Introduction

The problem of plant immunity to infectious diseases is one of the most interesting and complex of biological questions. An understanding of the internal mechanisms by which plants protect themselves from parasites under natural conditions would facilitate the development of effective means for the protection of cultivated plants from disease.

It is well known that the development of immune varieties is an effective method of guarding plants against disease. But the practice of selection shows that it is much easier to develop resistant than immune varieties, i.e., those relatively slightly affected by disease. The more resistant the variety, the lower the requirement for chemical preparations to eliminate the infection and the more effective their action. Under the conditions of modern agriculture this is of special significance. At the present time the residue of a number of fungicides in agricultural products often exceeds permissible norms. Moreover, of no less importance is the fact that, with the expanding rate of fungicide usage, we inevitably contribute simultaneously to the development of resistance in phytopathological microorganisms, as a result of which the protection of plants from disease becomes more and more complicated.

Currently, investigation of the greatest possible number of prospective substances and detection among them of a compound with high selective action is the only method of searching for effective fungicides. This compound should be lethal to the micro-

organism without causing damage to the host plant. It is quite probable that the substances that assist plants to protect themselves from infection and that establish their resistance to many diseases would be a good standard for a fungicide. These substances, as we understand, are either already present in the plants before contact with a pathogen, at which time their content may increase greatly in the process of interaction with the parasite, or they are formed *de novo* in infected tissues. A study of the biochemical nature of phytoimmunity leads to the conclusion that there is a real possibility of formulating preparations that would not only exert a toxic effect on phytopathogenic organisms but would simultaneously stimulate development in the plants themselves of protective substances against parasites. A successful solution to this problem would mark a new, extremely important step in the protection of cultivated plants from infectious disease.

It should nevertheless be emphasized that, with the great significance of plant protection from infectious diseases, the problem of phytoimmunity should not be confined to this alone. Burnet [1962] notes that the broadest concept of immunity appears to be embodied in the role it plays in processes directed toward maintenance of the structural and functional integrity of any organism.

According to the results of Stakman and Harrar [1957], more than 100,000 different fungi parasitize the higher plants, i.e., permanently or temporarily live on their surfaces, within them, or cooperatively with them, obtaining nourishment from them in varying quantity and in different qualitative form. This naturally accounts for the diverse character of interrelationships between plants and parasites and, consequently, for the diverse nature of resistance in plant tissues. Vavilov [1935] has emphasized repeatedly that no single mechanism of resistance to the different causes of infectious disease is likely to exist for all plants without exception.

These concepts notwithstanding, the wide distribution of phytoimmunity in nature and the alteration in character of interrelationships between plant and parasite during the course of evolution automatically suggest that, even with the extreme diversity of plants and parasites, the study of plant immunity must be based on a search for general principles.

The progress made by biological chemistry in recent years permits new approaches to the study of the biochemical nature of

plant immunity and the revision of ideas which until quite recently seemed unassailable. An attempt to review within the limits of a short book the results of all investigations would, however, be too difficult a task. In the present volume we shall examine only certain biochemical aspects of the resistance of plants to fungus diseases, basing ourselves frequently on work carried out in our laboratory at the A. N. Bakh Institute of Biochemistry of the USSR.