Fig. 8. A model for defense in resistant wheat plants against Hessian fly infestation. Defense requires resources. Growth of resistant plants is transiently suppressed following Hessian fly infestation (R1 Anderson et al., 2006); and primary metabolism in resistant wheat is also transiently suppressed after Hessian fly attack to preserve resources for defense (R2 Zhu et al., 2008). Host resources including lipids, carbohydrates, and protein/amino acids are rapidly mobilized through catabolic processes in resistant plants in response to Hessian fly attack. The resources are used mainly for two types of defense, producing chemicals that are directly toxic to Hessian fly larvae, and substances that fortify cell walls. Toxic chemicals include various inhibitors of Hessian fly digestive enzymes, lectins, cysteine proteases, reactive oxygen species, and toxic secondary metabolites. The toxic chemicals may not be able to kill Hessian fly larvae alone, but can slow down insect attacking, which can allow plants more time to enhance other types of defense. Fortified cell walls prevent Hessian fly larvae from delivering effectors into host cells, and therefore, unable to induce the formation of nutritive cells. Failure of nutritive cell formation results in the death of Hessian fly larvae due to the lack of nutrition.