
Some forest disease problems of India caused by decay fungi*

BIMAL KUMAR BAKSHI**

DA 139, Salt Lake City, Calcutta 700 065

In paying my respectful homage to Professor Sahay Ram Bose, I share with you my reminiscences about him as I knew him. Later, I will highlight some forest disease problems in India caused by decay fungi, a topic relevant to the subject of specialisation of Prof. Bose who was an authority on hard fungi, especially polypores.

PROFESSOR S.R. BOSE AS I KNEW HIM

In our early college days, we would see Professor Bose from distance during his visits to the University. An impressive personality, neatly dressed in western style with characteristic spectacles and cigar on his lips, Professor Bose would walk elegantly to the college. I came close to him in our postgraduate studies through our revered teacher, Late Dr. Sachindra Nath Banerjee who was a close associate of Dr. Bose. I would accompany Dr. Banerjee to the Carmichael Medical College (now R.G. Kar Medical College) where Dr. Bose was the Professor of Botany. The two authorities on polypores, Drs. Bose and Banerjee, would examine fungi often comparing them with specimens from the herbarium which had a rich and authentic collection and also from literature. Dr. Banerjee and I would take leave of Dr. Bose to come out of the laboratory to see that it was dark and evening lights were on. It was early in the afternoon that we walked into the laboratory. Time passed away without our realising it. After we left, Dr. Bose would continue with his research. Often Dr. Bose would leave his laboratory late in the evening to find that the public transport was withdrawn for that day. Such was the devotion and dedication to research in Professor Bose.

Dr. Banerjee used to lead his students to local excursions on Sundays for collection of fungi. Prof. Bose would sometimes join in such forays. There were spot discussions on the collection where Drs. Bose and Banerjee would give their considered views on fungi. We were greatly benefitted from such discussions.

During my service at the Forest Research Institute, Dehra Dun, I was fortunate to continue my studies with decay fungi because Dr. Krishnadas Bagchee, the pioneer of forest disease

*Professor S. R. Bose Memorial Lecture, delivered at the 38th Annual General Meeting of the Indian Mycological Society on 20 July 1994.

**Formerly, Forest Pathologist and Director, Biological Research, Forest Research Institute, Dehra Dun

research in India, had made an extensive collection of fungi all over India. These fungi were incorporated in an excellent herbarium and museum. Dr. Bagchee used to visit Calcutta to work on his collection at the herbarium of Professor Bose. On his retirement, I continued with this work. It was then that I came in intimate contact with Prof. Bose. During my visits to Calcutta on holidays, I used to visit Prof. Bose at his residence in the morning to find him in the midst of numerous literature, all current arrivals from India and mostly overseas. He would read them carefully, underlining important statements. I found Dr. Bose unassuming, cordial, friendly and fondly - fond of his grand-daughter, a little girl, who would often walk into his room on some plea. Dr. Bose's room had pictures of great men among whom were scientists. Once Dr. Bose invited Professor Satyendra Nath Bose, the National Professor to lunch at his residence when I and my wife were also invited. It was a pleasure for us to be in the company of two eminent personalities in their light moments. Later Dr. Bose took me to the residence of the National Professor where I found him in the midst of musical instruments.

On our invitation to visit us at Dehra Dun, Dr. Bose obliged. We were glad to have him with us for some days. My wife and I went to the railway station to receive him in a morning train. The train arrived. My wife stood at the exit gate. I walked the entire length of the platform looking out for him. Soon the platform became empty. Yet Dr. Bose was not seen on the platform. We became worried, we began to look into all upper class coaches. To our surprise and relief, we found Dr. Bose relaxing on the chair and smoking cigar. Normally, a visitor travelling on a train gets down on the platform reaching his destination or he looks out of the window for people whom he expects to come to receive him. When I told this, Dr. Bose said "I know you will come and find me out." I found Dr. Bose free from tension. He kept calm and composed.

During the fifties, the Indian Council of Agricultural Research (ICAR) published a series of monographs on different groups of fungi, assigning each subject to the specialist of the group. The monograph of Polyporaceae initially assigned to Dr. S.R. Bose was later given to me for writing. Later, when I told this to Dr. Bose, he smiled to say "the right person to write the monograph", little knowing that it was Dr. Bose who suggested my name to the ICAR, though he never told me of this.

SOME FOREST DISEASE PROBLEMS

I like to stress two among some basic principles in plant disease research. One, a plant should be known in health in order to study it in a diseased state. This needs a sound knowledge of botany which, in forestry, means silviculture - the art and science of cultivating forest trees. Second, the pathologist should not be short sighted or myopic when a mycologist, a bacteriologist or a virologist will try to discover organisms in respect of their field of specialisation in the ailing plant. In many cases, the presence of such organisms may be incidental and may not cause the disease unless proved through Koch's postulates. A pathogen, if present, will readily reveal itself to the specialist and therefore he need not particularly be in the look out for this. On the other hand, he should inspect the diseased field with an open mind to study the adverse factors to which the diseased plant is exposed. These may be pathogenic or physiogenic arising from many causes, including unfavourable edaphic and climatic factors or those arising from biotic interference. Correct diagnosis of the cause of the disease is the primary prerequisite to

developing disease control programme.

Some forest disease problems highlighting these principles are briefly described below.

Decay in trees

The combined losses in forest wealth due to all causes including diseases, insects, fire and wind throw is estimated at 13 percent. Of these, the losses from diseases alone constitute 45 percent. Heart rot accounts for nearly 80 percent of the loss through diseases. A few decay problems are briefly mentioned below.

Decay in sal. Sal is one of the most important timber trees. Its heartwood is used for making railway sleeper and for various construction work because its wood is highly durable in service, resistant to fungus and insect attacks. However, in the standing tree, the heartwood is liable to attack by many decay fungi which gain entry into trees through different infection courts to establish as heart rot which progresses in the wood with increasing years. A survey of *high sal* forests showed that nearly 73 percent trees exhibited decay estimated at 9.37 per cent. The sapwood is unaffected and therefore, decayed trees continue to grow to complete the normal rotation of 120 years.

In some parts of eastern India as in southern region of West Bengal, sal is raised on a short duration coppice crop for about 15 years when forests are felled. New coppice shoots develop from stumps. Repeated coppicing for several rotations results in large stumps which develop decay in the heartwood. Such decay does not progress into shoots where heartwood does not develop in 15 years. If, however, the rotation is raised, the heartwood develops and into which decay from the stump progresses. Thus, decay in stumps will limit any attempt to raise the rotation to about 30 years to obtain pole crop which is in great demand for communication and building work. To achieve this, decayed forests are to be felled and new seedling crop raised. Decayed stumps may be prevented from coppicing by girdling and killing the effective tissue giving rise to coppice by a weedicide or by uprooting them to make charcoal which is in high demand.

Decay in teak. A similar problem is seen in dry coppice teak forests in Gujarat state where the present system of coppicing flush with the ground results in development of callus shoots and high side shoots which develop organic union with the stump whose decay migrates into trees when heartwood develops in them. In a survey, about 50 percent trees were decayed at the end of 48 year rotation. Decay management practices laid down show that high coppicing at 10-15 cm from ground results in formation of low side shoots which develop roots and grow independent of the stool, healthy and free from decay. Callus shoots and high side shoots are removed in cleaning operation.

Decay in Khair. *Fomes badius* enters trees through lopping injury and develops fruit bodies readily on the stem. The heartwood is decayed and becomes useless. Prevention of damages to trees reduces disease incidence. Forest working plan should prescribe removal of all disease trees, including those below the exploitable diameter to reduce source of infection and disease spread.

Decay in blue pine. In some areas in the Western Himalayas, the villagers are given the right of controlled lopping of blue pine, the soft needles of which are used to spread on the floor of cattle sheds to be later removed with animal excreta for making compost.

Again, blue pine growing on farm land is heavily lopped to allow sun to agricultural field. Thus, the concenssion for controlled lopping of blue pine becomes uncontrolled. Through the lopping wounds, *Fomes pini* enters and makes progreassive heart rot. Fruiting bodies of *F. pini* develop freely at different levels of the tree.

Decay of trees in avenues, parks. It may be necessary to lop tree branches, those on the lower side drooping on the road for clear view of the avenue and those on the upper for making passage for communication wires. In extreme cases, all branches are cut and the tree used as pole on which cross bars are fixed to carry telephone wires. In avenues, trees are numbered by blazing the bark. All such injuries expose the heartwood to decay which reaches a stage when trees may be snapped during a strong wind. Also, root decay may result in wind throw of trees, posing a threat to lives. Clean cuts, dressing the wound with a preservative and numbering trees on a tin plate fixed to the tree are some measures to prevent decay.

Root rot in 'wet' Sal. Large scale wind throw and mortality in high sal forests in the wet zone of North Bengal and Assam prior to the sixtees was caused by *Polyporus shoreae* causing top dying and wind throw due to decay of sapwood of roots as a result of which trees lost foothold in soil to be wind blown in high wind. The fungus, normally endemic, became epidemic on sal due to high soil moisture as a result of fire control measures practiced in such forests prior to 1916. Control burning, a necessity silvicultural measure in wet sal, has since kept the disease under control.

Root rot mortality in Khair. In the Siwaliks, U.P., natural forests are clear-felled to raise plantations. After clearing the debris trenches are dug. Stumps and roots are dug out from the trenches but those occurring in between lines remain in situ. Khair seeds are sown in lines, mostly pure and sometimes mixed with other hard-woods. Mortality in Khair starts in 3-5 years when its roots come in contact with old roots decayed by *Ganoderma lucidum* occurring between the lines. Once the disease establishes on the line, its spread is rapid to adjoining healthy plants. The living wood is attacked and killed. Over 50 percent trees may be killed in 10 years. *G.lucidum* is endemic in the natural forest. When trees are felled, the natural resistance is lost and *G.lucidum* spreads rapidly to stumps and residual roots to build a large inoculum potential to attack susceptible hosts like khair when its roots come in contact with decayed roots. Mechanised plantaions when all roots of the old crop are removed will ensure disease-free stands.

There is a silver lining behind the dark cloud. The destructive role of decay fungi finds an useful expression as these fungi form the principal group among biological organisms that decay forest litter and thereby help in Nature's nutrient recycling.

THE GREAT BANYON TREE

The banyon tree at the Indian Botanic Gardens, Calcutta, is nearly 250 years old. It has seen many generations of men and is still going strong. There are nearly 2000 prop roots supporting spreading branches and a crown with a circumference of about 417 m and the highest branch rises to 27 m. New aerial roots are continuously developing. On striking the ground, they develop new branches. Thus this banyon tree is like a forest with a community of trees. In the forest, however, different species of trees grow individually while in the banyon tree, the community of trees of the only single species communicate between them with interconnecting branches.

The banyon tree does not appear to have a physical age limit and eludes the biological law of the Nature. As an exhibit, it attracts visitors in hundreds each day who stroll under the cool shade in admiration. In so doing, the soil is trampled hard and compact simulating a tennis clay court. Due to water run-off in hard soil, moisture is not available to roots in adequate quantity. Also oxygen supply to roots is less. The visitors feel amused to injure prop roots and write names by blazing the bark, little realising that decay fungi establish through resultant wounds. As a result, some prop roots become heavily decayed and some connecting branches die. This alarmed the authorities who sought advice from specialists.

On request to Dehra Dun, we studied the problem. Our main recommendations include cordoning the tree to keep off the onslaught of visitors, removal of decayed prop roots and dead branches, treating the cut ends with an antiseptic wound dressing, soil working and addition of NPK fertilisers to the soil. It is heartening to know that following compliance of these recommendations, the tree is maintaining its vigour as seen from the newly developing roots and production of new flush of leaves. There should be no cause of anxiety if proper care is given to the tree.