

Medicago sativa Extract: Resist the Blue Light (HEVL) Damage in Cell and Skin

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Introduction:

Blue light, also known as high energy visible light (HEVL), which wavelength is among 400 ~ 500 nm in visible light. Studies have reported that HEVL can penetrate the epidermis of the skin and reaches the dermis, causing oxidative stress and inflammation in cells, which leads to apoptosis^[1,2]. It also causes melanocytes to produce more melanin and reduce the extracellular matrix, leading to photoaging. In this paper, the function of *Medicago sativa* Extract (MS) against HEVL damage was identified from molecular and cellular terms to the human skin. Data suggest that *Medicago sativa* Extract could resist the HEVL damage through ROS reduction.

Materials & Methods:

1. Determination of ABTS free radical scavenging *in vitro*

Under treatment of oxidizing agent, ABTS can be oxidized into ABTS⁺ with green color. Dilute MS and positive control VC (PC) into 7-8 concentrations. Added 20 μ l samples and 180 μ l ABTS⁺ reagent in a 96-well plate, reacting for 10 min, and then detected the OD value in 405 nm.

2. Measurement of ROS production *in vitro*

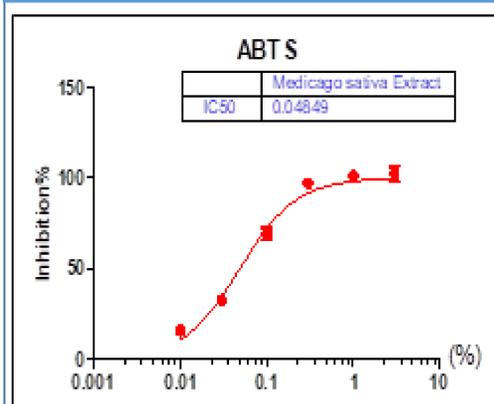
HaCaT cells were inoculated into a slide at 1×10^5 cells per well overnight, and then exposed to 36 J/cm² HEVL. After treatment, cells were incubated with culture medium contained MS again for 18 h. Immunofluorescence probes were added to detect the ROS expression under a fluorescence microscope.

3. Clinical trials of HEVL irradiation

13 Volunteers wore customized opaque cuff containing several 1cm \times 1cm exposure areas, applied with or without 0.5%~5.0% MS samples in the exposed area. 10 min later, the forearm was irradiated with HEVL for 30 J/cm² or 60 J/cm², quantitatively detected the skin ITA^o, Melanin and Erythem value by CK probe, meantime took pictures by VISIA to analyze the red area.

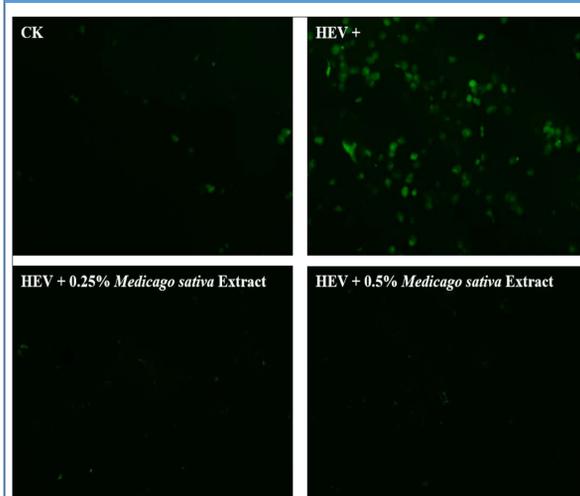
Results & Discussion:

Medicago sativa Extract scavenged ABTS free radicals



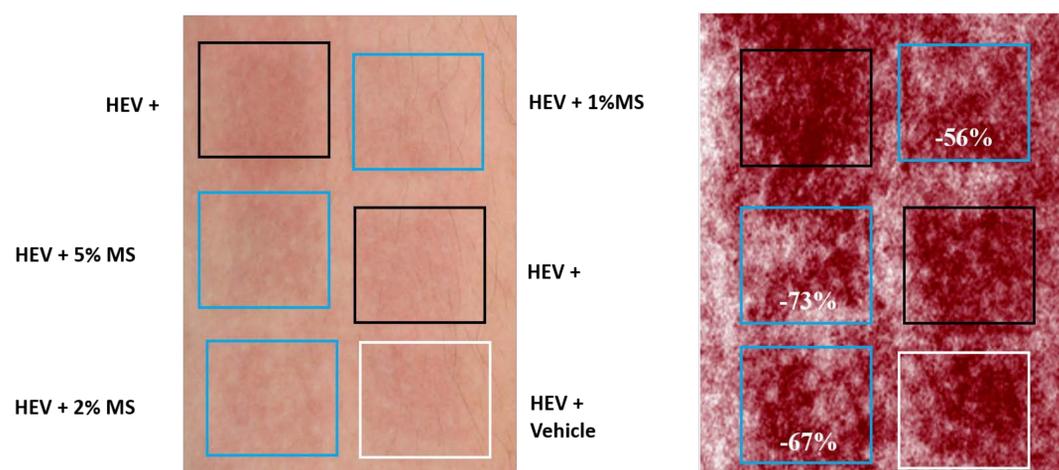
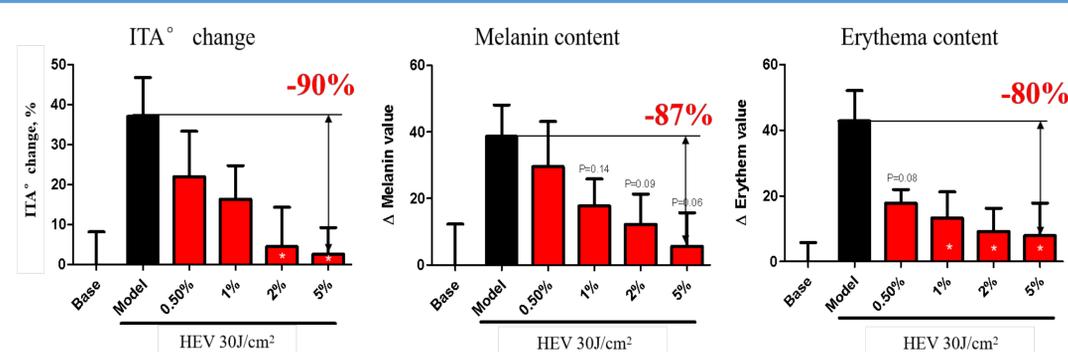
The IC₅₀ of *Medicago sativa* Extract was 0.048%, indicating it can scavenge ABTS free radicals. The inhibition rate reached to 97.5% at 0.3% concentration.

Medicago sativa Extract reduced HEVL-induced ROS free radicals



The cellular ROS level was increased after 36 J/cm² HEVL irradiation. While treated with 0.25% and 0.5% MS, ROS amount was reduced to normal group.

Medicago sativa Extract reduced HEVL damage in human skin



The ITA^o, Melanin and Erythem value were reduced in a dose-dependent manner when applied with 0.5%~5.0% MS after HEVL, indicating that *Medicago sativa* Extract could resist the damage of blue light on human skin.

Conclusions:

Medicago sativa Extract has obvious ability to clear ABTS free radicals, reduce cellular ROS production, and also decreased the skin ITA^o, melanin and erythem caused by HEVL irradiation. It will be applied in photo protection and skin care.

References:

1. Yuya Nakashima, *et al.* Blue light-induced oxidative stress in live skin. *Free Radical Biology & Medicine* 108 (2017) 300-310.
2. Alexa C. Wall, *et al.* Oxidative stress and endoreduplication induced by blue light exposure to CHO cells. *Mutat Res Gen Tox En* 841 (2019) 31-35.