GENERAL INTRODUCTION
India's economy is based on agriculture which is the main industry and on which more than 75% of the total population depends. Even since we have attained independence we have made a steady progress in this direction. But looking to the man power and land area under cultivation our so-called long strides are nothing as compared to the average production per acre in foreign countries. Our greatest misfortune is that whatever is produced we are not in a position to send it to the consumer. During this transit from producer to the consumer the losses are enormous. If we just see the figures of gross production and the net delivery to the consumer, the gap staggers anybody. This gap speaks the coloss$\text{al}$ losses to our country. The losses are mainly due to the damage done to the fruits and vegetables by various types of diseases during transit and storage. Fruits are often attacked by different fungi, bacteria and pests due to the carelessness of the growers during packing and handling.

The production of our agriculture crops too is hampered to a large extent due to the plant diseases, which are normally incited by different micro-organisms.

These losses have given not only a terrible economic setback to our country but also deprived a very large population from the benefit of the crop.
The total yield of the crop depends on the healthy plant growth and protection of plants from parasites. Plant growth is reduced due to plant pathogens, unfavourable weather, various types of insects and pests. These damage the host plant to varying extent depending upon the intensity of attack and timely care taken to control the diseases by the growers.

It is only during the last two decades that attention has gone towards finding the ways and means to reduce the incidence of the damage. Our scientists have started in a big way to investigate fruit-rot, leaf-rot and other diseases caused by different micro-organisms and they have carried out successful experiments.

During transit and storage the fruits which are not properly packed often get small injury on the surface, which helps the pathogen to invade directly into the host tissues. However, many fungi are known to attack through cuticle, lenticels and even through intact host surface. After the infection of the pathogen fruits begin to rot and deteriorate and become unfit for consumption. This post-harvest decay of fruits and vegetables results in great losses every year which sometimes run to unbearable extent. The estimation of losses from such diseases has been made in some cases. Survey of Jabalpur and Bombay has shown losses
ranging from 13.96% to 26.31% for tomatoes; 10.15% for brinjal and 8.15% for some cucurbits (Chaudhary, 1968). Similarly Chenula and Thakur (1968) estimated the losses in fruits of various diseases in Delhi. They have reported 10.68% for apples, 31.45% for bananas, 17.13% for mangoes, 19.23% for tomatoes, and 24.02% for potatoes. It appears from these figures that the losses caused by various micro-organisms are extremely serious and should attract the attention of plant pathologist at national level.

A good amount of work has been carried out in India and abroad by various workers on post-harvest diseases of fruits and vegetables during transit and storage (Saha, 1945; Sinha, 1946; Agrawal, 1949; Walker, 1952; Bhargava and Gupta, 1957; Hingorani et al., 1960).

In the recent years, plant pathologists have turned their mind to study the physiological and biochemical aspects of the diseases so as to understand its causation and other metabolic activities which may be helpful in controlling the diseases. Workers on this line are now devoting major efforts to learn about the pathogenesis. It has now been well understood that disease manifestation is not the play of pathogen alone but it is the result of host and parasite interactions. The work of Jone (1909) and Brown (1915) have laid firm basis for these physiological studies. A number of workers including Bateman (1964) and Hancock et al. (1964)
have attributed the role of cell wall degrading enzymes secreted by the pathogens during pathogenesis. These enzymes particularly in case of rot diseases, break down the cell wall of the host and, therefore, the cells become separated from each other. The cell wall degrading enzymes which are found in the culture filtrate and in diseased tissues include various kinds of pectinases, cellulases, hemicellulases and phosphati...ases, etc.

The exact role of cell wall degrading enzymes is not clearly understood. Many non-pathogenic and less virulent pathogens also produce good amount of these enzymes and there may or may not be correlation between pathogenic potentiality of the organisms and their ability to produce cell wall degrading enzymes in vitro/invivo.

With respect to the enzymological studies the concept of regulation by controlling the production and activity of enzymes involved in the pathogenesis with the help of various chemicals has acquired a great deal of fundamental and applied importance. Besides induction of resistance of the host against the action of various enzymes and toxins of the pathogen can also be a good approach for the control of various plant disease.

Thus based on above mentioned background the present work on some storage rot of fruits and vegetables was carried out.
During the survey of local fruit and vegetable market, samples of diseased fruits/vegetables of lemon, amla, apple, mango, guava, pear, peach, parwal, brinjal, plum, banana and others were collected and their causal organisms were isolated. *Aspergillus niger* Van Tieghem was isolated from the varieties of fruits and vegetables found to cause great damage to the fruits and vegetables. Thus *Aspergillus niger* isolated from the amla (*Emblica officinalis*), plum (*Prunus domestica*) and lemon (*Citrus medica*) fruits were selected for detailed study as the fungal pathogen was found to cause great damage on various fruits.

*Aspergillus niger* cause great damage to a variety of crops. Many workers have reported the different species of *Aspergillus* from various fruits and vegetables. Verma and Kamal (1951) reported the rot of mango fruits caused by *A. niger*. Venkatarayani and Delvi (1951) found that the black onion rot is caused by *A. niger*. Dasgupta and Bhatt (1946) studied the diseases of *Mangifera indica* caused by *Aspergillus nidulans*. Sharma (1962) reported the rot of bel fruit by *A. niger*. Sharma (1962) and Bisen (1980) reported the apple rot caused by *A. niger*. Biswas and Mukherjee (1981) studied the storage rot of onion caused by *Aspergillus* sp. and they also controlled this disease by plant extracts and oils. Arya *et al.* (1981) studied the *Aspergillus* rot of guava. Chenulu and Thakur (1968) reported
the rotting of tomato and potato by *A. niger*. Sing (1968) isolated the *A. niger* from the diseased fruits of pomegranate, mango and guava. Kaul and Lau (1975) also reported the *Aspergillus* rot of citrus. Somal (1968) reported the *A. sydowi* rot of amla.

Thus, with a view to evaluate the role of various cell wall degrading enzymes in the pathogenesis, the present problem was undertaken to study the fruit rot disease of amla, plum and lemon with special reference to pathological, biochemical aspects of the diseases and their control measures.

The present work has been planned on the following lines:

**PART I : GENERAL**

This part includes isolation of the pathogens, pathogenicity tests, inoculation experiments. Effect of temperature and effect of age of culture on disease development have also been studied.

**PART II : ENZYMOCLOGICAL STUDIES**

This part consists of detailed investigation of pectolytic, cellulolytic and proteolytic enzymes of the pathogens both *in vivo* and *in vitro* conditions. Effect of
pH and temperature on enzyme activity, effect of native carbon sources, sugars, organic and inorganic nitrogen sources, and growth regulators on enzyme secretion have also been studied.

PART III : CONTROL MEASURES

In this part the effect of various fungicides, antibiotics and phenolic compounds on the production of different cell wall degrading enzymes and on the rotting of fruits have been investigated.