

## THE USES OF FUNGI.

By

T. S. RAMAKRISHNAN.

Fungi are primitive plants devoid of the green colour (chlorophyll) and hence dependent for the supply of their organic food substances on dead or live animals and plants. To a layman the name fungus conjures up the vision of an unwanted organism capable of doing harm only and causing enormous economic loss. Its loathsome presence is felt all round us. In the field it is responsible for a variety of diseases in a number of economic plants either bringing about their destruction or resulting in much reduced yields. In homes it thrives in the preserved food materials and stored food grains, fruits and pickles and causes them to rot or turn 'mouldy' and become unfit for consumption. Leather goods such as shoes and suitcases and even clothing form favourable media for the growth of moulds during humid or rainy weather and if the articles are not carefully attended to every now and then, they perish quickly.

The ways in which fungi are capable of causing damage are numerous. Yet they also often become useful to mankind. They do not form a group of organisms capable of inflicting injury alone. There is a better side to this picture. Fungi are useful to man in a number of ways and in this article are described some of the uses to which fungi are put.

To begin with a number of them form delicious articles of diet. Mushrooms and morels, truffles and puffballs are the fungi that are largely used as food. These are found in plenty both in the open country and in the forests all over the world and are consumed by all the races both barbaric and civilized. In many countries the people are dependent for the supply of these on Nature, being collected in large quantities from the forests. In India the common mushroom which is found near the cattle sheds or manure pits soon after the rains, is relished very much and consumed in numbers. Other forms of mushrooms, truffles and morels are collected from the forests. On the Nilgiris these are brought regularly to the markets during the season. In Kashmir the morels are collected and dried in the sun in April and exported.

In many of the European countries the mushrooms are cultivated. France takes the lead in intensive mushroom farming. The cultivation is carried on underground, in disused quarries or abandoned mines. Provision is made for ventilation and abundant supply of water. The soil is specially prepared by the addition of large quantities of stable manure and leaf mould and made up into beds or ridges. These are then sown with the 'spawn' of the fungus which are only lumps of manure with a large quantity of the mycelium of the fungus. By keeping the soil moist the mushrooms come up in 3 to 4 weeks and the beds remain in bearing for 6 to 8 months. These are gathered in the young stage in what are known as large button stage-, since they are not palatable or digestible if fully expanded and hence have no sale. The important points to be considered in this farming are the presence of a large quantity of moisture and manure with plenty of air and the absence of light, for the mushrooms come up better and earlier in darkness. Before the war, Paris alone produced 750,000 francs, worth of mushrooms every month.

Besides mushrooms and morels some other kinds of fungi are also cultivated but the former are by far the commonest forms. These are generally cooked when fresh and then consumed. In China and Japan they are often dried and preserved, when they are said to develop a particular aroma and hence valued in the preparation of soups. Mushrooms are believed by some to be equivalent to meat food on account of the flavour which is developed when cooked. Others are of opinion that fungi are of little real food value and can only be used as accessory food and not as substitutes for meat or vegetables. But yeast is believed to have considerable food value and in the dried and purified state is used for this purpose. The collection and cultivation of fungi afford employment and form a means of livelihood to many. In this connection it must be mentioned that there are several mushrooms which are very poisonous and resemble the edible species. Hence great care must be exercised in the collection of the edible fungi and one must acquaint himself with the chief characters and peculiarities of the fungi that are used as food.

Besides forming a direct source of food many fungi are employed to set up fermentation in the processes of breadmaking and the manufacture of wine and other liquors. In the preparation of bread a little 'yeast' is added to the dough which sets up ferment-

tation followed by the evolution of carbon-di-oxide. This gas raises the dough and increases the porosity and softness of the bread and thus its digestibility. Again yeast plays the most important part in the manufacture of wine, beer, brandy, whisky and other intoxicating beverages. The spores of the yeast fungus are present in the air. These settle on the fruits of the grapevine and are largely responsible for the 'bloom' found on the fruits. Wine is prepared by pressing the juice out of the grapes and allowing it to stand, when fermentation is started by the yeast and the sugar is transformed into alcohol and carbon-di-oxide. The latter gas is responsible for the frothing up. The liquid is removed and stored up when the requisite amount of fermentation has progressed (and named as different grades in commerce). Beer is the product of fermentation set up by yeast in barley malt extract. Toddy is the fermented sap of coconut, palmyra or date palm and here again the fermentation is carried on by yeast. In addition to yeast other fungi are also utilized in the manufacture of fermented liquors. *Mucor oryzae* is employed for the preparation of arrack. The Japanese liquor 'sake' is prepared by using *Aspergillus oryzae*. Alcohol is obtained by the process of fermentation brought about by fungi in potato, rice, barley and other starchy materials. The increased use of alcohol for various purposes must necessarily make this aspect of the use of fungi the most important. Vinegar which is largely used as an accessory food and also in the preservation of certain articles of consumption is prepared by the acetous fermentation of a mixture of malted and unmalted grain or oxidation of wine through the agency of a fungus called *Mycoderma aceti*. Thus fungi are extensively used in industrial concerns.

Another way in which fungi become useful to man is in the entomogenous nature of some and in the consequent suppression or control of insect pests. The scale insects which are known to infect a number of plants including fruit trees have been in numerous instances kept under effective check by the growth of some insectivorous fungi which destroy them. The 'Florida' experiments for the control of whitefly with fungus cultures form a classic example of the benefits derived from fungi in this direction. Grasshoppers in Africa and cockchafers in France have been kept down by fungal parasites. The housefly which is the carrier of numerous diseases is in certain seasons killed in large numbers by *Empusa musci*. In the coffee estates in South India the greenbug

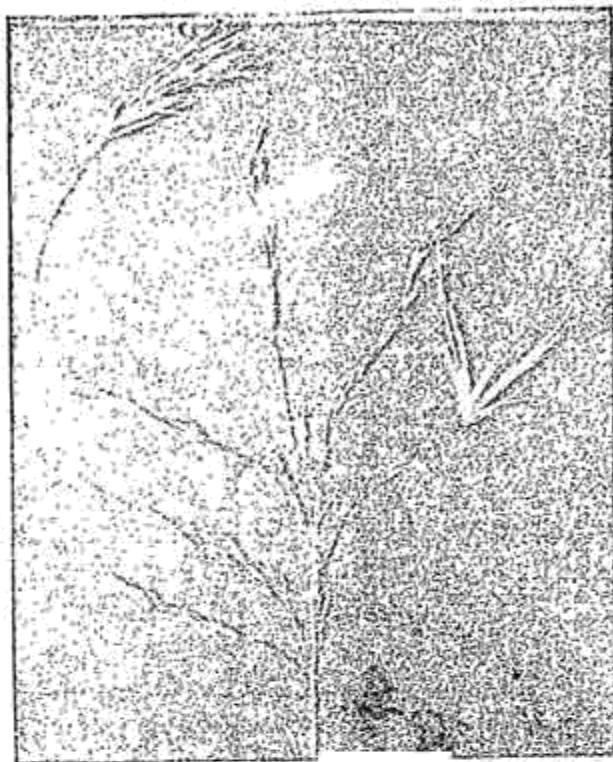
*Lecanium viridis* is in many cases kept under control by two fungi *Empusa lecanii* and *Cephalosporium lecanii*. Mealy bugs on Anona have also been found to be destroyed by *Cladosporium sp.* Numerous other instances are available where fungi form a limiting factor in the spread of insect pests.

Medicinal uses of fungi are also common. Folklore attributes various medicinal properties to several fungi. Though not used as universally and in such large numbers as of old yet a few fungi are still widely employed in modern pharmacopia. The 'extractum ergotiae' or Tincture of Ergot is prepared from the ergot which is the name given to the sclerotia of the fungus *Claviceps purpurea* formed in the ovaries of rye. This is used on occasions when active muscular contractions are to be induced especially in the uterus. In addition to ergot of rye, ergots of wheat and oat are also sometimes used. The sori or fruit bodies of *Ustilago maydis* which causes the smut of maize are in some instances used for the same purpose as ergot. *Saccharomyces cerevisiae* is another fungus used in medicine as an antiseptic in poultices applied to ulcers. Internally also it is administered in varying doses for diabetes, typhoid erysipelas and a number of other complaints. *Polyporus officinalis* in a powdered state forms a powerful purgative.

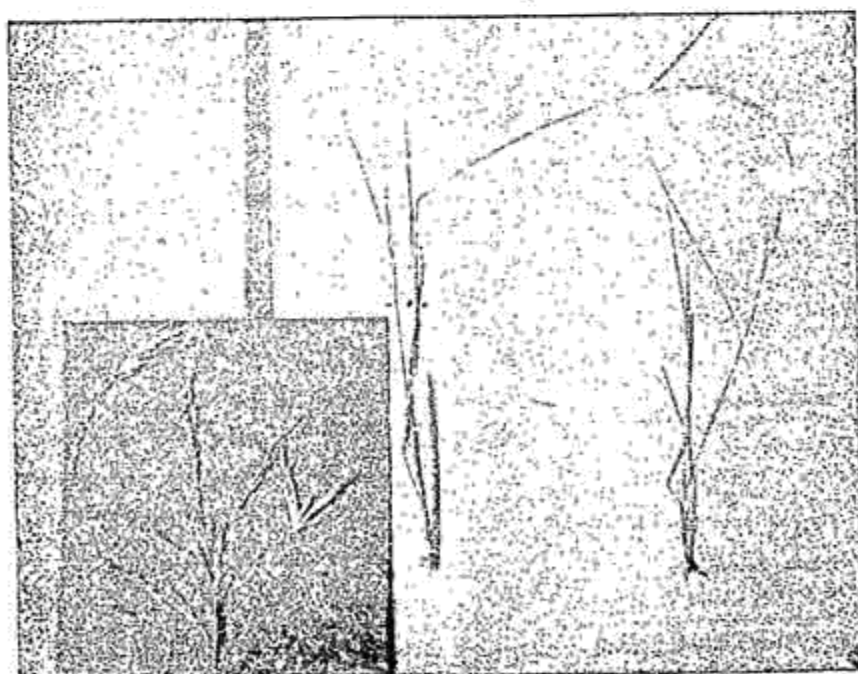
Many fungi act as cleaners and scavengers of the earth helping in the conversion of dead and decaying animal and plant remains into innocuous simpler substances. In this direction the service rendered by fungi in conjunction with bacteria cannot be overestimated. The organic manures applied to the soil are also rendered into a state which can be made use of by crops by these organisms. Fungi also play a very prominent part in the decomposition and disintegration of the waste materials used in making synthetic farm yard manure which is coming into great prominence owing to the limited supplies of cattle manure and the necessity for a bulky substitute.

Besides these there are other minor ways in which fungi are put to use. The fructifications of *Polyporus hispidus*, *Fomes ignarius* and *Hexagonia moria* have been used in Italy for the extraction of various dyes. These are used to colour cotton, woollen and silk fabrics and are also employed by leather dressers and cabinet makers. Several species of *Polyporus* and *Fomes* are used as razor strop, in the preparation of bottle corks, caps, aprons and other articles of dress, chest protectors, picture frames and

No. 1.



No. 2.



ornaments. In the dried form they are sometimes used as an ingredient of snuff. The soft bit used by entomologists for the mounting of insects is also derived from a *Polyporus*. In ancient times dried pieces of *Fomes fomentarius* were used as tinder but with the advent of the cheap match boxes they have gone out of use.

The above are in the main some of the uses of fungi. As scavengers, entomophagocytes and articles of food they are very beneficial to mankind not to speak of their extensive use in industrial and medicinal spheres. To a small extent they are put to domestic and personal uses.

### AGRICULTURAL CO-OPERATION WITH SPECIAL REFERENCE† TO WEST COAST.

BY

K. UNNIKRISHNA MENON,

*Asst. Director of Agriculture, Tellicherry.*

The word co-operation means working together. When it concerns agriculture as a business, it should plainly enough mean the working together of farmers. The necessity for the same arises out of the one fact that the large majority of farmers in this country manage small areas. The absence of sufficient capital to work even these small holdings places the farmer within the clutches of an usurious money or grain lender. Thus even if the crops are moderately paying the farmer's resources remain encumbered as he cannot meet the unusually high demand on them. The pitiable condition in which the farmer is placed reaches its climax when the cultivation methods adopted, seeds used and manures applied are poor. Of these, the last item of cultivation expenses largely determines the yield. The inadequate capital which is mostly the result of want of confidence in the business invariably reduces the quantity and quality of the manure applied with the result that the yields are always poor. Under such circumstance the loans taken by him through co-operative societies to finance this unprofitable method of cultivation fail to make him richer. This again becomes aggravated by the fact that the money obtained as loans for agricultural purposes is partly wasted in other unprofitable ways. And the oft-repeated question of over-dues haunt him and his society like a night-mare.

---

†Paper Read at the M. A. S. U. Conference July 1927.