한국식물병리학회지 3(1) : 54-55 (1987)
Korean J. Plant Pathol. 3(1) : 54-55 (1987)

Host-Parasite Interaction in Powdery-Mildewed Barley, with Special Reference to Cultivar-Race and Nonhost Resistance

Jiko Shishiyama

Faculty of Agriculture, Kyoto University, Japan

흰가루病에 感染된 보리에서의 寄主一病原菌의 相互作用 : 品種一레이스 및 非寄主抵抗性의 考察

獅 山 慈 行

京都大學, 日本

Our contributions on the powdery-mildewed barley leaves during past decade have shown that fluorescence microscopy is useful to examine whether or not the change of host cells response compatibly or incompatibly and have revealed certain cytological events that are specific for expression of resistant gene in the early infection course. The study was undertaken to evaluate the relationship between the degree of resistance conferred by specific alleles and corresponding cytological event in barley cultivars with defined genes for resistance. The hot responses studied were papillae formation, cytoplasmic aggregation, collapse of epidermal and mesophyll cells, and their autofluorescences with aid of fluorescence microscopy, histochemical technique and other biological approaches. The results obtained are summarized as follows.

The fluorescence was detected at papillae, halo, and lateral wall in the penetration site, although their response seemed to be nonspecific for resistance, that is, so-called nonhost resistance. The most characteristic cellular event relating to cultivar-race specific resistance was intense cytoplasmic aggregation (AGG), followed by fluorescent epidermal cells (FEC). The occurrence of AGG and FEC was correlated with the degree of resistance found in various multiple allelic lines of JMl_{sn} gene (r = 0.94). Of the penetration hyphae which successfully penetrated, nonfluorescent papillae in less resistant and susceptible leaves formed normal haustoria without any fluorescence 48 hr after inoculation. However, in the former and resistant leaves fluorescent mesophyll cells were recognized 24 hr after inoculation.

According to the chronological analysis of cytological responses being expressed by AGG and FEC, it is suggested that incompatible combinations may operate, subsequently, until 13-15 hr after inoculation. On these early infection courses, the histochemical analyses were carried out on papillae AGG and FEC. In papillae, positive reactions for callose and protein were recognized in both compatible and incompatible combinations. However in AGG positive reactions for phenols, lipids and protein were recognized, but lignin and cellulose reactions were not noticeable in both papillae and AGG. Especially, FEC showed fine positive reaction for polyphenols. This fluorescent compound found in papillae, AGG, and FEC, not yet determined its chemical structure, showed peaks at about 282 and 325 nm and maximum emission of fluorescence at 535 nm, and also antifungal activity at 80-100 μg/ml for conidial germination of *Erysiphe graminis*

sp. *hordei*, race I.

On the induction of the fluorescent compound barley leaves, the following compounds were fective as elicitors: conidial homogenate, its alysed fraction (mol. wt. 5,000-20,000 glycopro-in), enzymes (α-amylase, lipase, proteinase, acerozyme, and pectolyase), glycine, glucosamine, riton X-100, Cu, Pb, Sn, and Zn. Therefore, it is ıpposed that the fluorescent compound showing ıtifungal activity produced inducibly by the ɔnformational change of membrane structure hich is specific event in host-parasite combination ıd also occurs by artificial blockers, i. e., chemical and mechanical agents.

On the papilla formation as mentioned above, it was increased at challenged inoculation site by the double inoculation using compatible or incompatible race as a preliminary inoculum and by the inoculation with non-pathogens for barley, that is, *Erysiphe polygoni*, *Alternaria alternata* and *Colletotrichum lagenarium*. Judging from these results, it is suggested that the papilla formation caused by the challenger does not seem to be responsible for the cultivar-race specific resistance and is due to nonhost resistance.