Computational Study of the antioxidant activity of 4-(5-chloro-2-hydroxy-phenylamino)-4-oxobut-2-enoic acid analogs using quantum-chemistry descriptors and molecular docking

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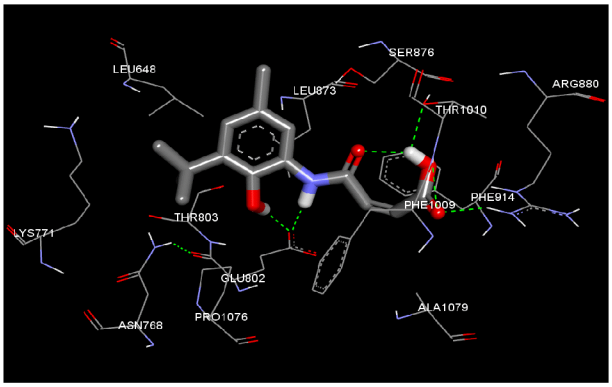
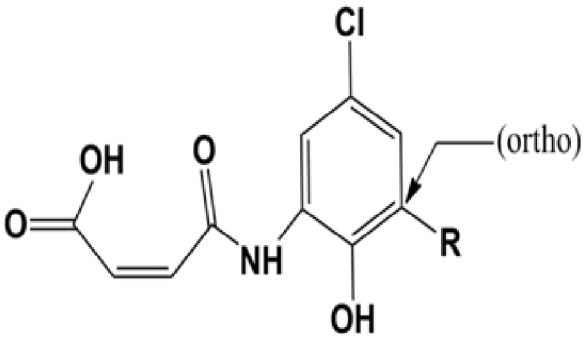
Antioxidants are chemicals that offer up their own electrons to free radicals and thus prevent cellular damage. In recent years, many efforts have been devoted to find new high order antioxidants for their potential applications to scavenge free radicals. Several strategies being executed and the most effective strategy appears to continually modify the existing classes of antioxidant agents to provide new analogues.





Recently [1], a novel compound, 4-(5-chloro-2- hydroxyphenylamino)-4-oxobut-2-enoic acid (compound A) was synthesized and screened for various biological activities like antitumor and antioxidant activities. Our first aim in the present work is to give a deeper insight about the high antioxidant activity of compound A and to suggest other derivatives which may have more antioxidant power than compound A and ascorbic acid. The substituent effect in the ortho position (see Fig.) on the antioxidant power is also analyzed. Our second goal is to study the main scavenging mechanisms (HAT/SPLET/SET-PT) in gas phase and in solvents (EtOH, DMSO, H_2O). For this purpose, we have calculated the more relevant quantum-chemistry antioxidant descriptors, namely, BDE, AIP, PDE, PA, and ETE. Aside from the antioxidant descriptors, we calculated other parameters, namely, the HOMO energy, the chemical hardness (η), the dipole moment and the atomic spin density (ASD). The antioxidant activity of compounds A-E against ROS has also been analyzed using the molecular docking technique. [2]

[1] M Sirajuddin, S Nooruddin, V Ali, S McKee, K Zeb, K Malook, *Spectrochim Acta A Mol Biomol Spectrosc*, **2015**, *134*, 244–250.

[2] A.T.E Ardjani, Mekelleche S.M., *J Mol Model*, **2016**, *22*, 302-312.