

## Plant diseases and their control in relation to increased crop production

By

D. MARUDARAJAN  
( Government Mycologist )

**Introduction:** The importance of plant diseases as factors responsible for limiting crop production cannot be overestimated. Crop diseases have been recorded from the earliest times and have exercised a profound influence on human affairs. In India, the losses caused by plant diseases are enormous and there is no doubt, that if adequate measures are taken to keep them in check, the level of our crop production can be considerably increased. In the year 1946, the rust disease of wheat was responsible for almost wholesale destruction of the crop throughout the country, cultivators finding it difficult to gather even enough seed for their next sowing. The blast disease of paddy which breaks out off and on in an epiphytotic scale in the districts of Tanjore, Nellore and Chittoor has been known to cause damage extending up to 70 percent in certain years.

The foot rot disease of rice which occurs in the Godavari delta and parts of Coimbatore district causes damage to the extent of 20 percent. The smut disease of sorghum occurring throughout the province reduces the yield ranging from 2 to 10 percent. Besides these major diseases mention has to be made of diseases affecting our pulse, oil seed and vegetable crops and the diseases affecting the potato crop in the Nilgiris which cause considerable damage and reduction in yield. These losses which are of sufficient magnitude to cause concern even in normal times are of enormous significance in the present crisis, when every ounce of grain produced is of value.

**Plant diseases:** Plants are subject to the attack of microscopic parasitic agents like fungi, and bacteria, (or virus) which invade the tissues of the plants attacked, rob them of the food materials, and cause destruction and decay. These agents are not usually visible to the naked eye, on account of their minuteness but their presence is indicated by the symptoms manifested on the host plant. These tiny organisms have the capacity of rapid multiplication and when conditions favourable for their development occur, they spread rapidly from plant to plant and cause epiphytotics.

**Control Methods:** In order to control plant diseases caused by parasitic organisms the first step is to understand the nature of the disease, and the peculiarities of the organisms which cause the disease. The control methods devised should be effective in killing the organism without affecting the host. It is also essential that the methods devised are such that the cost of treatment should be commensurate with the resulting

profit. A century of research in this direction has resulted in the discovery of various chemicals which can be used as fungicides, satisfying these conditions. Foremost among them, although the earliest discovered, is a solution of copper sulphate and lime in certain proportions. This solution which goes by the name of Bordeaux mixture was first discovered by Millardet in France in the last century and it is still hard to beat as a general purpose fungicide especially for the control of fungus diseases attacking the foliage of plants. In recent years a number of proprietary fungicides with copper as the base have been put in the market, but while many of them possess advantage over Bordeaux mixture in regard to convenience in handling their superiority over Bordeaux mixture in other essential respects is doubtful. Sulphur is another fungicide the use of which dates back to the last century. In recent years the discovery of the use of organo mercury compounds which can be used as seed dressing fungicides has been responsible for the effective control of a large number of seed borne diseases which have hitherto defied control by other methods. Along with investigation directed towards the use of fungicides, considerable progress has been attained in Western countries in perfecting the appliances necessary for the application of fungicides to the crops.

It is not all diseases that are amenable to control by the application of fungicides. Where the use of fungicides is either uneconomical or ineffective resort is had to the introduction of disease resistant varieties. It has been found that different varieties of crop plants react differently towards specific plant diseases and the introduction of resistant varieties have resulted in the effective control of a number of a crop diseases. A third method of control of plant diseases is by guarding against the introduction of new diseases to areas where they have not been hitherto prevalent. In many countries suitable plant quarantine laws are being enforced to prevent the introduction of new diseases.

In respect of certain diseases the only effective method of control has been found to completely destroy the affected plants, in order that the organism associated with the disease may also be destroyed and thus prevent its being spread to other plants. With a view to secure this end, suitable laws are enacted which enable the Government to enforce the eradication of diseased plants.

Besides these methods for the control of plant diseases, it goes without saying that attention should be paid to provide proper conditions for the growth and development of crops, namely, adequate water supply, balanced manuring, clean cultivation to prevent competition from weeds, provision of drainage facilities to prevent water logging, so that crop plants may be able to withstand the onslaught of diseases and pests without succumbing to them.

The control of virus diseases calls for special methods such as (1) the introduction of resistant varieties (2) the roguing out of diseased plants to eliminate sources of infection and (3) destroying the insect vectors which are responsible for the spread of the disease in the field.

**Work done in South India Rice :** The rice crop in South India is subject to a number of diseases, but by far the most important are (1) the blast disease caused by *Piricularia oryzae* and (2) the foot rot disease caused by *Fusarium moniliforme*.

(1) The blast disease has been recorded from all over the province and in the districts of Tanjore, Chittoor, Nellore and Vizagapatam it is a serious factor in limiting production. The disease attacks the crop in all stages but the greatest damage is done when the disease breaks out while the crop is in the earhead stage. The damage caused by this disease is dependent on the intensity of the attack which is influenced by various factors such as (1) the susceptibility of the variety of rice grown (2) the weather conditions prevailing during the season, especially during the heading period of the crop and (3) the nitrogen status of the soil. When the disease occurs in the nursery stage it could be controlled to a certain extent by the application of Bordeaux mixture and this method is being popularised by large scale demonstrations organised for the purpose, in the districts of Nellore, Chittoor and Vizagapatam. When the disease occurs in the transplanted crop, however, this method of control is not feasible, and the introduction of resistant varieties offers the only means of preventing losses caused by the disease. The replacement of a susceptible strain with a resistant strain is no easy problem in rice. The widely divergent conditions of soil, climate, seasons, cultivation practices, duration and availability of water supply, render it necessary to have a large number of varieties suited to each tract. The evolution of a disease resistant strain is the combined task of the plant breeder and the plant pathologist, and it is gratifying to record that in the Madras Province, collaborative work of the Paddy Specialist and the Mycologist, has resulted in the evolution of a large number of disease resistant cultures which are now in readiness for distribution in the districts.

Of these, two cultures 3840 and 3912 have shown outstanding performance in regard to yield, the quality of their grain and other desirable characters when tested in various places in the districts of Trichy, Tanjore and Madura and accordingly steps have been taken by the department to multiply them in seed farm conditions. Within the space of two or three years it is hoped that enough seed of these two promising cultures will be available to replace the susceptible variety grown in the Tanjore and Nellore districts and thus effectively reduce the losses caused by blast in this area.



Work is in progress with regard to the evolution of short duration varieties which are resistant to blast to suit Chittoor and Chingleput districts.

(2) A disease of rice next in importance is the foot rot disease. The disease has been found to be seed borne, and treatment of seed with organo mercury compounds such as Ceresan and Agrosan GN at the rate of 1 gram per pound of seed has been found effective in obtaining complete control of the disease. The adoption of this method is not difficult and can easily be carried out by the cultivator himself without much effort. The cost of treatment is also not high; it amounts to less than four annas an acre.

The disease occurs in the Godavari delta and parts of Coimbatore district and it has recently been reported from Ramnad also. Arrangements have been made for stocking the fungicide in sufficient quantities in the Agricultural depots, to meet the needs of cultivators in these tracts.

Large scale demonstrations, to popularise the method were carried out in a village near Gobichettipalayam in the year 1946, 1947 and during the current season, and a quantity of seed that would cover the greater portion of the area in the whole village was treated under the auspices of the department and free of cost to the cultivator. In this demonstration the co-operation of leading ryots in the village was enlisted and it is gratifying to note that the disease has been more or less eradicated from this region. In this connection, it may be mentioned that there is considerable scope for the manufacture of these organo mercury compounds in India, and though conditions may not be propitious for the starting of such industries just, at present owing to the non-availability of mercury the future holds possibilities in this direction.

**Sorghum.** Next to rice Sorghum is the most important cereal crop in this province. This crop is subject to the smut disease caused by *Sphacelotheca sorghi*. The disease is carried through the seed but manifests itself only when the crop reaches maturity. It affects the grains and there is considerable loss of yield. The disease is easily controlled by treating the seed with a fungicide. In earlier years the use of copper sulphate was advocated but in recent years the use of sulphur has been adopted instead.

While the control method advocated was fairly simple and easy of adoption by the cultivator the difficulty of procuring sulphur stood in the way of the method becoming popular. In order to overcome this difficulty the department has, during the last four years arranged for the stocking of sulphur in all the Agricultural depots in the main Sorghum growing districts and a considerable area of these districts are now sown

to treated seed. It has been programmed to cover the entire Sorghum area in a few years and arrangements are under way for stocking enough sulphur to meet this requirement and reach the target.

**Other crops :** Fruit crops like oranges and grapes need special attention in respect of control of diseases. Systematic spraying is necessary in order to obtain maximum profits from these crops. In Wynaad taluk in Malabar, oranges are subject to a serious disease caused by *Phytophthora Sp.* which is effectively controlled by the application of Bordeaux mixture. It has been shown that the net profit from sprayed trees is about Rs. 600 per acre over unsprayed trees. In the cultivation of grape vine, the control of mildew is effected by spraying. Investigation carried out on diseases of ground nut, gingelly and potatoes has shown that all these crops will benefit by application of fungicides like Bordeaux mixture when they are attacked by fungus diseases affecting the foliage.

From the foregoing it is clear that our crop production can to a considerable extent be increased by devoting more attention to the control of plant diseases. The department has been endeavouring for the last three decades, to popularise among the cultivators remedial measures for the diseases occurring on crops and their attempts have met with a certain amount of success. But much yet remains to be done. Sprayers and fungicides are not easily available and attempts should be made to have them manufactured in India. An efficient plant protection service should be built up in the province with a view to help the ryot in taking timely measures against plant diseases. A beginning has been made in this direction and 1500 stirrup pumps converted into sprayers have been distributed to the districts as a temporary measure but these should be replaced at a very early date as they are not meant for efficient and long service. Government have recently sanctioned the appointment of a Plant-protection staff for each district. Arrangements are in progress to have each Agricultural Depot stocked with sprayers, fungicides and insecticides to meet the more urgent needs of the area served by them.

With the help of this organisation it is hoped that adequate steps would be taken to ensure that such methods of control of diseases as are known and proved to be economic are generally adopted by cultivators so that avoidable losses caused by plants diseases are eliminated.

