by *Phytophthora nicotianae* var. *parasitica.* Fruit Rot of Aonla examined by Arun Arya and Chitra Arya (2004) in vegetable markets of Kadak Bazar and Khanderao markets in Vadodara. Mills and Platt (2005) studied potato late blight [*Phytophthora erythroseptica*] and pink rot [*PhytolAthora erythroscptica*], that are responsible for significant postharvest economic losses. According to Verma and Tikoo (2004), post harvest fungal rot and loss of kinnow in Jammu was minimum in Nov which went on increasing in December(9%). *Penicillium digitatum* and *P. italicum* were most predominant pathogens. *Aspergillus niger* spoiled kinnow fruit (4%) only in April. *Alternaria alternata, Fusarium moniliforme*, and *Botrydiplodia theobromae* were other fungal pathogens identified in spoiled fruits.

Drumstik (*Moringa oleifera* Lamk.) is a perennial multipurpose vegetable There is a first report of occurrence of *Fusarium semitectum* as fruit rot pathogen of drumstik. (Resmi et.al., 2005). *Rhizopus* rot on young fruit of jackfruit was widely prevalent in the red and lateritic zones of West Bengal, India in 1996-2001 (Kaiser and Saha, 2005).

Pandey (2006) recorded the several pathogens which affect the tomato fruit. They were Alternaria solani, Phytophthora infestans, P. nicotianae var. parasitica, *Rhizoctonia solani, Sclerotium rolfsii, Myrothecium roridum* and *Colletotrichum coccodes and according to him, Colletotrichum capsici* is a new fruit rot pathogen in Uttar Pradesh. Xiol (2006) studied post harvest fruit rots in d'Anjou pears caused by *Botrytis cinerea, Potebniamyces pyri*, and *Sphaeropsis pyriputrescens* in the US. According to Singh; Mandal; Agarwal (2006), *Rhizopus* rot disease is a serious problem in dry arid climate and cause heavy loss of fruits in peach (*Prunus persica* (L) Batch.) fruit during storage. Reis; de-Almeida;Stuchi; de-Goes (2007) studied *Alternaria alternata*, the causal agent of Alternaria brown spot (ABS), which is responsible for necrosis on leaves, twigs, and fruit, reducing the productivity and quality of citrus fruits.

Mercer; Wood and Greenwood (1969) studied the effect of orange Extract on anthracnose of french beans caused by *Colletotrichum Lindemuthianum*. According to Bartz and Stall (1975), fruits from different pepper lines were not equally susceptible to *Erwinia carotovora.* Janisiewicz; Yourman; Roitman and Mahoney (1991) assayed,

efficacy of antifungal compound pyrrolnitrin, isolated *Pseudomonas cepacia* in controlling gray mold (incited by *Botrytis cinerea*) and blue mold (incited by *Penicillium expansum*) diseases on wounded fruit of apples and pears at temperatures (2 and 24°C). The resistance of Strawberry fruits (Cultivars Chandlere, Botucatu, IAC Campinas, IAC, Guarani, IAC Princesa Isabel, Reiko and Sequoia) to lesion development caused by *Colletotrichum acutatum* and *C. fragariae* (*Glomerella cingulata*) was investigated (Tanaka; Passos; Ito,1994).

Kampp (1994) tested bacteria and yeast isolates on *Botrytis cinerea* and *P. expansum* as biocontrol agents in apple and pears. Ahmed and Prasad (1995) worked on the inhibitory potential of aqueous foliar extract against soft rot diseases of *Luff cylindrical* (*L. aegyptiaca*) fruit caused by *Helminthosporium spiciferum* (*Colchliobolus spicifer*) and *Fusarium scirpi.* Sawant; Sawant and Ganapathy (1995), recorded the Collar rot of passion fruit caused by *Rhizoctonia solani* and suggested suitable control methods. According to Fallik and Grinberg (1997) recorded Potassium bicarbonate reduces postharvest decay development on bell pepper fruits caused by *Botrytis cinerea and Alternaria alternata.*

Rosenberger (1999) worked on the control of commercially important post harvest decay in apples caused by *Colletotricum gleosporioides* (*Glomerella cingulata*), *C. acutatum, Botryosphaeria obtusa, B. dothidea, Botrytis cinerea, Penicillium expansum and Alternaria alternate* during/after harvesting in north eastern USA. Dhaliwa; Thind;Chandra Mohan and Chhabra (2002) used ten essential oils against *Penicillium digitatum* causing fruit rot of mandarin. Muniz et. al. (2003) identified fungi, *Fusarium lateritium, F. subglutinans* which are the causal agents of post harvest diseases on Lemon fruit in Alagoas, Brazil. In recent years, researchers have discovered that some yeasts have antagonism against *Penicillium expansum* were discovered. (He; Zheng; Yin; Sun; Zhang, 2003).

Karabulut and Baykal (2003) tested a 103 yeast isolated against post harvest diseases of peaches caused by *P. expansum, B. cinerea, and Monilinia fructicola.* Calvo; Calvente; de-Orellano; Benuzzi and De- Tosetti (2003), tested the mixture of yeasts for their ability to control *Penicillium expansum* and *Botrytis cinerea* on Red Delicious apple fruits. Karabulut and Arslan (2004) worked on the control of post harvest diseases of

sweet cherry caused by *Penicillium expansum* and *Botrytis cinerea* with ethanol and hot water.

Yao and Tian (2005), investigated the effects of application of 200 mumol 1-1 methyl jasmonate (MeJA(200)) and *Cryptococcus laurentii* alone or in combination against post harvest diseases caused by *Monilinia fructicola* and *Penicillium expansum* in peach fruit stored at 25 and 0degreeC. Tian; Qin, ; Xu (2005) studied on the synergistic effects of biocontrol yeasts *Cryptococcus laurentii* and *Rhodotorula glutinis* combined with silicon (Si) against *Alternaria alternata* and *Penicillium expansum* molds were investigated in jujube fruit (Chinese date, *Zizyphus jujuba*) stored at 20 and 0degreeC, respectively.

Bamba and Sumbali (2006) conducted to elucidate different toxigenic behaviour of pathogenic *Alternaria alternata* isolates from diseased citrus fruits and from the surface of healthy citrus fruits viz., mandarin orange var. Nagpur Santra, Kinnow mandarin and sour lime. According to Torres et. al. (2006), studied the effectiveness of a formulated product of the yeast Candida sake CPA-1 for controlling postharvest diseases on pome fruits caused by *Penicillium expansum.* Zhang; Zheng and Yu (2007), evaluated the activity of *Cryptococcus laurentii* for reducing post harvest gray mold decay, blue mold decay and *Rhizopus* decay of peach caused by *Botrytis cinerea, Penicillium expansum and Rhizopus stolonifer* respectively.

While going through literature, it is observed that little work was done on *Pisum sativum* L. (Pea Pod), *Cyamopsis tetragonolobus* L. (Cluster bean), Solanum melanogena L. (Brinjal), *Cocos nucifera* L. (Coconut).