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Effects of developmental stages and sex on the redox status of farm animals

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Nowadays, humans worldwide depend utterly on animals for the production of meat, fat, milk and other essential products. Therefore, the demand for livestock products has increased and world livestock production is facing major challenges that endanger the welfare and health of animals and, consequently, their productivity. Contemporary concerns over farm animal welfare have emerged as a result of producers' efforts to greatly increase the performance of their livestock. The progressive exploitation of the biological capacity of the animals to produce economic output, raise increasing worries about the extent to which they are stressed. To this end, the present study evaluates the redox status of farm animals (i.e., goats) from farms of Greece using modern research tools. In the current condition, we evaluated the levels of some widely used biomarkers for the assessment of animal redox status, namely thiobarbituric acid-reactive substances (TBARS, lipid peroxidation biomarker), protein carbonyls (protein oxidation biomarkers) and total antioxidant capacity (TAC) in blood plasma, reduced glutathione (GSH) and catalase activity in erythrocytes. These biomarkers were also measured in tissues of the animals and specifically in liver, in the non-substantial stress psoas major muscle, in the quadriceps muscle subjected to intermediate stress and in the most stressed muscle of the diaphragm. The analysis was made both at the developmental stage as indicated by animal on body weight, and gender. We report significant differences between the aforementioned independent variables. This study is expected to contribute mainly to the promotion of the welfare of farm animals, the promotion of Greek meat production and the improvement of its quality and commerciality through the scientific data that will emerge.

Key words: redox status, livestock, biomarkers, developmental stages

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Assessment of antioxidant activity of extracts from *Conium divaricatum*, *Ruta graveolens* and *Artemisia arborescens*

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In the present study, we evaluated the polyphenolic content and the antioxidant activity of four extracts derived from 3 Greek wild plant species, namely *Artemisia arborescens*, *Conium divaricatum* and *Ruta graveolens*. The antioxidant activity of the extracts was evaluated *in vitro* by DPPH, ABTS, Reducing Power, OH[•] and O₂^{•-} scavenging assay. In addition, the total phenol content was assessed by Folin-Ciocalteu assay. The results revealed that aquatic and methanolic extracts from *Conium divaricatum* were the most potent as regards antioxidant activity. Specifically, aquatic extract from *Conium divaricatum* exhibited IC₅₀ values of 60 µg/ml, 28 µg/ml and RP_{25,50} of 44 µg/ml for DPPH, O₂^{•-} scavenging assays and reducing power assay, respectively. Moreover, the methanolic extract from *Conium divaricatum* was the most potent in ABTS and OH[•] radical scavenging assays with IC₅₀ 85 µg/ml and 70 µg/ml, respectively. As regards the total phenolic content, the aquatic extract from *Conium divaricatum* exhibited the highest value (87.8 mg TPC/g dry extract). Furthermore, the antioxidant activity of aquatic extract from *Conium divaricatum* was examined in HepG2 liver and endothelial EA.hy926 cell lines. The results revealed that in HepG2 cells, the extract at 3 µg/ml, 6 µg/ml and 12 µg/ml protected proteins and lipids from oxidation, in a dose-dependent manner. However, the levels of glutathione and ROS were not affected by any concentration of the extract. Furthermore, in EA.hy926 cells, the results revealed that extract treatment decreased lipid peroxidation and protein carbonyl levels up to 61%. In addition, the extract increased total antioxidant capacity (TAC) up to 174%. In addition, glutathione levels (GSH) increased in a dose-dependent manner, namely 31.69, 35.24 and 47.26% at 1, 2, 25 and 50 µg/ml, respectively. In conclusion, in the present study, the antioxidant activity of aquatic and methanolic extracts derived from *Conium divaricatum* was assessed for the first time, to the best of our knowledge; however, further studies are required to elucidate the molecular mechanisms through which this activity is mediated.

Key words: *Artemisia arborescens*, *Conium divaricatum*, *Ruta graveolens*, HepG2 hepatic cell line, EA.hy926 cell line, antioxidant activity, polyphenol compounds