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Effect of Vegetative Structure of ZnONPs Particles on Physiological Characteristics of Samir and Bohouth 244 Cultivars of Barley “*Hordeum vulgare* L.”

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Abstract

An experiment was conducted in the greenhouse of the University of Al-Muthanna, College of Science Department of Biological, during the growing season in 25/November /2021. The aim of the study was to test of ZnO NPs at different levels (0, 50, 100 and 150) ppm, and in three different ways (soaking seeds, foliar spraying, seed soaking and foliar spraying) on growth and some physiological parameters of barley cultivars (*Hordeum vulgare* L.) Samir and Bohouth 244 varieties. The project implemented on a factor basis according to a complete random design (CRD) with three replications. UV-visible spectroscopy, scanning electron microscopy (SEM) and Transmission electron microscopy (TEM) were used to examine the biologically produced ZnO NPs. The results indicate the significant effect of (ZnO NPs) at the best concentration (100 ppm) when using (seed soaking and foliar spray) compared to other concentrations, root length (51.00) cm and fresh biomass of the shoot and root (5.29 and 3.87) g, respectively. On the other hand, such as the stability of the membrane (12.49%), the content of nitrogen (1.55) mg / g and zinc (203.49) mg / g, as well as the content of carbohydrates (72.40) mg / g, protein (9.75) mg / g, while the leaching of ions such as Na^+ and K^+ The results showed significant effects in reducing the leaching of ions from the leaves (25.05 and 20,19)%, respectively. As for the results of the physiological parameters. The ZnO NPs gave the highest leaf area (24.58) cm^2 and also a significant increase in chlorophyll a (2.50) mg/g, with an increase in the activity of the enzymes CAT, SOD and GPX (1.04,2.72and 20.71) unit/ml, respectively. While the least significant effect of zinc oxide nanoparticles at a concentration (50 ppm) for the third treatment (seed soaking) in the cultivar Buhoth244 on growth characteristics such as plant height (34.00) cm, fresh biomass of shoot and root (1.32 and 0.71) g, respectively, and the dry biomass of the shoot and root (0.09,0.22) g, and the length of the root (30.00) cm. As for

the physiological parameters, chlorophyll a (2.03) mg /g, carotenoids (0.72) mg / g, in addition to the stability of the membrane (29.16%) and the leaching of Na^+ ions K^+ (42.98 and 81.72) %, nitrogen content (0.61 mg/g), zinc (46.33 mg/g), carbohydrates (38.83 mg/g) and protein (4.43 mg/g). The positive effect of ZnO NPs on barley plant by increasing the activation of enzymes and thus stimulating the physiological and plant properties