

ern countries. Though India could usefully consume a much higher proportion of food materials than she produces at present, still in view of the depressed market for cash crops such as cotton, rubber, coffee, tea and sugarcane, and the early possibility of an all-round increase in the production capacity of our land per acre due to better manuring, increased irrigation facilities, etc., there is bound to be an increasing excess of agricultural production over consumption and the problem of how best to utilize the excess must be faced.

Agriculture is the chief industry of India and there is no reason why more efforts should not be made to find industrial outlets for our agricultural products. Space does not permit a discussion of the methods adopted in America, Germany and elsewhere in order to tackle this problem. Already the Imperial Council of Agricultural Research have got a few schemes of an Agri-industrial nature such as the malting of cholam, but further scope in this direction is immense.

C. N. A.

## Indian Forest Mycology with Special Reference to Forest Pathology\*

WORK done in India on forest tree diseases and the peculiar problems which they present have received little publicity and Dr. K. D. Bagchee, who is investigating them at Dehra Dun, dealt, in his Presidential Address to the Botanical Section, at considerable length, with what has been so far accomplished. In forest tree disease investigations, the root and stem rotting fungi, the canker pathogens, the nursery diseases and the rots of timber call for attention but none, perhaps, gives more anxiety to a forest mycologist than the rusts which cause a great deal of damage to young plantations, especially of conifers.

In the case of root and stem rotting fungi, the discovery of the primary pathogens responsible for the rots is of great importance. Bagchee finds that the rots, in more cases than one, are the result of the combined action of several fungi and bacteria, as in the case of the *gauj* disease of *sal* in the U.P. Terai. In the root-rot disease of *shisham*, he has definitely discovered that the primary organism of the disease is a species of *Fusarium*, though the fruiting bodies of *Ganoderma lucidum* and *Polyporus gilvus* have been invariably found at the base of dead or dying trees. Controversies regarding the pathogenicity of some root- and stem-rotting fungi have been finally set at rest, for Bagchee has shown that *Fomes annosus*, *Armillaria mellea* and *Trametes pini* do play an important rôle in bringing about some of these rots.

But the most important work done during

the past decade on forest tree diseases mainly concerns itself, however, with the rusts. Bagchee reports that there are fifteen rusts affecting the conifers alone in our Northern Indian Forests. As a rule, these are heteroecious and have their aecial stages on the narrow-leaved conifers and the telial stages (or the perfect stages) on the broad-leaved plants, usually dicotyledons. Intensive study by Bagchee of the two rusts, *Chrysomyxa deformans* and *C. piceae* on *Picea morinda* and of another *Chrysomyxa* sp. on *Pinus excelsa*, whose telial stages, strangely enough, occur not on the broad-leaved dicotyledonous plants but on the conifers themselves and whose aecial stages have not so far been discovered, has led to the inevitable conclusion that these rusts have adopted a microcyclic mode of existence abandoning the necessity of passing from one host to another to complete their life-cycles, as they are able to perennate in the mycelial form within the coniferous hosts.

In rusts which are not microcyclic, one of the important tasks of a mycologist is to find out the alternate hosts where the telial stages occur. Bagchee has been singularly fortunate in being able to establish this in three cases, the most important discovery being the matching of *Peridermium brevius* with a species of *Coleosporium*, which Bagchee proposes to name as *C. barclayense*, found on *Senecio rufinervis*.

It must not, of course, be supposed that all fungi found in the forests are harmful. Their rôle in converting leaves, logs, roots and other plant debris into humus and their part in renovating and enriching the resources of nature for the life and growth of new things, have been also briefly referred to.

M. B.

\* Summary of the Presidential Address (Botany Section) by Dr. K. D. Bagchee, D.Sc., D.I.O., F.N.I., Indian Science Congress, Lahore, 1939.