senescent phases. In this group some pathogens are tissue non-specific but most are tissue specific. The pathogen may be macerative, toxicogenic or both. Important pathogens are the species of *Armillaria, Polyporus, Poria, Helminthosporium, Fusarium*, etc.

VI. Importance of Plant Diseases

A. Introduction

Plant diseases damage plants and their products on which humans depend for food, clothing, furniture, housing and the environment. Plant diseases can make a difference between a happy life and a life haunted by starvation and hunger. The death from starvation of a quarter million Irish people in 1845 and Rice Bengal Famine in 1943-44 in Bengal are examples of consequences of plant diseases. Plant diseases may cause annihilation, devastation, disfiguring and limitations. Some of the major effects of plant diseases are;

(1) May limit the kinds of plants and industry in an area.

(2) May reduce the quantity and quality of plant produce.

(3) May make plants poisonous to humans and animals

(4) May cause financial losses, and

(5) the cost of controlling is also a direct loss.

B. The Damage and Losses

Zakok (1970, 1973) has suggested a classification of losses (Table-1) that describes the complexity and inter dependence of loss at all levels of society. He also proposed three useful concepts for describing the dynamics of crop destruction. They are;

(1) Injury:

Any observable deviation from the normal crop; injury may lead to damage.

(2) Damage:

Any decrease in quantity and quality of a product; damage may lead to loss.

(3) Loss:

Any decrease in economic returns from reduced yields and cost of agricultural activities designed to reduce damage.

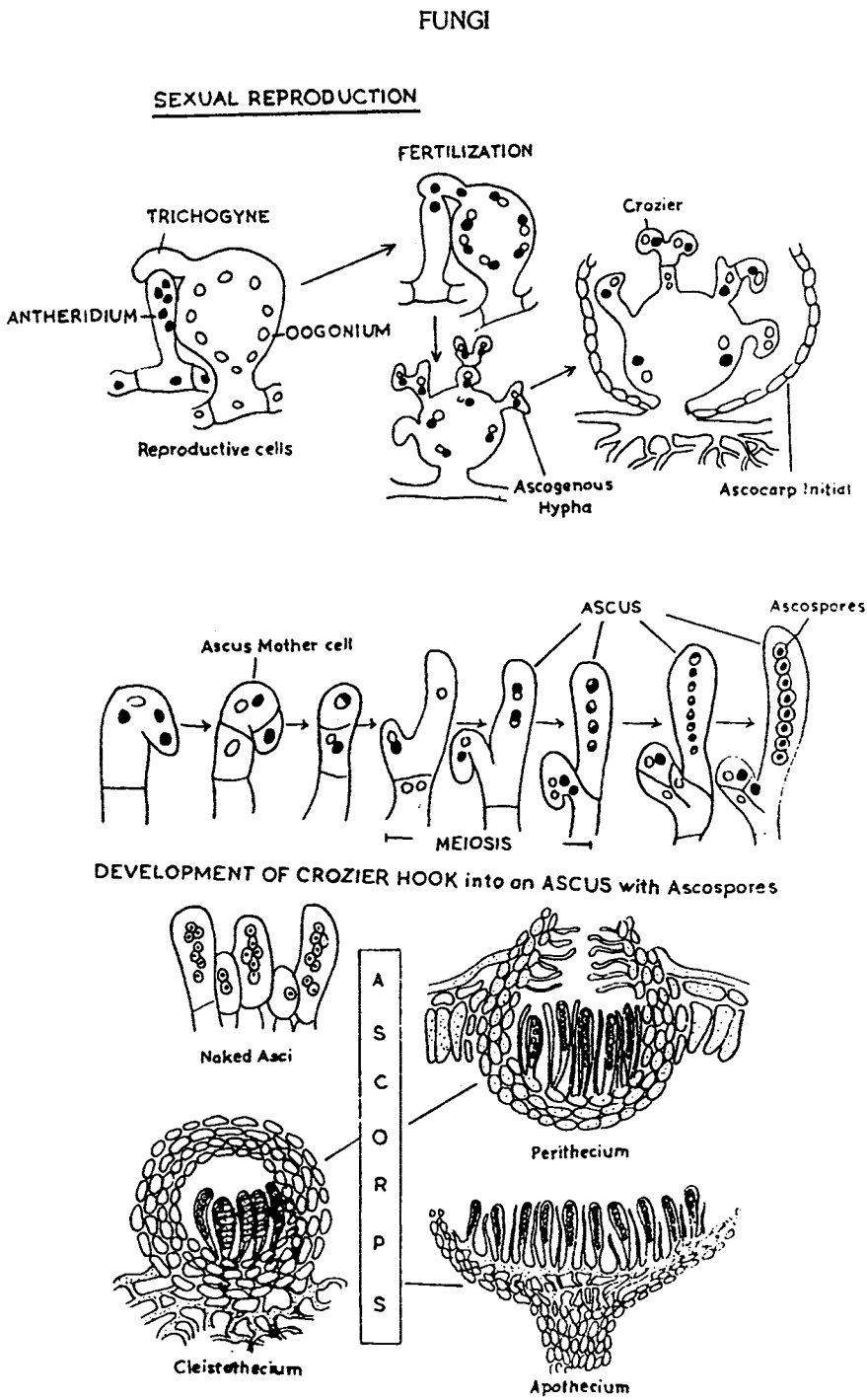

Figure-11: Development of crozier hook in to an ascus with ascospores

elium may be branched or unbranched and tend to grow closely oppressed to the host surface. Hyphae are thin walled and septate with each cell usually containing a single nucleus. 20 to 50 percent hyphal cells produce simple, unlobed or multilobed appresoria. Microscopic studies have revealed several types of haustoria. The shape varies form globose to pyriform to lobed. The haustorium is separated from the cytoplasm of its host cell by extra haustorial matrix and an extra haustorial membrane.

Asexual Reproduction

A few days after the host infection, the somatic hyphae produce great numbers of hyaline, erect conidiophores. The conidiophores of most species are unbranched. The conidiophore consists of one to three cells. The basal cell is referred as the foot cell while the terminal cells are conidiogenous cells. In the case of *Blumeria graminis* (Fig. 16), the basal cell is swollen, and also functions as conidiogenous cell. Conidia develop singly or in chains. When formed in chain, conidia remain firmly attached end to end with mature conidia at the distal end of the chain and the immature conidia at the proximal end (basipetal development). Conidia are one celled and hyaline (Figure-14, 17) Each is thin walled, uninucleate, vacuolated, oval or cylindrical with rounded sides and ends. Based on characterstics of conidiophores and conidia, the asexual stages of most powdery mildew fungi key out to the anamorph genus *oidium*. Three additional

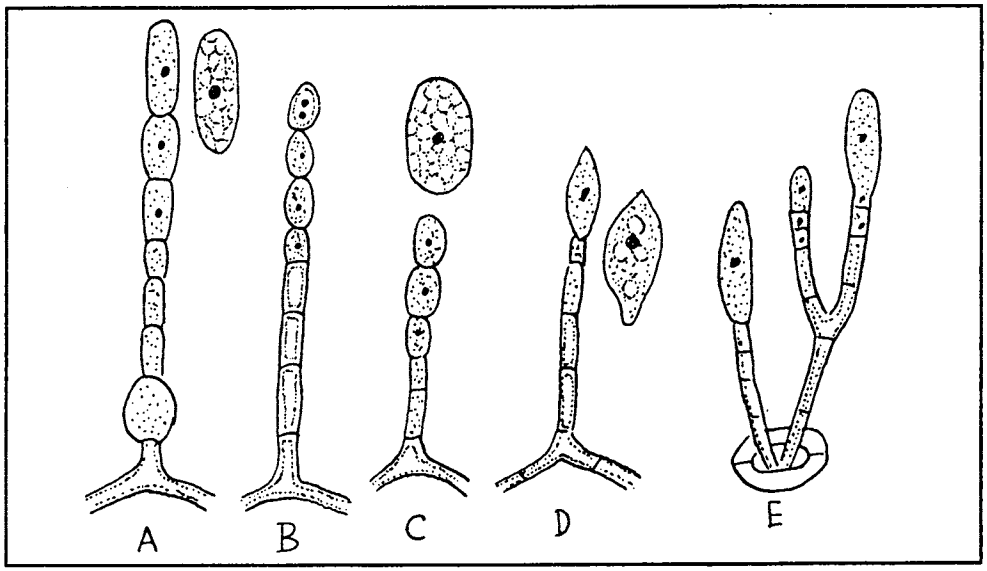

Figure-14: Conidiophore and conidia of *Bluneria graminis* (A) *E. cichoracearum* (B) *E. polygoni* (C) *Phyllactinia* (D) and *Leveillula* (E).

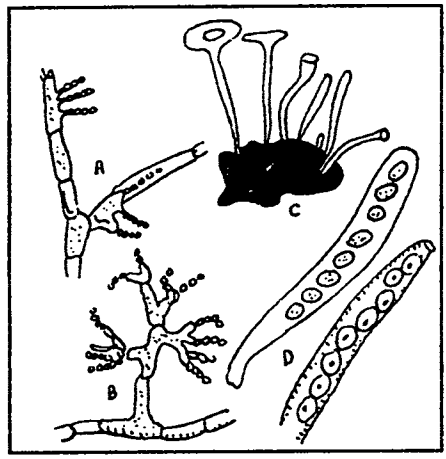

Figure-18: *Sclerotinia sclerotiorum*: A-B-endo- and exo-genously produced chains of microconidia (spermatia); C-germinating sclerotium with apothecial heads D-àscus and ascospores.

When the food supply is exhausted and the vegetative growth has ceased the hyphae with thick granular protoplasm and short cells collect in small dense masses which gradually become the sclerotia. At first these are pink but later turn dark-brown to black and become smooth. They vary in size and shape with environmental conditions and with the strain. Sclerotia formed on host surface are usually loaf-shaped or globose while those formed in the pith of the stem are elongated according to space available for growth. They range from 2 to 10 x 2 to 5 mm in the large sclerotial strains while in small sclerotial strains they are usually nearly spherical with a diameter of 0.5 to 1 mm. On germination these sclerotia give rise to several columnar structures (stipes) which develop the funnel-shaped cup (apothecium) at the tip. The mature apothecia are 6-9 mm across, generally borne 6-10 mm above the soil surface and become darker in colour with age. The ascospores are discharged in abundance from these cups. The ascospores are always 8 in each ascus which has an apical pore through which spore discharge occurs with violence. The asci are cylindrical and measure 108 - 153 x 4.5 - 10 microns, the average being 122.9 x 5.9 microns. The ascospores are hyaline, 1-called and ovate. Their size falls within the range of 7-16 x 3.6 - 10 microns. In absence of asexual spores the fungus is disseminated mostly by means of ascospores which are the most common structures of infection. Sclerotia can survive in soil or on plant debris for long.