



## FUNCTIONAL CHARACTERISTICS OF BIOACTIVE PHYTOCHEMICALS IN *BETA VULGARIS L.* ROOT AND THEIR APPLICATION AS ENCAPSULATED ADDITIVES IN MEAT PRODUCTS

Ayman Younes Fathy Allam<sup>1✉</sup>, Dolganova Natalia Vadimovna<sup>2</sup> and Amin Abd El Halim Kandil<sup>1</sup>

<sup>1</sup> Food Science and Technology Dept., Fac., Agric., Menofiya University., Shibin El-Kom., Egypt.

<sup>2</sup> Industrial Ecology and Biotechnology Dept., Astrakhan State Technical Univ., Russia.

✉ [ayman.younis21@agr.menofia.edu.eg](mailto:ayman.younis21@agr.menofia.edu.eg)

<https://doi.org/10.34302/crpjfst/2021.13.4.14>

### Article history:

Received:  
10 August 2021  
Accepted:  
28 August 2021

### Keywords:

*Beetroot*;  
*Microbiological*;  
*Texture*;  
*Flavonoids*;  
*Alginate beads*;  
*Natural preservative*.

### ABSTRACT

Beetroot ethanolic extract contains active compounds and valuable elements such as phenols, carotenoids, alkaloids, tannin, flavonoids, and vitamins B<sub>3</sub>, B<sub>9</sub>, B<sub>6</sub>, and C. Quality characteristics and microbiological activity, texture, and colour were examined in the storage process at refrigerated temperature (up to 9 days at 4±2 °C) of beef burger pads made directly and encapsulated in alginate beads of *Beta vulgaris subsp.* (BVE). Over time, the Encaps-SDW and SDW (Control Samples) total mesophile bacteria counts peaked at CFU 8.61±0.22 and 8.74±0.17 log CFU/g, respectively, during storage (9 days). The lowest values ( $p < 0.05$ ) were shown in the Encaps-BVE and BVE samples, with 7.23±0.12 and 6.58±0.09 log CFU/g, respectively. However, the differences between all samples were significant ( $p < 0.05$ ), the BVE extract strongly inhibited *Enterobacterial* growth, with values on average two log units lower in BVE and Encaps-BVE than SDW and Encaps-SDW samples (control samples). Also, the addition of BVE extract kept the pH of beef minced nearly constant during storage; however, the pH value of control samples increased significantly ( $p < 0.05$ ). Furthermore, samples containing Encaps-BVE showed a more consistent trend in terms of texture and colour characteristics during the storage period than the other treatments, indicating the importance of using it as a natural preservative in meat product formulations to preserve quality standards and preservation.