



Influence of Spirulina Algae on Vitality of a probiotic bacteria and some fermented milk properties as composite functional drink

By

Gehad Hamdy Sayed Hassan

B.Sc. Agric. Sc. (Food Sciences), Fac. Agric., Fayoum Univ., 2013

M.Sc. Agric. Sc. (Microbiology), Fac. Agric., Fayoum Univ., 2020

THESIS

Submitted in Partial Fulfillment of Requirements for the Degree of Doctor of Philosophy in Agricultural Sciences

In

Agricultural Microbiology

Agricultural Microbiology Department

Faculty of Agriculture

Fayoum University

2025



Influence of Spirulina Algae on Vitality of a probiotic bacteria and some fermented milk properties as composite functional drink

By

Gehad Hamdy Sayed Hassan

B.Sc. Agric. Sc. (Food Science), Fac. Agric., Fayoum Univ., 2013

M.Sc. Agric. Sc. (Microbiology), Fac. Agric., Fayoum Univ., 2020

Supervision Committee:

Prof. Dr. Osama Abdel-Tawab Seoudi

Professor of Agricultural Microbiology, Microbiology Department, Faculty of Agriculture, Fayoum University.

Signature

Dr. Hani Shaaban Mahmoud

Associate Professor of Dairy, Dairy Department, Faculty of Agriculture, Fayoum University.

Signature.....

Date: 24 / 9 /2025



Influence of Spirulina Algae on Vitality of a probiotic bacteria and some fermented milk properties as composite functional drink

By

Gehad Hamdy Sayed Hassan

B.Sc. Agric. Sc. (Food Science), Fac. Agric., Fayoum Univ., 2013

M.Sc. Agric. Sc. (Microbiology), Fac. Agric., Fayoum Univ., 2020

Approval Committee:

Prof. Dr. Ali Salama Ali Salama

Professor of Agricultural Microbiology, Agricultural Microbiology Department, Faculty of Agriculture, Zagazig University.

Signature.....

Prof. Dr. Yasser Fathy Abdelaliem Eied

Professor of Agricultural Microbiology, Agricultural Microbiology Department, Faculty of Agriculture, Fayoum University.

Signature

Prof. Dr. Osama Abdel-Tawab Seoudi

Professor of Agricultural Microbiology, Agricultural Microbiology Department, Faculty of Agriculture, Fayoum University.

Signature.....

Dr. Hani Shaaban Mahmoud

Associate Professor of Dairy, Dairy Department, Faculty of Agriculture, Fayoum University.

Signature

Date: 24 / 9 /2025

ABSTRACT

The cyanobacterium *Arthrospira platensis* has garnered significant attention in recent decades, primarily for its potential as a "food of the future" due to its rich profile of bioactive compounds, including phycobilins, carotenoids, unsaturated fatty acids, and proteins, which have diverse medicinal and nutritional applications. This study aimed to optimize growth media for *S. platensis* cultivation and investigate the effects of key environmental parameters; temperature, pH, light intensity, and photoperiod on its growth rate and the production of phycocyanins and chlorophylls. Results revealed that modified Zarrouk supplemented with 0.15 g/L urea (MZU) outperformed the standard Zarrouk medium. On the other hand, optimal growth results were achieved at 30°C, pH 9.0, under continuous exposure to white LED light (24:0 light: dark cycle) with a light intensity of 3000 luminous. Notably, *Spirulina* growth was completely inhibited at 40°C, while an elevated pH of 11 enhanced chlorophyll production. This study demonstrates that the integration of cost-effective urea supplementation into modified culture media can significantly enhance the growth and bioactive compound yield of *S. platensis*, making it a viable and sustainable option for large-scale applications. Additionally, the application of *Spirulina platensis* in a prebiotic fermented milk beverage was explored. *Spirulina* incorporation significantly enhanced the physicochemical properties, sensory profile, and functional attributes of the fermented product. The addition of *Spirulina* improved viscosity, phenolic content, and antioxidant activity while boosting the production of desirable flavor compounds such as acetaldehyde and diacetyl. Furthermore, it enhanced the viability of probiotic strains, ensuring their survival and activity during fermentation and storage. These findings highlight the potential of *Spirulina*-enriched fermented milk as a composite functional drink with superior health benefits, paving the way for innovative and sustainable functional food products.

Key words: *Spirulina platensis*, Growth optimization, bioactive compounds, Functional food, Sensory and physicochemical properties and Prebiotic fermented milk.