

## HOW TO KEEP OFF THE "INVISIBLE FOES."

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It is common knowledge that insects and several other members of the animal kingdom cause ravages on our crops. Drought, floods, extremes of temperature, heavy winds, excessive rain, improper drainage, toxins in the soil and a variety of unexplained or partially explained causes are also known to take their toll of crop plants. Besides the above, crop plants are subject to several diseases caused by parasitic fungi. Fungi are members of the vegetable kingdom representing a low order of creation, and are ordinarily too small to be visible to the naked eye but they could be made visible with the aid of a microscope.

Most parasitic fungi have a partiality for one important organ of a crop plant. Some attack roots, some attack the stem, some attack leaves, while some attack the flowers and fruits. Fungi with less restricted tastes attack more than one organ and are consequently more dangerous. Root parasites attack the most vulnerable portion of the plant and cause the wilting or complete death of the plant. Stem parasites weaken the frame work and dislocate the transportation of food materials. Leaf parasites partially or completely stop the preparation of food in the leaves. Parasites of flowers and fruits reduce the yield and incidentally restrict reproduction.

Quite a large number of fungi have been recorded on paddy (*Oryza sativa*). Fortunately, however the number of parasites among them is small and the number of diseases caused by such parasites in South India is smaller still.

By far the most serious of the diseases of paddy known in this Presidency is 'Blast.' It is caused by a fungus *Piricularia oryzae* which has been recorded from almost all the rice growing countries of the world.

Our knowledge of the existence of this disease in South India very recent. It was only in 1918 that the first record of this

disease was made when there was a serious outbreak in the Tanjore delta.

(1) The outbreak of the disease is closely linked up with the weather conditions prevailing during the cropping period of paddy. The fungus requires a warm humid atmosphere for its development and when such conditions prevail, it develops and spreads like wild fire till the whole crop in the neighbourhood of the source of infection is affected.

(2) The attack ordinarily begins on the leaves on which brown linear or oval spots are formed. These spots gradually enlarge and produce a grey centre where several spores are formed. If the weather conditions are favourable at the flowering period the whole earhead may get chaffed, either by the glumes getting diseased, or the neck of the head getting choked by the fungus. But if the attack takes place after the grains have passed the milk stage, the loss to the crop is not serious. In the plot of Korangu samba raised on the Central Farm during 1927, the loss from this fungus was estimated to be 69 per cent while in the varietal plot the loss was estimated at 90 per cent.

(3) The spores of the fungus are viable under dessication, up to a period of six months, a period long enough for the fungus to bridge over the off season. The infected straw, stubbles and even the underground portions of the plant are known to harbour the mycelium of the fungus which under favourable weather conditions give rise to a crop of fresh spores.

(4) The fungus has been proved to infect cereals like wheat, barley and oats, but morphologically indistinguishable fungi which cause the blasts of ragi, Italian millet and some wild grasses have never been known to infect paddy.

(5) There is a wide range of variation among several varieties of paddy in their resistance to *Piricularia*. In most cases the short duration and the coarse varieties are more resistant than the long duration and fine varieties. The following table gives the percentage of disease among ten popular varieties of the Southern districts grown for comparison in Coimbatore.

No.	Variety.	Percentage of disease.
1	E. B. 24	Nil.
2	Co 1	... 5.7
3	Sadai samba	... 18.2
4	Nellore samba	... 37.0
5	Co 3	... 37.3
6	Co 2	... 42.4
7	A.D.T.1	... 51.2
8	A.D.T.2	... 54.0
9	T 288	... 86.1
10	Korangu samba	... 89.3

(6) Other conditions being equal heavy vegetative growth and the free use of nitrogenous manures tending to produce excessive vegetative growth have been found to produce a high susceptibility to disease.

*Control measures.* The disease is not amenable to direct treatment. The chief avenue of disease control therefore lies in the utilisation of disease-resistant varieties. Exhaustive trials made in Coimbatore have revealed the existence of resistant varieties. Attempts are being made by the Paddy Specialist to utilise such varieties to breed new strains which combine in them disease resistance with other desirable qualities.

Besides the avoidance of highly susceptible varieties, the manurial aspect of growing paddy requires special attention. Any condition which encourages excessive vegetative growth has also been known to bring in its train susceptibility to disease. When allowed to develop an abnormal vegetative growth, even the most resistant variety has been known to suffer from the disease. The control of the disease may therefore be summed up in the words 'Resistant varieties and well-balanced manuring.'

The disease next in importance is *Helminthosporium oryzae*.

In this Presidency it is found wherever paddy is raised, but has seldom if ever taken an epidemic form. The disease is characterised by small brown linear spots occurring on leaves and may under favourable conditions cause the blackening of the nodes, neck and grains. The earheads are sometimes affected and

they fail to emerge from the sheath. Individual grains are often attacked and such grains become either partial or total loss. The existence of the disease was first brought to the notice of this Department in 1918-19 when the paddy fields in the Deltaic regions of Godavari and Kistna were affected and a heavy damage to the crop was reported. Investigation showed that the disease was present on a crop which was in a very weakened condition due to a variety of causes.

The fungus spreads through spores which are borne on the leaves, stalk and grains. The fungus is also able to live as dormant mycelium in the seed and is carried from season to season. Seedlings raised from infected grains are often subject to a seedling blight. The dead seedlings form the medium for the saprophytic development of the fungus and the spores blown about in the wind serve as secondary sources of infection.

*Control.*—Fortunately the fungus is not a virulent parasite and attacks only plants which are weakened from other causes. The chief method of control lies in good farming. General sanitary practices such as destruction of infected stubble, clean cultivation, disinfection of seed and the importation of seed from non-infected localities go a good way in preventing epidemic outbreaks.

The next disease is one of the minor diseases of paddy and is caused by a fungus called *Sclerotium oryzae*. It has been noticed only in a few of the paddy growing

3. *Sclerotical disease. Sclerotium oryzae.* areas of this Presidency and is not known to cause any appreciable damage to the crop. The disease escapes the notice of the ryots in its early stages when the infected plants can

be differentiated from the healthy ones by the peculiar phenomenon of 'tillering,' i. e., the development of fresh green shoots at the base of the infected culms. Infected culms turn yellow and die. Grains are poorly developed and the glumes are in most cases empty. In many of the localities where the disease has been noticed the disease appears late in the season when the crop approaches maturity.

The disease develops mostly in water-logged localities and is rather rare in well-drained fields.

The sclerotic of the fungus are capable of living in the soil for several years but the question of the application of chemicals aimed at killing them is out of consideration in the case of a crop like paddy.

A sure and permanent method of controlling the disease lies in the breeding of disease-resistant varieties. The following general preventive measures based on general sanitary principles are usually recommended.

(1) As soon as the disease is detected in the fields remove the infected plants and burn them.

(2) Do not plant too thickly, but allow plenty of aeration.

(3) Do not carry straw from infected fields to uninfected ones.

Another disease of paddy ordinarily met with in South India is caused by a fungus called '*Ustilaginoidea virens*,' and is known as 'Nelpazham' in Tamil and 'Varipandu' in Telugu. It appears on the earheads of paddy as large yellowish green bodies which are more than twice the diameter of the normal grains. As a rule, the fungus appears only in years of bumper crop.

Attempts to reproduce the disease have failed so far. The life history of the fungus is not known.

Fortunately, the disease is not severe in India and occurs once in several years and the fungus is not known on any other plant.

There is yet another interesting disease of paddy which is occasionally met with as a curiosity in South Indian fields. The plant is to all intents and purposes quite healthy but at flowering time, the ears instead of being a loose panicle bearing healthy glumes, is converted into a black solid cylindrical spike on which spores are borne in profusion. All attempts made in Coimbatore to study the life history of the fungus have failed. Fortunately, the disease is so rare and has never been known to cause any appreciable damage to the crop.