

Physiological specialisation in Fungi

Physiological specialisation is the presence or development of physiological races within a taxonomic group.

Parasitic species have races that are adapted to different hosts.

It has long been known that within species of most pathogenic fungi there are many biotypes or physiological races that differ principally or solely in physiological rather than morphological characters. It also has been known for about a quarter of a century that it is necessary to know the number, geographic distribution and pathogenic potentialities of races to understand the development of epidemics and the regional and seasonal variation in the disease resistance of many crop plants.

Moreover it has become increasingly apparent that knowledge of physiologic specialisation is important in formulating **plant Quarantine** regulations and in the breeding of disease resistant varieties. There are indications that it may be important also in the control of diseases by the use of fungicides and soil management practices.

The term physiologic race usually is used to designate **intraspecific biotypes** or group of biotypes that can be distinguished by consistent behaviour in pathogenicity. It is implied that races are essentially alike morphologically but there may be some differences in morphology also.

In general, intraspecific lines are designated as physiological races if morphological characters are neither sufficiently great nor consistent to justify designating the lines as varieties.

It is the usual practice then, to apply the term physiological race to lines or collections of plant pathogenic fungi, if the most important differences between them are in pathogenicity, even though there may be appreciable morphological differences also.

Physiology races may differ in growth rate, size, colour, topography and other characters of colonies on artificial media; in sex and mutability; in nutritional and temperature requirements; in enzyme activity; and in tolerance to pH concentrations, poisons, fungicides or toxins; in ability to produce substance toxic to plants; in pathogenicity and in many other characters. The number of races within many species, the abundant production of new ones and the number of characters in which they may differ requires many criteria for distinguishing between closely related species or sometimes even between distantly related ones.

Puccinia graminis f. sp. tritici, stem rust of wheat which itself is a variety of *Puccinia graminis* comprises for example an indefinite number of pathogenically different biotypes or pathotypes. Each of the 189 described races may comprise one or more of these biotypes. During 2004-2009 crop seasons, four new black rust pathotypes were identified. Three were from Karnataka and one from Maharashtra. The dynamic nature of black rust pathogen provides continuous threat to wheat varieties in use.

f. sp. stands for forma specialis. It is an informal taxonomic group allowed by International Code of Nomenclature for algae, fungi and plants that is applied to a parasite which is adapted to a parasite which is adapted to a specific host.

Similarly *Fusarium oxysporum* has multiple formae speciales each assigned to a particular host. *F. oxysporum f.sp. betae* is very host specific to sugar beet.