# Identification and Characterization of Genes Functioning With HR4, a Newly Identified Gene Conferring Resistance to the Green Peach Aphid

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Approximately 40% of all agricultural production is lost due to pests. HR4 (HOMOLOG OF RPW8 4) confers resistance to Myzus persicae, more commonly known as the green peach aphid (GPA), which is one of the most detrimental pests in the United States. To implement HR4 protein-driven resistance in agriculture, we must understand the mechanisms and proteins involved in this resistance. To accomplish this, we utilized a yeast-2 hybrid system to identify eight proteins that associate with HR4. Four of these HR4-binding proteins, PapD, CRK45, SAP18, and Fibrillin 4, were previously shown to be involved in plant defenses. We found that PapD, CRK45, and Fibrillin 4 specifically interacted with HR4 but not HR3, a close homolog of HR4 that is not involved in defense against the GPA. Furthermore, we found that PapD and CRK45 interact with each other, indicating that they may work conjointly with HR4 to confer resistance to the GPA. Bioassays conducted with mutant plants lacking PapD function confirmed that PapD is required for controlling GPA infestation. Serendipitously, we found that the papD mutant plants were also unresponsive to an unknown abiotic stress. We hypothesize that the complex involving HR4 and its interactors is localized to the membrane where it perceives aphid infestation-associated elicitors, leading to the activation of downstream defense signaling. By understanding the components of this complex, we may be able to employ crops with HR4-conferred resistance into agriculture, thus reducing our dependence on harmful pesticides to protect crops against pests.

**Awards Won:**