# Two-stage cultivation: An innovative method for augmented bioactive metabolites production from euryhaline microalgal species for their utilization in nutraceuticals

Manpreet Kaur[1], Surekha Bhatia[2] and Urmila Gupta Phutela[3]

[1] Department of Biochemistry, Punjab Agricultural University, Ph.D. Scholar, Ludhiana, India
[2]Department of Processing and Food Engineering, Punjab Agricultural University, Senior Biochemist, Ludhiana, India
[3]Department of Renewable Energy Engineering, Punjab Agricultural University, Principal Scientist, Ludhiana, India

## I. ABSTRACT

Microalgae have the excessive adaptation strategy to survive in diverse physicochemical or stress conditions, where they struggle for nutrients and space and endure by producing several bioactive metabolites (BM's) in their body. BM's accumulation in microalgae can be prompted by various abiotic stress conditions. Two-stage cultivation for augmentation of BM's production could be an effectual approach in euryhaline microalgal species. In this way, they are firstly cultivated in nutrient-adequate optimized conditions to make the most of biomass, whereas, in the next stage, salinity-cum-alkalinity stresses persuade the accretion of desired BM. In this study, euryhaline microalgal species *Spirulina subsalsa*, *Scenedesmus* MKB, BGLR7, BGLR8, and BGLR18 collected from waterlogged areas of Punjab, India was identified and mass multiplied under optimized and two-stage cultivation conditions. Microalgal species were grown under optimized conditions up to 20 Days After Subculturing (DAS) and then transferred to salinity-cum-alkalinity stress and allowed to grow for 10 more days. At 30DAS stage, biomass was harvested, freeze-dried, and evaluated for biochemical constituents viz., proteins, lipids, carbohydrates, total Kjeldahl nitrogen, and phenolic compounds i.e., bound phenolics, free phenolics, bound flavonoids and free flavonoids, and DPPH radical scavenging activity. In comparison to the one-stage cultivation (30DAS) i.e., under optimized conditions, two-stage cultivation showed a significant upsurge in BM's accumulation signifying their delightful defense method to tolerate salinity-cum-alkalinity. We reported a significant increase in antioxidant activity under two-stage cultivation. Furthermore, due to augmented BM's production, two-stage cultivation for euryhaline microalgal species could perfectly be a good way for the production of novel nutraceuticals and dietetic supplements. Moreover, we are looking forward to the development of molecular techniques for strain perfection of euryhaline microalgal species by genetic engineering.

## II. KEYWORDS

Bioactive, Genetic Engineering, Health benefits, Stress-tolerant

## ACKNOWLEDGEMENTS

Authors convey their sincere thanks to SERB-FICCI and Chemical Resources Panchkula to support the project under Prime Minster Research Fellowship Program.