

Title: Neuritogenic peptides and neuroprotective composition comprising such peptides (Patent No. : 570261; Application No. : 202231054298; Date of Filing : 22/09/2022)

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This invention relates to the development of novel bioactive peptide formulations derived from snake venom–based neurotrophin molecules, offering a biologically safe and functionally potent alternative to existing chemical and synthetic agents. The patented technology focuses on two peptides originally identified from nerve growth factor–like proteins found in Indian snake venom. These peptides were isolated, purified, synthesized, and extensively evaluated for their biological activities in cellular and organismal models. The invention encompasses not only the individual peptides but also their combinatorial formulations, providing a broad and versatile platform with multiple applications across scientific, agricultural, and industrial domains.

The patented technology addresses a critical need for safe, multifunctional, and biologically potent agents that can replace or complement existing chemical-based formulations, which often suffer from toxicity, narrow activity profiles, and environmental hazards. This invention introduces two carefully designed and synthesized peptides inspired by snake venom–derived neurotrophin molecules. Each peptide was characterized for structure, activity, and functional stability, and both demonstrated strong biological effects across different stress conditions. Experimental studies revealed that while one peptide provided higher protection against a particular class of stressors, the other peptide exhibited superior performance against alternate biochemical or environmental challenges. These complementary strengths make the peptides valuable as standalone agents, but their true innovation lies in the development of a combined formulation that widens the range of protection. Instead of relying on chemical synergy, the combined peptide mixture delivers broader biological responsiveness, enhanced coverage across diverse stress environments, and improved robustness when applied to variable real-world conditions. This expanded applicability—rather than peak activity—forms the scientific and technological foundation of the invention and sets it apart from existing single-agent formulations.

The invention further demonstrates that peptide-based formulations can effectively reduce oxidative stress, enhance cell survival, and modulate intracellular pathways associated with neuroprotection and stress resilience. Extensive studies in PC-12 cells and *C. elegans* models revealed the peptides' ability to improve organismal survival, mitigate stress-induced damage, and promote healthier cellular homeostasis. Their natural origin, low toxicity, and

biodegradability make them ideal candidates for translational application, especially where environmental safety and biocompatibility are crucial. The technology is suitable for diverse applications, such as enhancing resilience in biological research systems, developing safer stress-protection agents for agriculture, and contributing to biomolecular research tools in biotechnology and biomedical sciences.

A major strength of this patent is its focus on broad applicability rather than synergistic enhancement. The two peptides were combined not with the intention of increasing their activity beyond what each can achieve individually, but to create a formulation that is effective across a wider range of biological and environmental challenges. Each peptide performs well under different types of stress conditions; however, no single peptide can address all stressors equally. Therefore, mixing them provides a broader, more versatile protective effect, ensuring that when one peptide is less effective under a given condition, the other can compensate. This combined formulation offers consistent and reliable performance across diverse real-world scenarios, where the nature of exposure can vary significantly. Thus, the rationale for using both peptides together lies in achieving wider coverage and enhanced robustness, rather than expecting a mathematically synergistic outcome.

The patented technology holds significant translational promise. In agriculture, the peptides may serve as safer alternatives to harmful chemical agents by improving plant or organismal stress tolerance with minimal ecological footprint. In biotechnology, they may act as modulators to enhance cell health, survival, or stress resistance in research and production systems. In biomedical and neurobiological research, the peptides demonstrate neurotrophic and protective effects that may support the development of therapeutic research tools. Their natural origin enables improved sustainability, while their potency at low dosages ensures cost-effectiveness and potential scalability.

The patent has been officially granted under the Indian Patent Act, confirming the novelty, biological relevance, and translational value of the technology. It protects both the individual peptides and their combined formulations, along with their preparation methods and applications. This recognition highlights the scientific innovation underlying the discovery and strengthens its potential for future commercialization and collaborative development.

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