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Title: "Effect of Environmetal Pollution on β-Carotene and Astaxanthin Pigment of Cyanobacteria"

ABSTRACT

Objectives

i. Screening of cyanobacterial strains for β-carotene and astaxanthin
ii. Optimization of culture conditions of the best strain for β-carotene and astaxanthin
iii. Effect of environmental pollution (heavy metals, pesticide) on β-carotene, astaxanthin, free radicals (MDA) and antioxidant enzyme on selected strains(s)
iv. Characterization of β-carotene and astaxanthin (TLC & HPLC) of the best strain

Result

I. 53 cyanobacterial strains were screened to check the presence of β-carotene and Astaxanthin. Highest β-carotene (8.9796µg mg^{-1}) and Astaxanthin (6.856 µg mg^{-1}) was found in *Hapalosiphon fontinalis.*

II. Maximum β- carotene (52.95%) and astaxanthin (56.36%) was observed on 8^{th} day under 25 min UV stress.

III. Highest biomass yield (0.163g L^{-1}) was obtained in 20:4 light/dark regime on 20^{th} day while, *β*- carotene and astaxanthin was highest on 8^{th} day.

IV. Maximum growth (0.108 g L^{-1}) was observed on 20^{th} day in 10mM NaCl. The highest *β*-carotene (61.42%) and astaxanthin (48%) was observed on 8^{th} day.

V. Highest growth (0.118 g L^{-1}) was observed on 20^{th} day at 50mM sodium acetate, and *β*-carotene (51.03%) and astaxanthin (56.28%) was observed on 4^{th} day.

VI. Highest *β*- carotene (89%) was observed on 8^{th} day in pH 8 but, the highest astaxanthin (16.36%) was observed in pH 9.

VII. Highest reduction (51.38%) in growth was observed on 20th day under 0.5mM chromium. Chlorophyll showed 82.9% decrease at 0.5 mM Cr. β-carotene and astaxanthin and total protein increased maximally at 0.4 mM Cr respectively. TBARS levels increased in dose dependent manner. Highest SOD, CAT, APX was at 0.3mM.

VIII. Reduction in growth (51.1%) and chlorophyll (62.8%) was observed in 0.009mM cadmium. But β-carotene and astaxanthin enhanced up to 0.005mM Cd. TBARS, SOD, CAT, APX was enhanced in dose dependent manner. Protein content increases till 0.005mM cadmium

IX. The highest reduction in growth, chlorophyll, β-carotene and astaxanthin at 0.09 mM copper. But TBARS, SOD, CAT, APX and protein were enhanced maximally at 0.09mM copper.

X. The highest reduction in growth was noticed in 125 µg mL^{-1} malathion on 20th day. Chlorophyll was increased till 50 µg mL^{-1} malathion. Carotenoids decreased in low concentration of malathion (25, 50 µg mL^{-1}) and then increased. Maximum enhancement in TBARS, SOD, CAT, APX was at 125 µg mL^{-1} malathion. Maximum increase in total protein was at 100 µg mL^{-1} malathion.

XI. During TLC analysis Two bands were identical with *β*- carotene and astaxanthin standards.

XII. The HPLC analysis showed one major peak at 54.733 min and was identified as *β*- carotene.

In response to toxic effect of polluatnts, the level of antioxidants viz. carotenoids, superoxide dismutase, catalase and ascorbate peroxidase were elevated to survive under these adverse condition. These finding suggests that *Hapalosiphon fontinalis* can be consider as an alternative source of *β*- carotene production and due to its tolerant nature, it is advised to always include in rice field cyanobacterial inoculums mixture.