

INTRODUCTION

Growth and yield of the plant depends on the availability of nutrients and water in the soil where they grow and on maintenance within certain ranges of environmental factors such as light, temperature and moisture. Plant growth and yield also depend on protecting the plants from the parasites. Any thing that affects the health of plant is likely to affect their growth and yield, may seriously reduce their usefulness to themselves and to mankind. Plant pathogens, unfavourable weather, weeds and insect pests are the most common causes of reduction or destruction of plant growth and production. It has become a common practice to cultivate the same crop year after year in the same field without any rotation. Such conditions favour the outbreak as well as perpetuation of a number of diseases which cause considerable damage to the crop and affect the quality and yield of the produce.

Three of the natural enemies of cultivated plants, weather, weeds and insects are dealt with respectively, in the disciplines of climatology, agronomy and horticulture and entomology, a fourth is dealt with the science of plant pathology, the study of nature, cause and prevention of plant disease. Plants are parasitized by large number of microbes, both bacteria and fungi and also by viruses, Mycoplasma Like

Organisms (MLO). Many higher plants saprophytic or epiphytic living on dead plant material are supported by a living host plant, and a few have become clearly parasitic, deriving much or all their food from the host plant. The tissues of one organism may be closely associated with or invaded by those of another and considerable exchange of material may take place. If the presence of one organism is detrimental to the health and well being of other, the association is called parasitism and the result of parasitism is disease.

Disease is a complex phenomenon and it is difficult to define in few words. But it is an interaction among the host, parasite and the environment, which disturbs the normal plant metabolism. Diseases are classified as infectious and non-infectious on the basis of causal agent. Infectious plant diseases are caused by living organisms which are parasite on other crop or plants. More than thousand species of seed plants, at least seven families parasitize other seed plants and induce in them harmful physiological processes that we recognize as disease. Some weeds exists as total parasites or semiparasites upon crop plants. Angiospermic plants may be parasitic on other important hosts and cause damages at economic level. Balanophora causes serious damage to coffee, Cuscuta to clovers, Striga to sorghum, pearl millet and sugarcane, Orobanche to tobacco, tomato, brinjal and beans and Loranthus and Viscum to horticultural trees. These are very injurious weeds and

cause great damage to crops. Mistletoes, dodders and Orobanche (broomrapes) have reduced crop yield and have killed economically important plants.

Since disease is a malfunctioning process, the physiology of diseased plant is also an area of intensive study. It is essential to study how plant pathogen breaks down plant cell walls, how pathogen interrupts the translocation of water, minerals and food material, how metabolic systems such as photosynthesis and respiration are affected and how the many other physiological processes and plant metabolism are disturbed.

In recent years, much of the earlier symptomological approach of problem of plant disease have given a way to an integrated study of cause and effect. It is now becoming increasingly clear that a sufficient knowledge of plant physiology and biochemistry is essential for interpreting the metabolic changes during pathogenesis. As a matter of fact the biochemical and pathological trends of research started about 25 years ago and was found the physiological research on host-parasite relations. These modern trends of research intended to unravel the physio-biochemical processes of the diseased plant (such as photosynthesis, respiration, nitrogen metabolism and growth). They wish to determine the true causes of cell proliferation, the possibilities for the inhibition of virus multiplication, the metabolism of fungal toxicity, mode of action to toxins, the role of hormones or hormone-like substances in pathogenesis, as well as virus biosynthesis.

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The physiological plant pathology focuses physiological and biochemical aspects of pathogens and the response of host tissues. Physiological plant pathology has assumed a new significance within the broader field of plant pathology.

In the present investigation the deviations caused by pathogen, Orobanche, a total root parasite in the normal metabolism of tobacco and brinjal plant namely, organic constituents, inorganic constituents, organic composition and nicotine in tobacco is carried out. Pathological anatomy of roots of tobacco and brinjal have also been investigated. Healthy plants (free from Orobanche) were used for comparison with infected plants.

The present work is divided into three parts, review of available literature, materials and methods followed by results and discussion. Review of literature on Orobanche, indicates that the biochemical studies of parasitism by Orobanche have been mainly performed in the case of crops like tobacco, tomato brinjal and Petunia. Although Orobanche has been studied by biologists, a long time, only few investigations have been made on physiology of its host-parasite relationship.

Mineral nutrition of the host is one of the basic processes impaired by disease. Impairment may be due to direct plundering by the parasite or to the indirect effects of parasite on absorption, mobilization or function. According to

Benoit et al. (1978) infection modifies the normal inorganic metabolism of the host. They also feel that host nutrition influences the plant diseases and the relationship between the two is quite complex. The role of particular element in various host remains more or less similar but different host respond differently to nutrients and their response differs against the attack of plant pathogen. The nutritional environment directly affects the fate of invading pathogen. The intimate effects of pathogen or parasite on alterations in the host occur at the cellular level but may be reflected in altered growth of the whole plant. The disruption of mineral nutrition by pathogens however, a general understanding of the source and function of mineral elements is necessary before diseased and normal conditions can be compared. Once we know this, we can profitably use this knowledge to control some of ^{the} diseases at least partly. With this objective in mind an attempt has been made to study the effect of Orobanche on the inorganic constituents in the leaves of affected tobacco and brinjal.

Concentrations of organic constituents through their altered rate of synthesis and utilizations, resulting from the disturbances in the normal mineral metabolism. With this aim in view, effect of Orobanche infection on the concentration of various organic constituents have been investigated here.

Nicotine is the sink product synthesized in roots and transported to the leaves (Dawson, 1942). The ultimate objective in studying the effect of Orobanche, on tobacco is to understand what extent it affects the nicotine content or how best tobacco has evolved in its system of adaptation to the total root parasite Orobanche, with respect to nicotine content. To determine the mechanism by which Orobanche parasitizes tobacco and brinjal plant and anatomical changes in host roots parasitized by Orobanche, pathological anatomy of roots is carried out.

Tobacco (Nicotiana tabacum L.) being one of most remunerative cash crops in India, its cultivation has been expanding progressively. Tobacco holds unparalleled position among the crop plants in several industrial particulars. Management of tobacco needs attention from the view point of both fertility and water availability as well as plant protection from diseases and pests. Tobacco is said to have been introduced in India by the Portuguese in the beginning of 17th Century A.D. (Indian Tob. Mongr., 1960). Its cultivation now extends to all parts of the country and now it is one of the most valued crops, though the area under cultivation is only about 0.28 per cent of the total sown area.

Tobacco plant is tropical in origin but grows successfully under tropical, subtropical and temperate climates.

Plants are largely self-pollinated, and they are mostly annuals. Bidi tobacco is grown as rainfed crop during Kharif-rabi season in black clayey or loamy soils of Belgaum district of Karnataka and Kolhapur and Sangli districts of Maharashtra. When the majority of leaves have been spangled and yellowing has commenced, the crop is considered to be ready for harvest. Diseases of the crop are important in both yield of leaf and quality of the produce. Plant diseases frequently cause large losses in the crop and disease investigations and control are important factors in the improvement of crop. Extensive researches for improvement of crop has been going on in different parts of the country, as tobacco is not only the export commodity, but also plays crucial role in the economy of the country. India ranks third after U.S.A. and China, in tobacco production.

Although in recent years tobacco is condemned to be causing health hazards, it has gained importance in medicine, drugs and pesticidal industries. The chief ingredient which gives tobacco its distinctive properties is 'nicotine' an alkaloid occurs in the leaf in combination with vegetable acids, malic and citric. The alkaloid is virulent poison acting mainly on the nerve centres and paralysing them. The industrial product of considerable importance is nicotine sulphate, which is prepared from tobacco for use as an insecticide. There are many diseases of tobacco caused by fungi, bacteria, viruses, nematode and also phanerogamic

parasitic plants. Orobanche is a total root parasite and causes considerable yield loss.

The present knowledge in India regarding the science of vegetable production is scanty. As far as successful vegetable production is considered, production [better seeds, improved cultural practices, better plant protection methods are necessary. Vegetables provide proteins, carbohydrates, mineral salts and vitamins, Vegetable crops occupy only about 1.2 per cent of the total cultivated area of the country. It is encouraging to note that recently more attention is being paid to increasing the production of vegetables.

Brinjal (Solanum melongena L.) commonly known as egg-plant belongs to family Solanaceae. Brinjal is a vegetable crop native of India. It is the most common vegetable grown throughout ^{the} country. It has become widely distributed throughout the tropics. It is a popular vegetable and is economically important in many aspects. It is one of the most valuable vegetable crops due to its high nutritional value. Due to its adaptability to various soil and climatic conditions it is extensively cultivated. It is rainfed as well as irrigated crop. Well drained sand loam soil is best for cultivation. Fruit must be harvested frequently otherwise yield decreases. Orobanche is a total root parasite of brinjal which causes considerable yield loss.

The growth rate and yield of both the plants can^{be} greatly decreased due to Orobanche infection which may absorb nutrients, water and minerals from vascular system of roots of infected plants by means of haustoria. Incidence of Orobanche, losses caused, identification and physiology under diseased condition of brinjal and tobacco are important aspects which are useful to understand the distribution pattern, economic importance and selecting and applying appropriate measures at the most appropriate time because both the plants are economically important.