CHARACTERIZING, DETECTING AND ELIMINATING OF SEED-BORNE VIRUSES TO ENABLE THE SAFE INTRODUCTION OF SEEDS

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With an increasing trend in off-shore hybrid vegetable seed production and global seed trade, the risk of introducing a seed-borne pathogen to a production area in a different country through seed is high. There are only limited options in managing viruses and viroids. If a cultivar with disease resistance to a particular seed-borne virus [such as *Tobacco mosaic virus* (TMV) and *Tomato mosaic virus* (ToMV)] is available, planting a disease resistant cultivar is highly recommended. However, for many other seed-borne viruses and viroids, a disease resistance cultivar that is suitable for local production system may not be readily available. To avoid the potential introduction of an unwanted disease, a logical disease management option would be the use of certified, high quality virus-tested seeds. Although a number of important seed-borne viruses have been recognized, other novel or emerging viruses and viroids would require additional molecular and biological characterization. Research is needed to determine their seed-transmissibility and risk assessment analysis. For example, Tomato mottle mosaic virus (ToMMV), a third tobamovirus on tomato, was recently identified on tomatoes from Mexico using next generation sequencing (Li et al., 2013). This finding was quickly confirmed in the U.S. (Webster et al., 2014; Fillmer et al., 2015) and China (Li et al., 2014). Based on partial genomic sequence comparisons, ToMMV which was regarded as a novel genotype for ToMV, has also been observed in Brazil (Moreira et al., 2003) and likely other countries. Further characterization of its biological properties and seed transmissibility are necessary. Development of new and specific virus detection methods should be followed to ensure the proper identification of its possible presence in seed-health test. Although many of seed-borne viruses have some type of seed-health test methods available, the traditional serological method (i.e., enzyme-linked immunosorbent assay) followed by biological confirmation of virus infectivity on indicator plants is still the most common method of choice for seed-borne viruses. The recent development of sensitive and affordable molecular methods (i.e., PCR and real-time PCR) could offer more reliable detection methods for viruses in seed samples and for viroid detection. Further development and incorporation of these molecular detection methods into an internationally recognized seed-health test

system are necessary. For a contaminated seed lot, eliminating virus infectivity may be made possible through seed treatment and other management options. The effectiveness of a seed treatment using thermotherapy and chemotherapy should also have a minimum adverse effect on seed germination. Moreover, many seed-borne viruses can be efficiently transmitted to a production field through mechanical transmission. I will also discuss the efficacy evaluation of numerous disinfectants against several seed-borne viruses and viroids in greenhouse tomato production.

References

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