CHAPTER-1
INTRODUCTION
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The term 'blight' connotes for a wide variety of diseases of plants or plant parts on account of some causal agents which causes sudden, rapid, and serious withering, the cessation of growth, and/or death. In literature, blight include (Westcott, 1960) such cases, which are known under seedling blight, nursery blight, stem blight, shoot blight, cutting blight, branchlet blight, twig blight, tip blight, branch blight limb blight, spur blight, leaf blight, needle blight, blossom blight, inflorescence blight, head blight, bud blight, flower blight, petal blight, flower spot blight, stamen blight, fruit blight, pod blight, and berry blight, etc. Besides the description of blights on the basis of plants or plant parts, there also exists terminologies on blights named after the time or place of occurrence of a disease like early blight, late blight, snow blight, melting out blight, Southern blight, etc; terminologies implying the characteristics symptoms of a blight, for example, grey mould blight, thread blight, web blight, stem necrosis blight, fire blight, brown felt blight; and also blights caused by bacteria and fungi, such as, bacterial shoot blight, bacterial halo blight, bacterial fire blight, bacterial leaf blight, Alternaria blight, Ascochyta blight, Phomopsis blight, Botrytis blight, Dothiorella twig blight,
Macrophomina blight, Cylindrocladium blight, Phytophthora blight, Stemphylium blight, Maydis leaf blight (maize), Turcicum leaf blight, and several others. Ainsworth (1961) therefore, defined blight as a common name for a number of different diseases of plants especially when damage is sudden and serious.

Historically (Walker, 1969), blights of plants are not of recent origin because the ancient Hebrews (Jews or Israelites) were aware of blights of economic crop plants.

Twig blight generally refers to the sudden and serious damage and death of tender branchlets of a tree and also other organs like leaf, flower, and fruit borne by it. It usually occurs on numerous woody trees, shrubs and even the herbaceous plants belonging to diverse plant families, irrespective of the fact that a plant may or may not be economically important from our point of view. Twig blight, in particular, is conspicuous with trees like forest trees, fruit orchards, avenue plantations, trees on wastelands, plantation crops, etc. The stag-headed appearance of the blighted twigs can be located from a distance particularly if a tree is severely affected.

The leaves of blighted twigs usually dry up, shrivel, and turn brown. These affected leaves may be attached to the twigs or may shed causing defoliation and leaving the twigs barren. They may also exhibit spotting of various kinds.
Bark of the affected twigs may contain lesions, cracks, cankers, gum etc. In case of flower bearing twigs, if blighted, the flowers and young tender fruits along with the inflorescence axis may die, dry up and shed. The affected twigs usually lose their natural colour and lusture, shrivel, deform, and die. In case of the involvement of any pathogenic fungi or bacteria with the disease, the new shoots arising below the dead twigs also are infected and die as a consequence of the effects similar to the originally infected twig. In any particular plant, twig blight is either restricted to a certain portion or may spread over to majority of the twigs of the concerned plant; depending upon the vulnerability of the host to the pathogen concerned, the agent through which the disease spreads, and the conduciveness of the climatic conditions prevailing at a given situation. In case of a severely affected tree where most of the twigs of the crown are blighted and is accompanied by shedding of leaves, the entire plant appears as bald and as if dried.

Twig blight is commonly initiated a few centimeters away from the tip of the ultimate branchlet in the form of a small inconspicuous lesion or borer-hole but gradually spreads. Once the infection is fully established, it proceeds downwards and kills the tissues of the twig as well as other organs borne by it. Depending upon the pathogenic behaviour and the virulence of the pathogens involved with the disease, the blight may be restricted only to the tip of the twig or
may extend to the entire twig. In case some wood rotting pathogens are involved or gain access to the disease syndrome, the pathogen may infect the main branches and even the trunk, eventually causing death and decay of branches or the plant as a whole. In the latter situation, the disease may also produce cankers, gummosis, and several ancillary symptoms of dieback. Thus, the same disease, depending upon the stage of its development at the time of observations under natural conditions, are apparently designated by different names of which three are particularly popular, namely, wither tip, twig blight, and dieback.

Drying and death of twigs may also be caused by several diseases other than blight, for example, wilt, root rot, decline, basal stem rot, collar rot, and others. There is however, one major and clear-cut difference between twig blight and the other set of diseases, in that, while the twig blight is initiated at the tip of a tender twig on the crown of a tree and progresses downwards to the main trunk, the other set of diseases is initiated in the root or the basal region of a tree trunk, and either the pathogen or its toxins advance upwards so as to reach the tip of the tree for the pathological consequences. Besides this, the causal agents involved may be different in the two sets of diseases concerned. Therefore, it is always desirable that the affected tree or plant be examined critically in order to avoid erroneous diagnosis and unwarranted confusions; as in the absence of
any critical examinations, or may land in faulty conclusions, and ineffective recommendations for its control and management.

Ecologically, the Western and Eastern Ghats, Deccan Peninsula, and the North Eastern Hilly Region of India are classified as 'tropical rain forest'. It is characterised by high summer temperature followed by heavy rainfall during the monsoons. It is in this region that twig blight and dieback diseases of woody tree species are of common occurrence. In the Indo-Gangetic Plains, Rajasthan, Punjab States, and the foot hills of the Himalayas, where the normal monsoon rainfall is usually low, these diseases are relatively rare, unless the microecological conditions are vitiated by man-made contraventions in order to maintain the commercial orchards and plantations.

In the region of tropical rain forests, economic species like coffee, cacao, tea, rubber, a wide variety of fruit trees such as mango, guava, jackfruit, citrus, pomegranate, sapota, annona, etc., forest trees, avenue trees, and trees on wastelands usually manifest the symptoms of twig blight. Even some of the tree vegetables like Moringa oleifera and woody herbaceous species like chilli and brinjal also are affected by the disease.

The pathological significance and the economic consequences of twig blight of various crops is not fully understood, at present, in India. In fact, there are no estimates available.
on the losses incurred on account of this set of diseases available so far. Except for reporting the diseases and their possible causal agents as a part of academic mycological interest, no serious investigation was ever made to elucidate the etiology, epidemiology, and control of twig blight and dieback diseases in this country. In brief, these diseases are considered of minor importance economically, especially for two main reasons. In the first place, the owners of the commercial orchards believe that twig blight can be easily warded off by pruning at regular intervals followed by spray or paint with some copper fungicides. Secondly, it is also believed that shoot borers act as primary incitants instead of acting as predisposing factors, bore the tender twigs, and fungi enter and establish later as secondary invaders into already damaged twig; control of shoot borers, therefore, would automatically control twig blight and dieback diseases. However, there are yet no two opinions that it is the fungi and, the fungi alone, that advance deep into the host tissues, causing more serious damage than that of the shoot boring insects.

Death of a twig is not the only menace caused by the causal agents of twig blight. An affected but still alive twig may also provide sufficient inoculum for causing blossom blight, fruit drop, fruit rot, and even spotting and blighting of leaves, especially in perennial tree species. This fact being frequently overlooked for which the disease
is underestimated. Alternatively, it is now well established that the causal agents of blossom blight, fruit drop, and leaf necrosis pathogens also enter into the twigs and cause blighting.

It is an established fact that the causal agents of twig blight invade into the tissues of a twig, besides insect wounds and injuries, although the necrotic lesions of the pathogenic organisms, withered panicle axis, and even from the necrotic lesions and blights of leaf through the petioles. Unless the complex situation is fully investigated and elucidated, it may be difficult to prevent the pathogens in entering into and establishment in the susceptible tissues of the twigs.

In literature (Chapter II), several fungi are reported as causal agents of twig blights in India. However, two species, namely, Botryodiplodia theobromae Pat. and Colletotrichum gloeosporioides Penz., are responsible for spotting and blighting of leaves, blighting of blossoms, and shedding as well as rotting of fruits at various stages of development and maturity.

Orissa is a part of the tropical rain forest, situated in the Eastern Ghats of the country. Twig blight is very common on numerous economic as well as other species. Our knowledge about this disease in Orissa is very much limited (Rath et al., 1978). Therefore, investigations on
this disease was initiated (since 1987 with the objectives of:

1. To identify the fungi causing twig blight of fruit and vegetable species in Orissa by undertaking regular surveys of different localities of Puri district for the collection of diseased samples; isolation, purification, identification, and pathogenicity tests; and to undertake studies on the host range and mode of perpetuation of the two major pathogens, viz., Botryodiplodia theobromae and Colletotrichum gloeosporioides.

2. To evaluate some chemicals for the control of B. theobromae and C. gloeosporioides, in vitro.

The results obtained from these studies are presented in this thesis. It is hoped that the information accumulated during the present investigations shall enrich our knowledge on the problem posed by the disease and the progress made so far in understanding them, especially in relation to the fruit and vegetable crops under Orissa conditions.