Title Prospects for cut-flower postharvest disease management with host defence elicitors

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Abstract

Purpose of the review: There is increasing public awareness of socio-environmental risks in using synthetic fungicides. This imperative drives a move to seek more generally acceptable alternatives to protect cut-flowers and other fresh produce from pathogens. In the context of postharvest management of cut-flowers, this paper considers natural disease resistance (NDR) and its potential activation with environmentally sound chemical elicitors.

Main findings: Plant NDR mechanisms are comprised of constitutive and induced defences. Induced defences involve the hypersensitive response, local and systemic acquired resistance, and induced systemic resistance. The various systemic resistance defence mechanisms differ in their natural elicitors, signalling pathways, and resultant defence compounds (eg, pathogenesis-related proteins). A range of exogenous biotic and abiotic agents can be used as elicitors to either prime (potentiate) or activate (elicit) NDR. Understanding the molecular, biochemical and physiological mechanisms involved in elicitation of NDR provides a basis for practical utilisation of this approach in both pre- and postharvest disease management. However, for the most part, basic studies are carried out on model or immature plants (eg, Arabidopsis) grown in controlled environments. The cut-flowers of commerce are diverse in both botanical structure and physiological changes during postharvest handling. Nonetheless, most are generally highly perishable, with many being vulnerable to pathogen attack. The polyphagus fungus *Botrytis cinerea* (Botrytis) is the single most important cut-flower pathogen. The diseases and symptoms it causes include petal specking, flower blight, and accelerated (ethylene-mediated) abscission. Exogenous treatments with host defence elicitors, such as methyl jasmonate and benzothiadiazole, potentially could suppress fungi infecting cut-flowers. However, their efficacy has proven limited in applied experimentation conducted to date. If elicitors of natural defence mechanisms are to find practical application in postharvest disease management for cut-flowers, then substantial research effort will be required to understand how production practices and conditions (eg, climate, nutrition, pest and disease pressures) and postharvest management practices (eg, temperature management) influence the ability of host plant tissues to respond. In

the medium to long term, it is probable that elicitation of natural defence against pathogens, like Botrytis, will find a place within integrated pre- and postharvest disease management programs (IDM) for cut-flowers and other ornamentals.

Direction for future research: Detailed molecular, biochemical and physiological studies on specific cut-flower pathosystems are needed, in the context of postharvest horticulture, to gain an understanding of the complex nature, magnitude and timing of host defence responses to elicitor treatments. Also, the possibility of priming, particularly preharvest, for enhancement of subsequent elicitation of induced resistance merits attention. Finally, research is warranted into the prospects for integration of elicitation of natural defence into IDM packages for cut-flowers.