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NUCLEAR CHANGES IN EPIDERMAL CELLS OF *Arisaema dracontium* INDUCED BY *Uromyces ari-triphylli*

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ABSTRACT

Natural infections of leaves of *Arisaema dracontium* by *Uromyces aritriphylli* produced yellow leaf spots. Epidermal nuclei overlying yellow and adjacent normal, green mesophyll were studied in samples taken two weeks apart using quantitative interference microscopy. Nuclei were smaller over yellow leaf spots than over green mesophyll on both dates. Nuclei over yellow leaf spots had slightly greater dry mass than nuclei over green mesophyll on the first sampling date but had less dry mass than those over green mesophyll two weeks later.

Kulfinski and Pappelis (1971, 1976) and Heitefuss and Wolf (1976) reviewed reports of nuclear changes during the development of fungal disease symptoms in plant tissue. In the case of some obligate parasites, host nuclei and nucleoli were reported to increase in size in early stages of infection. Nuclear RNA and DNA also increased. In some cases, increased size of host nuclei was accompanied by increased ribosomal content and synthesis of cellular RNA and protein. In contrast to these findings, dry mass of host nuclei decreased during the nuclear swelling stage in epidermal cells above infected mesophyll in *Podophyllum peltatum* infected with *Puccinia podophylli*.

Within two days following inoculation with non-obligate fungal pathogens, nuclei in onion bulb epidermal cells underwent substantial decreases in size and dry mass (Kulfinski and Pappelis, 1971). Dry mass loss in onion nuclei was due to loss in RNA and histone, DNA content remaining unchanged (Kulfinski and Pappelis, 1976).

This report describes nuclear responses in host epidermal cells above infected mesophyll showing yellow leaf spot symptoms induced by a systemic, obligate fungal pathogen in relation to nuclei above normal, green mesophyll.

MATERIALS and METHODS

Leaves of Arisaema dracontium (L.) Schott, systemically infected with Uromyces ari-triphylli (Schw.) Seeler, were collected in Thompson's Woods on the campus of Southern Illinois University-Carbondale. Square epidermal pieces, measuring approximately 5mm on a side, were removed from above yellow leaf spots and from above the immediately-adjacent non-infected, normal, green mesophyll. Stripped epidermal squares were mounted in distilled water and viewed through a Leitz interference microscope. Nuclear dry mass, nuclear area, and nuclear dry mass per unit area were computed as described by Kulfinski and Pappelis (1971, 1976).

Three replications were obtained on June 1 and again on June 15, representing slightly different stages of infection. Twelve nuclei were measured per epidermal square in each of three replications studied on June 1. Ten nuclei were measured per square in each of three replications studied on June 15.

RESULTS and DISCUSSION

Nuclei over normal, green, non-infected mesophyll remained the same in size ($9.0 \times 10^{-7} cm^2$) during the two-week time interval but increased by 8% in dry mass per nucleus (from 8.5 to $9.2 \times 10^{-11} g$).

On June 1, epidermal nuclei over yellow leaf spots were 71% of normal in cross-sectional area (6.4 compared to $9.0 \times 10^{-7} cm^2$) and 106% of normal in dry mass per nucleus (9.0 compared to $8.5 \times 10^{-11} g$). On June 15, nuclei over yellow leaf spots were 87% of normal in area (7.8 compared to $9.0 \times 10^{-7} cm^2$), and 86% of normal in dry mass per nucleus (7.9 compared to $9.2 \times 10^{-11} g$).

Epidermal nuclei over green mesophyll increased by 8% in dry mass during the two week period. Similar results but greater in magnitude, have been found in onion epidermal nuclei of increasing age with enlargement and development (Kulfinski and Pappelis, 1976). While dry mass of epidermal nuclei over green mesophyll increased, that over chlorotic mesophyll decreased by 12% during this two week period. Similar decreases have been measured in onion epidermis parasitized by Botrytis allii, Aspergillus niger, and other fungi, but the decreases in onion were usually much larger in a shorter period of time (for example, 42% due to A. niger in 48 hours).

The nuclei of epidermal cells of this host over normal and infected mesophyll were easily obtained and studied. We suggest that this would be ideal tissue for quantitative interference microscopy studies of host-parasite interaction and possibly of other degeneration conditions or factors.

Our findings herein are like our earlier findings for Podophyllum peltatum infected by Puccinia podophylli, in that nuclei in epidermal cells over yellow leaf spots decreased in size and dry mass. However, in the earlier study, nuclear dry mass decreased during nuclear swelling. We believe these two diseases involving systemic, obligate fungal pathogens would be ideal for comparative and also chronological studies throughout the leaf development and sympton development stages. No other models for such studies have been described.

LITERATURE CITED

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