

Towards the bioengineering of *Nepenthes* pitchers for pharming

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Background

Plant-made proteins are now possible at farm-scale level with the commercial approval of various plant-derived recombinant pharmaceutical proteins. The production of recombinant proteins in transgenic plants or plant cell cultures can yield high quality proteins that are generally safer for use as drugs than proteins harvested from microbial or mammalian sources due to lower risk of contamination by viruses, pathogens, and toxins. However, the production and maintenance of plant cell culture systems are expensive and often low yield, hence commercial protein farming companies prefer whole-plant systems.

Methods

Most if not all current transgenic plant-derived recombinant protein production systems require the destruction of plants or seeds, thus time-consuming to wait for plant growth. The active protein secretory system in carnivorous tropical pitcher plants (*Nepenthes* sp.) is a unique trait¹ which can be exploited as a more cost-effective and superior recombinant protein farming system. Immature closed pitchers are sterile with some *Nepenthes* pitchers contain over 3 L of secreted fluids. Researches are on-going to understand the regulation of protein secretion²⁻³.

Results

Selective production of large quantities of plant-derived proteins in the sterile pitchers devoid of any animal viruses or microbial contamination offers a great biotechnological prospect. The extraction and purification of recombinant protein from the pitcher fluid is convenient with lower contamination by other proteins and cellular components, compared to extraction from plant tissues. Furthermore, non-constitutive synthesis of soluble recombinant proteins is possible, based on our understanding of chitinase production and secretion upon chitin induction. In this respect, aseptically grown *Nepenthes* pitcher plants provide an ideal system to produce recombinant proteins.

Conclusion

Current efforts, challenges, and genome editing applications toward a carnivorous plant bioreactor will be presented in this talk.

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References

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