Nanocluster structure of pistacia atlantica subsp. Kurdica turpentine and its antibacterial effects

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Background: Medicinal herbs such as *Pistacia Atlantica* (*P. Atlantica*) subsp. *Kurdica* have antimicrobial effects. The present study is aimed to investigate the nanocluster structure of *P. atlantica* subsp. *Kurdica* turpentine and its composing elements and antibacterial effect. Methods: 100 µl ethanol was used to dissolve oily turpentine. 2, 2.2, 2.4, and 2.6 µg/µl of turpentine were used for investigating the antibacterial effects using disk and well diffusion methods. Elemental and nanocluster structure analyses were performed by Energy-Dispersive X-Ray Microanalysis (EDXMA) and Field Emission (FE)-scanning electron. Two-way analysis of variance (ANOVA) and Bonferroni test were used for data analysis ($p \leq 0.001$). Results and Discussion: EDXMA elemental analysis of turpentine included: Zinc (Zn), Magnesium (Mg), Fluorine (F), Oxygen (O), Silicon (Si), Carbon (C), and Argon (Ar). A topography image of the turpentine showed a nanocluster surface with bright clusters in the background. The largest diameters of the growth inhibition zones (24.67 ± 0.58 mm in the disk diffusion and 23.67 ± 1.53 mm in the well diffusion) that were created by turpentine were observed against *S. aureus* ATCC 25923 at the concentration of 2.6 µg/µl. The diameter of the inhibition zone around bacterial growth had a direct relationship with turpentine concentration ($p \leq 0.001$). Conclusion: The nanocluster structure of turpentine and its composed elements were detected in this research. Moreover, the antibacterial effects of turpentine were proved. Herbal substances are widely used in medical applications. Different elements of *P. atlantica* subsp. *Kurdica* turpentine can be used as antibacterial agents, but more in-vitro and in-vivo studies should be performed in this field.