

# The Importance of Keto-Enol Forms of Arylpropanoids Acting as Antifungal Compounds

F. Giannini<sup>1</sup>, C. Devia<sup>1</sup>, A. Rodríguez<sup>1</sup>, R. Enriz<sup>1</sup>, F. Suvire<sup>1</sup>, H. Baldoni<sup>1</sup>, R. Furlan<sup>2</sup> and S. Zaccchino<sup>2</sup>

<sup>1</sup>Universidad Nacional de San Luis. Facultad de Química, Bioquímica y Farmacia. Cátedra de Química General. Chacabuco y Pedernera. 5700 San Luis, Argentina

E-mail: p8101@unsl.edu.ar

<sup>2</sup>Universidad Nacional de Rosario. Facultad de Bioquímica y Farmacia. Cátedra de Farmacognosia. Rosario, Argentina

---

**Abstract:** We report here the importance of a keto-enol equilibrium of an arylpropanoid series acting as antifungal agents. An interesting relationship between  $\ln$  MIC,  $\Delta E$  enolization and net atomic charges was found. Two compounds were synthesized and their MIC evaluated in order to prove the above relationship.

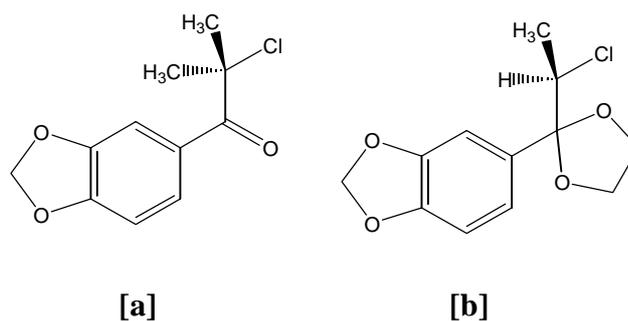
---

## Introduction

In the course of our screening program for antifungal activity, we reported that 8-O.4'-neolignans possess a moderate but significant antifungal activity against dermatophytes [1,2]. We performed a systematic study of antifungal properties of arylpropanoids portions and structurally related compounds [3], in order to gain insight into structural requirements for their activity. We found that some arylpropanoids possess strong antifungal effects displaying a biological behaviour similar or better than the currently used antifungal agents such as *amphotericin B* and *ketoconazole*.

Structure-activity relationship studies indicated that the C=O group was an indispensable moiety for the antifungal activity of arylpropanoids as well as the apparently necessary  $\alpha$ -hydrogen. These results suggest that keto-enol tautomerization could possibly play a role in the bioactivity of antifungal arylpropanoids. The present work reported here has three phases:

- 1- An exhaustive conformational and electronic study of this series using different levels of theory.
- 2- A correlation study between antifungal activity and computed parameters ( $\Delta E$  of enolization and net atomic charges).
- 3- Synthesis and evaluation of antifungal activity of compounds [a] and [b] to corroborate the results obtained on steps 1 and 2.



## Experimental

### Chemistry

Compound **[a]** 2-methyl-2-chloro-1-methylenedioxyphenylpropan-1-one was synthesized via a chlorination reaction with  $\text{Cl}_2\text{Cu}$ ,  $\text{ClLi}$  in DMF, 16 hs.,  $120^\circ\text{C}$ . Compound **[b]** 1-(1-methylenedioxyphenyl)propan-2-yl 2-chloropropanoate was prepared from **[a]** by reaction with ethylene glycol in dry benzene catalyzed by 10-camphorsulfonic acid in a Dean and Stark apparatus, 16 hs.

### Calculation Methods

The calculations were performed at semiempirical level, using AM1 from MOPAC 7 program, and *ab initio* levels using the GAUSSIAN 94 program system.

## Results and Discussion

From all the methods employed, the keto-forms were computed to be more stable than the enol forms. Also the cis-endo forms of the enol were systematically more stable than the other forms [4]. On the other hand, a correlative trend was observed when the  $\ln [\text{MIC}]$  values were plotted against computed molecular properties, such as  $\Delta E$  of enolization and net atomic charges. These results suggest that keto-enol tautomerization may be one of the mechanism of antifungal activity.

In order to corroborate this hypothesis two structurally related compounds, which could not undergo keto-enol tautomerization were synthesized. The experimental results are an additional support for our hypothesis

*Acknowledgements:* This research was supported by grants from the Universidad Nacional de San Luis (UNSL), Universidad Nacional de Rosario (UNR) and Fundación Antorchas (Proyecto A-13622/1-49).

## **References and Notes**

1. Zacchino, S. et al. *J. Nat. Prod.* **1997**, *60*, 659.
2. Zacchino, S. et al. *J. of Ethnopharmacol.* **1998**, *62*, 35.
3. S. Zacchino *J. Nat. Prod.* (in press).
4. Rodríguez, A. M. et al. *J. Mol. Struct. (Theochem)* **1999**, *463*, 283.