Plant Pathology Seminar Series

Phytochemical Production and Applications to Plant Pathology

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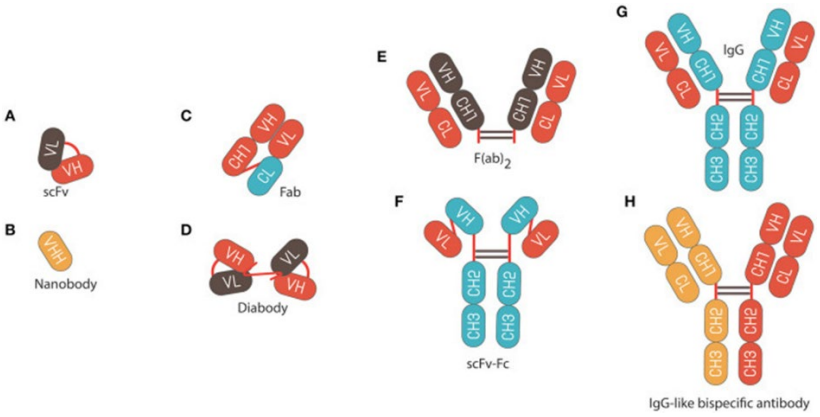

Abstract

Plants have an incredible capacity to manufacture even very complex chemicals. For a long time, plants have served as organic chemistry factories, producing compounds that have been found to be helpful as human medicine (Houghton 2001). More recently, plants have also been harnessed for molecular farming, producing products of interest to people via genetic modification (Tschofen et al. 2016). In the future, genetic modification may in turn be used to help plants produce their own medicines and products of interest to the plant itself (Makeshkumar et al. 2021). While the use of genetic modification can be met with public pushback, many of these techniques have shown great promise in combatting plant diseases (Makeshkumar et al. 2021). Of particularly promising phytochemical products are single-chain variable fragment (scFv) antibodies, or more colloquially, “plantibodies.” These fragments are smaller but functionally analogous to the antibodies of animals, resulting in resistance to a specific pathogen with only minimal modification of the plant genome (Boonrod et al. 2004; Gargouri-Bouzid et al. 2006; Gil et al. 2011; Nickel et al. 2008; Tavladoraki et al. 1993). This unique transgenic approach could be particularly impactful in managing emerging plant diseases and recalcitrant diseases to which cisgenic approaches and cultural practices fail to provide time- and cost-effective control measures.

4:10 pm **| October 9, 2023** | Plant Pathology 515 2023-Fall Seminar Series | **Clark Hall 149**
Zoom Link: https://wsu.zoom.us/j/95102610389?pwd=ZXY3ckVSdlpSb2lvSXJYeGg1akpzZz09
Meeting ID: 951 0261 0389 **Passcode:** 4417 **Call in number:** 1 646 558 8656

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References

Boonrod, K., Galetzka, D., Nagy, P. D., Conrad, U., and Krczal, G. 2004. Single-chain antibodies against a plant viral RNA-dependent RNA polymerase confer virus resistance. Nat. Biotechnol. 22:856–862.

Gargouri-Bouzid, R., Jaoua, L., Rouis, S., Saïdi, M. N., Bouaziz, D., and Ellouz, R. 2006. PVY-resistant transgenic potato plants expressing an anti-NIa protein scFv antibody. Mol. Biotechnol. 33:133–140.

Gil, M., Esteban, O., García, J. A., Peña, L., and Cambra, M. 2011. Resistance to *Plum pox virus* in plants expressing cytosolic and nuclear single-chain antibodies against the viral RNA NIb replicase. Plant Pathol. 60:967–976.

Houghton, P. J. 2001. Old yet new – Pharmaceuticals from plants. J. Chem. Educ. 78:175.

Makeshkumar, T., Divya, K., and Asha, S. 2021. Transgenic technology for disease resistance in crop plants. Pages 499-560 in: Emerging Trends in Plant Pathology, K. P. Singh, S. Jahagirdar, B. K. Sarma eds. Springer, Singapore. Available at: https://doi.org/10.1007/978-981-15-6275-4_23 [Accessed October 1, 2023].

Nickel, H., Kawchuk, L., Twyman, R. M., Zimmermann, S., Junghans, H., Winter, S., Fischer, R., and Prüfer, D. 2008. Plantibody-mediated inhibition of the *Potato leafroll virus* P1 protein reduces virus accumulation. Virus Res. 136:140–145.

Tavladoraki, P., Benvenuto, E., Trinca, S., De Martinis, D., Cattaneo, A., and Galeffi, P. 1993. Transgenic plants expressing a functional single-chain Fv antibody are specifically protected from virus attack. Nature 366:469–472.

Tschofen, M., Knopp, D., Hood, E., and Stöger, E. 2016. Plant molecular farming: Much more than medicines. Annu. Rev. Anal. Chem. 9:271–294.