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Institute of Laser for Postgraduate Studies

Effect of Q-Switched Nd: YAG Laser on Some Physiological Parameters of *Saccharomyces cerevisiae*

A thesis

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By

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Summary

In present study, the effect of Q-Switched Nd: YAG laser with two different wavelengths, (1064nm) and (532nm), has studied basing on the fact that Cytochrome *c* oxidase absorb at IR region, Also the prosthetic group of heme in cytochromes b, c1 and c is iron Protoporphyrin IX (PpIX), which are reported to have high absorption of green region of electromagnetic spectrum.

The results of this study showed a noticeable increase in biomass value has obtained with using 532nm at 11.4 mJ/cm^2 and 30pulses, while the maximum value of total cell number has revealed using 34 mJ/cm^2 and 15 pulses at 532nm comparing with that results that get with using 1064nm. The maximum value of viability has reached after irradiation with 532nm at 22.7mJ/cm^2 and 15pulses in comparing to that with 1064nm irradiation.

In next experiments, it has focused on investigation of laser effect on enzymes (some of them represent mitochondrial enzymes). The maximum values of invertase activity and specific activity has got after irradiation with 1064nm at 34mJ/cm^2 and 15 pulses comparing to the 532nm wavelength. The irradiation with 532nm at 22.7mJ/cm^2 and 15 pulses produced maximum values of alcoholdehydrogenase activity and specific activity. The maximum values of activity and specific activity of catalase has obtained after irradiation with 1064nm at 22.7mJ/cm^2 and 30 pulses. The maximum value of activity and specific activity of superoxide dismutase has got after irradiation with 1064nm at 22.7mJ/cm^2 and 30 pulses. The irradiation with 34mJ/cm^2 energy density and 15pulses at 532nm causes slight increasing in protein concentration.

Finally, the effect of Q-Switched Nd: YAG laser on cell proliferation curve has seemed to cause a noticeable acceleration of cell divisions which has expressed in reduction of the latent period (lag phase) of the growth.

The general conclusion, there has a biphasic response of the cell (it means the LLLT activates some metabolic pathways positively while the other

جمهورية العراق

وزارة التعليم العالي والبحث العلمي

جامعة بغداد

معهد الليزر للدراسات العليا

تأثْير ليزَر النّيديميومْ- ياك ذي مفتاح عامل النوعية على بَعض المعلمات الفسلجية في خَميرة الـ *Saccharomyces cerevisiae*

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المستخلص

أظهرت الدراسة الحالية أن الليزر المتغير الجودة (Q-switched) ذو الموجة الطولية 532 نانومتر يؤثر على الخلايا الحية لبكتيريا Cytochrome c oxidase (532 نانومتر) وبكتيريا Cytochrome b, c1 and c3 (Protoporphyrin IX) وذلك بكثافة طاقة مقدارها 11.4 mJ/cm² وبمعدل تكرار 10 هرتز، وبكثافة طاقة مقدارها 22.7 mJ/cm² وبمعدل تكرار 10 هرتز، وبكثافة طاقة مقدارها 34 mJ/cm² وبمعدل تكرار 10 هرتز، وبكثافة طاقة مقدارها 22.7 mJ/cm² وبمعدل تكرار 10 هرتز، وبكثافة طاقة مقدارها 22.7 mJ/cm² وبمعدل تكرار 10 هرتز، وبكثافة طاقة مقدارها 22.7 mJ/cm² وبمعدل تكرار 10 هرتز، وبكثافة طاقة مقدارها 34 mJ/cm² وبمعدل تكرار 10 هرتز.

وأظهرت الدراسة أن الليزر المتغير الجودة (Q-switched) ذو الموجة الطولية 532 نانومتر يؤثر على الخلايا الحية لبكتيريا Invertase وبكتيريا Alcohol dehydrogenase وبكتيريا Catalase وبكتيريا Superoxide dismutase وبكتيريا Lag phase.