

Microalgae-based food additives for improved shelf life and nutritional value

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INTRODUCTION & AIM

The functional role of foods has shifted from providing only energy and basic nutrients to including the supply of non-nutritive bioactive compounds capable of protecting against the development of chronic diseases [1]. The use of microalgae covers different areas, involving many applications [2]. Currently, the food industry is applying whole microalgal biomass, or their extracted purified compounds as novel ingredients to formulate food products [3]. However, nowadays, consumers demand sophisticated and innovative products, and microalgal biomass, and products derived thereof, are positioned firmly in the food market [4].

By examining the antioxidant activity, the study's main goal was to find out how adding *Spirulina platensis* to yogurt impacts its nutritional value and the potential of *Chlorella vulgaris* as a functional food additive in wheat bread.

METHOD

1. *Spirulina platensis* in Yogurt



Yogurt samples were prepared with varying concentrations of *Spirulina platensis* (0, 0.5, 1, 1.5 and 2) and stored at 4°C for a period of 21 days, simulating typical refrigeration conditions.

2. *Chlorella vulgaris* in wheat bread

The microalgae species used in this study was *Chlorella vulgaris* that was prepared with different concentrations of microalgae powder (0, 1, 2, 3 and 4).



3. Antioxidant activity

The antioxidant activity was measured by using DPPH free radical scavenging assays to determine the yogurt's ability and bread potential to inhibit oxidation.

RESULTS & DISCUSSION

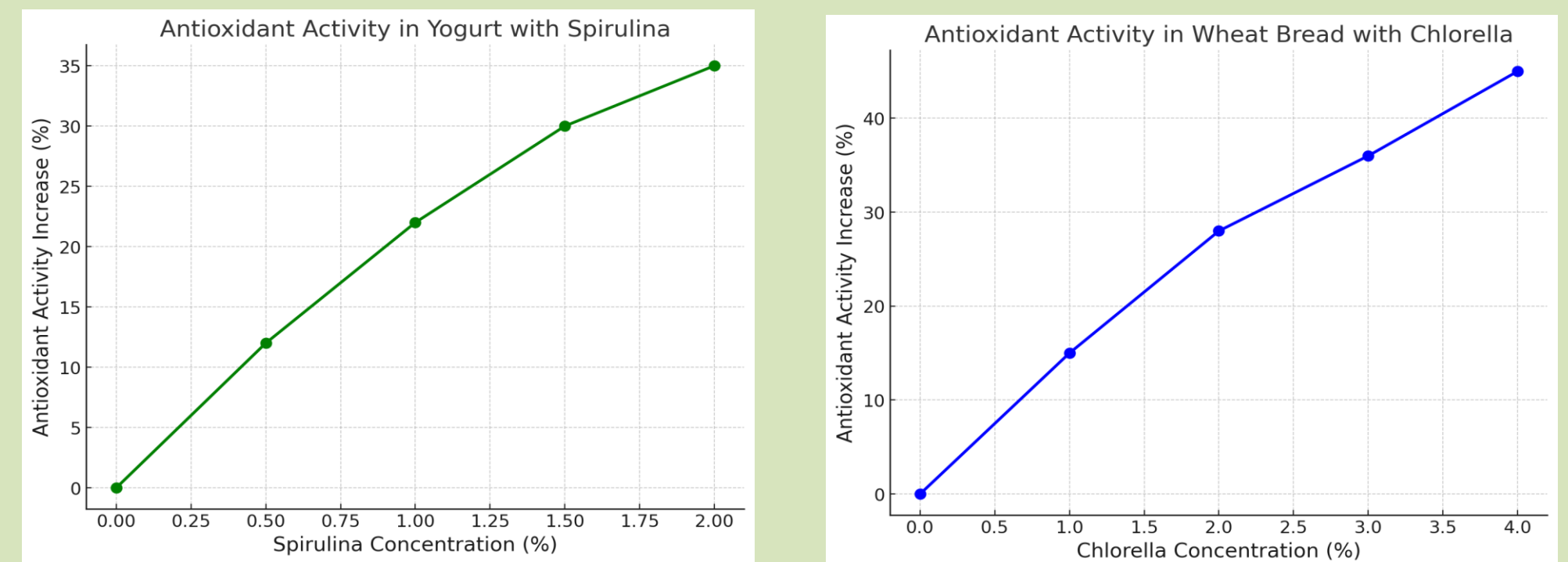


Fig.1: Antioxidant activities of *Spirulina platensis* and *Chlorella vulgaris*.

- The addition of *Spirulina* resulted in a significant increase in antioxidant activity, with a 35% rise in the yogurt containing 2% *Spirulina*. This indicates improved potential for inhibiting lipid oxidation, thereby prolonging shelf life.
- Bread with 4% *Chlorella* exhibited a 45% increase in DPPH scavenging activity compared to the control, indicating a strong potential to inhibit oxidative processes in the body.

CONCLUSION

The study found that adding *Spirulina platensis* to yogurt at concentrations as high as 1% can improve its nutritional value, antioxidant capacity, and shelf life without appreciably changing its sensory appeal. The nutritional and antioxidant advantages were enhanced by higher concentrations (1.5% or more), but the flavor and color changed noticeably, which could have an impact on customer adoption. Wheat bread's nutritional value can be increased by adding up to 2% of *Chlorella vulgaris*.

REFERENCES

- [1]: Bilali, H.E.; Callenius, C.; Strassner, C.; Probst, L. Food and nutrition security and sustainability transitions in food systems. *Food. Energy. Secur.* 2019, 8, e00154.
- [2]: Papalia, T.; Sidari, R.; Panuccio, M.R. Impact of Different Storage Methods on Bioactive Compounds in *Arthrospira platensis* Biomass. *Molecules* 2019, 24, 2810.
- [3]: Ljubic, A.; Safafar, H.; Holdt, S.L.; Jacobsen, C. Biomass composition of *Arthrospira platensis* during cultivation on industrial process water and harvesting. *J. Appl. Phycol.* 2018, 30, 943–954.
- [4]: Bernaerts, T.M.M.; Gheysen, L.; Foubert, I.; Hendrickx, M.E.; van Loey, A.M. The potential of microalgae and their biopolymers as structuring ingredients in food: A review. *Biotechnol. Adv.* 2019, 37, 107419.