

عنوان مقاله:

Nanoencapsulation of astaxanthin from *Haematococcus pluvialis* using maltodextrin-sodium caseinate coating and evaluation of antioxidant and antibacterial activities of the carrier nanocapsules

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نویسندگان:

Soheyl Reyhani Poul - PhD graduate, Department of Processing of Fishery Products, Faculty of Fisheries and Environment, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, Iran

Sakineh Yeganeh - Professor, Department of Fisheries, Faculty of Animal Science and Fisheries, Sari Agricultural Sciences and Natural Resources University, Sari, Iran

خلاصه مقاله:

The aim of present research in the first stage was to extract astaxanthin from *Haematococcus pluvialis* using acid-acetone method and then nanoencapsulation of the pigment using maltodextrin-sodium caseinate coating. In the next step, antioxidant and antibacterial activities of nanocapsules carrying astaxanthin and the free form of the pigment was evaluated. In order to evaluate antibacterial activity of the samples, *Listeria monocytogenes*, *Staphylococcus aureus*, *Streptococcus iniae*, *Bacillus subtilis* (Gram positive), *Yersinia ruckeri*, *Escherichia coli* and *Enterobacter aerogenes* (Gram negative) were used. The results showed that the antioxidant activity of nanocapsules carrying astaxanthin is significantly higher than the free form of pigment ($p < 0.05$); In addition, this activity was improved by increasing the concentration of samples from 100 to $200 \mu\text{g/ml}$ ($p < 0.05$). By astaxanthin nanoencapsulation, the diameter of non-growth zone of the studied bacteria increased ($p < 0.05$), but minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of the pigment and its carrier nanocapsules decreased ($p < 0.05$). According to the results of zone of inhibition, Gram positive (except *Listeria monocytogenes*) and Gram negative bacteria were resistant up to concentrations of 60 and $80 \mu\text{g/ml}$ of samples, respectively. In the following, the MIC and MBC of the pigment (free and nanoencapsulated forms) for the seven bacteria ranged from 50 to 400 and 100 to $500 \mu\text{g/ml}$, respectively. The results of evaluation the antioxidant and antibacterial activities of nanocapsules carrying astaxanthin during storage period (30 days at 4°C) indicated stability and no significant change of these properties ($p > 0.05$). According to the values of diameter of non-growth zone, MIC and MBC, *Listeria monocytogenes* was the most sensitive bacteria against astaxanthin and its carrier nanocapsules. Based on the findings, astaxanthin extracted from *Haematococcus pluvialis* has antioxidant and antibacterial activities, and these properties are improved by the pigment nanoencapsulation using maltodextrin-sodium caseinate coating.

کلمات کلیدی:

Haematococcus pluvialis, Astaxanthin, Carrier nanocapsules, Maltodextrin, Antioxidant activity, Antibacterial property, *Haematococcus pluvialis*, Astaxanthin, Carrier nanocapsules, Maltodextrin, Antioxidant activity, Antibacterial property

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