

Appreciation of the Antioxidant Activity of Copper (II) Derivatives Cysteine Complexes

Vitor Gabriel S. Silva^{1*}, Magno F. Santos¹, Guilherme A. Lima¹, Christiane M. Nogueira¹, Vivian C. da Silveira¹

¹Universidade Federal do Espírito Santo, São Mateus, Brazil

*e-mail: v.gabrielsouza94@gmail.com

Oil oxidation is an undesirable chemical reaction that involves oxygen and degrades the quality of the oil producing rancidity. Antioxidants are substances that inhibit or retard lipid oxidation of oils and fats. *Allin* is an active ingredient in garlic that contains antibacterial and antioxidant activity. The interaction between molecules with biological activity and metal ions has received notoriety due to its characteristics and properties.

Stoll and Seebeck method¹ was used to synthesize compounds similar to *allin*. It has been prepared and characterized (RMN, IR and elemental analysis), the (S)-4- chlorobenzyl cysteine, the (S)-4-methylbenzyl cysteine and their respective copper complexes.

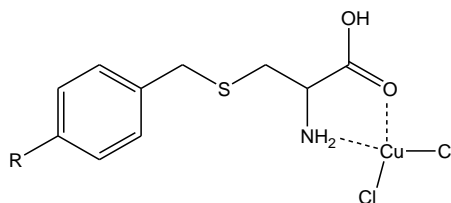


Figure 1: Structures of the synthesized compounds (R= CH₃, Cl).

The peroxide value (PV) was determined according to the method proposed by AOCS Cd 8-53 and the acid value (AI) by AOCS Ca 5a-40.² The ability of the synthesized compounds to scavenge free radicals was determined by the use of DPPH, based on the methodology described by Brand-Williams *et al.*³

The oxidation level of an oil is low when de PV is between 1.0 and 5.0 meq O₂/Kg of oil.⁴ The (S)-4-methylbenzyl cysteine (3.77 meq O₂/Kg), its copper (II) complex (2.84 meq O₂/Kg) and TBHQ (3.99 meq O₂/Kg) presented PV lower than 5.0 meq O₂/Kg of oil and the others moderated PV (between 5.0 and 10.0 meq O₂/Kg of oil) after incubation at 60°C for 6 days with soy oil.⁴ The copper (II) complex of (S)-4-methylbenzyl cysteine has polarity similar to the oil and it worked better as a radical scavenger. The acidity in the presence of TBHQ decreased by 68% while the copper (II) complexes decreased by 26%.

The IC₅₀ value in the presence of DPPH for the copper (II) complex of (S)-4-chlorobenzyl cysteine proved to be better than the copper (II) complex of (S)-4-methylbenzyl cysteine due to the lower concentration, 80 mM and 113 mM respectively. Although both complexes are good antioxidant, the essays indicate that the complex with chlorine was better than the one with methyl.

1. Stoll, A.; Seebeck, E. *Helv. Chim. Acta.* **1949**, 32, 876
2. AOCS - American Oil Chemists' Society. *Official methods and recommended practices of the American Oil Chemists' Society*, 5th ed.; Champaign, IL, 1998.
3. Brand-Williams W.; Cuvelier M. E.; Berset C.; Lebenson Wiss Technol. **1995**, 28, 25.
4. O'Brien, R. D. *Fats and Oils: Formulating and Processing for Applications*. Pennsylvania: Technomic Publishing Company, 1998.