



## COPPER METAL-ORGANIC COMPOUNDS WITH O,N,O-LIGANDS AS POTENTIAL MICRONUTRIENTS IN PLANT GROWTH

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**Abstract:** Three Cu(II) coordination compounds based on diisopropanolamine (DIPA), Triisopropanolamine (TIPA), and bipyridine (bipy) ligands were synthesized and structurally characterized. Their Cu(II) coordination environments were investigated by solid-state EPR spectroscopy, supported by EasySpin simulations. The Cu(II)-DIPA and Cu(II)-TIPA compounds exhibited distinct electronic environments, in agreement with single-crystal X-ray crystallography, whereas the dinuclear Cu(II)-bipy compound was EPR silent, most likely due to magnetic exchange interactions. Antibacterial screening revealed no inhibition of bacterial growth under the examined conditions.

### • Introduction

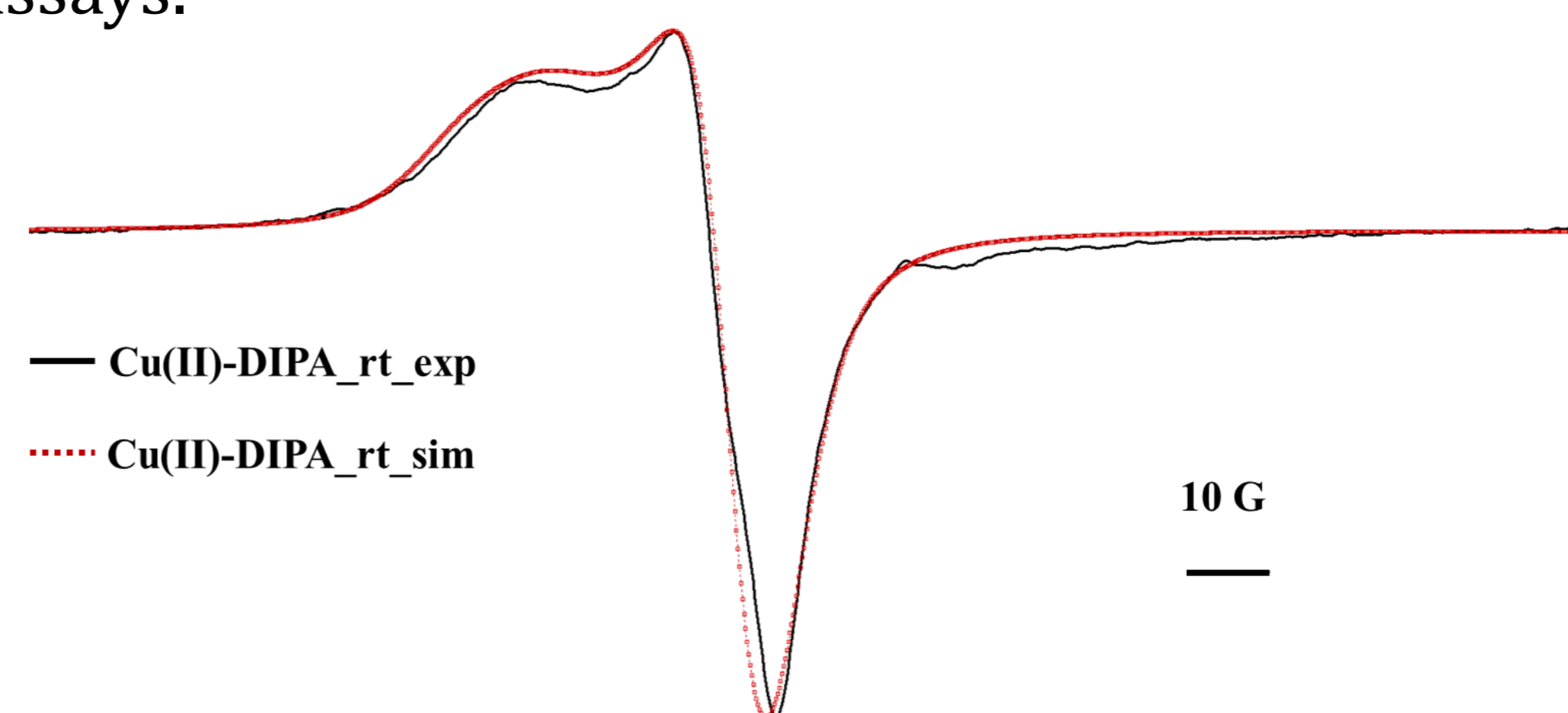
Copper is an essential plant micronutrient involved in key physiological processes, including photosynthesis, respiration, antioxidant defense and signal transduction. However, the narrow range between beneficial and toxic copper levels highlights the need for controlled copper-based systems. Cu(II) coordination compounds are, therefore, attractive candidates, as their structural and electronic properties can be modulated through appropriate ligand design and donor-atom selection [1,2,3].

### • Materials and methods

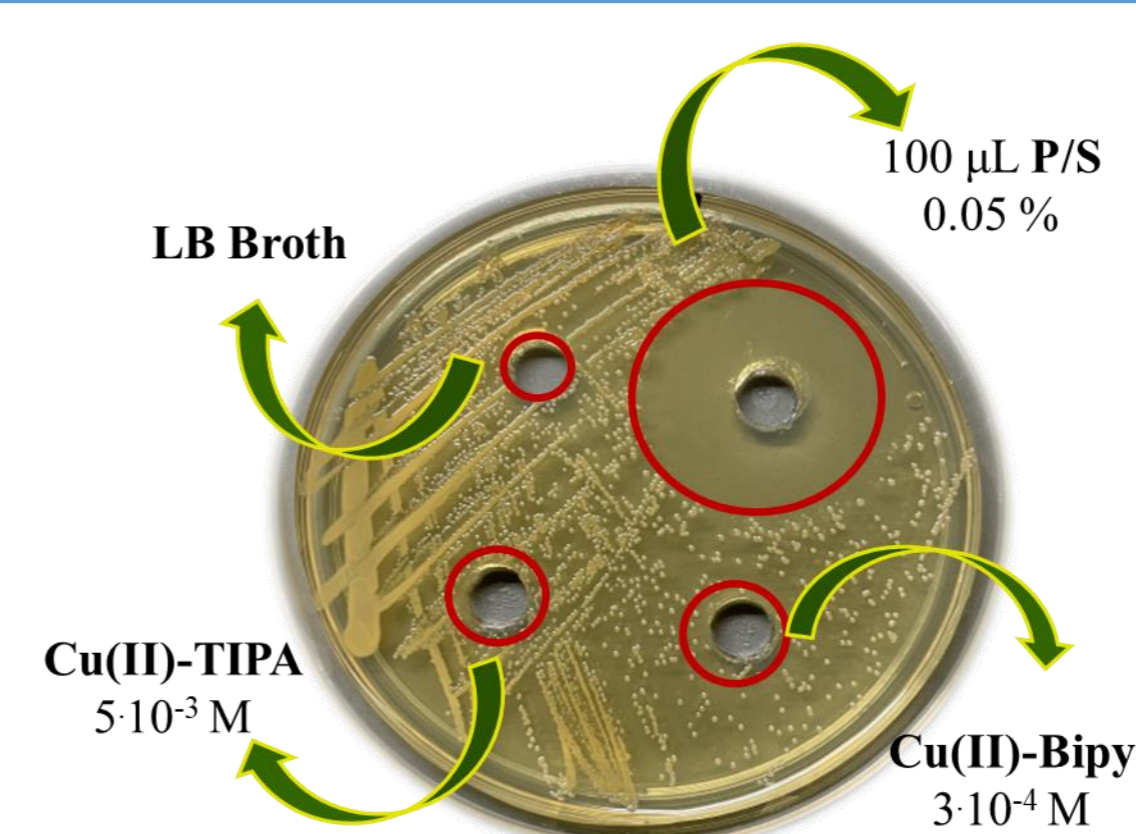
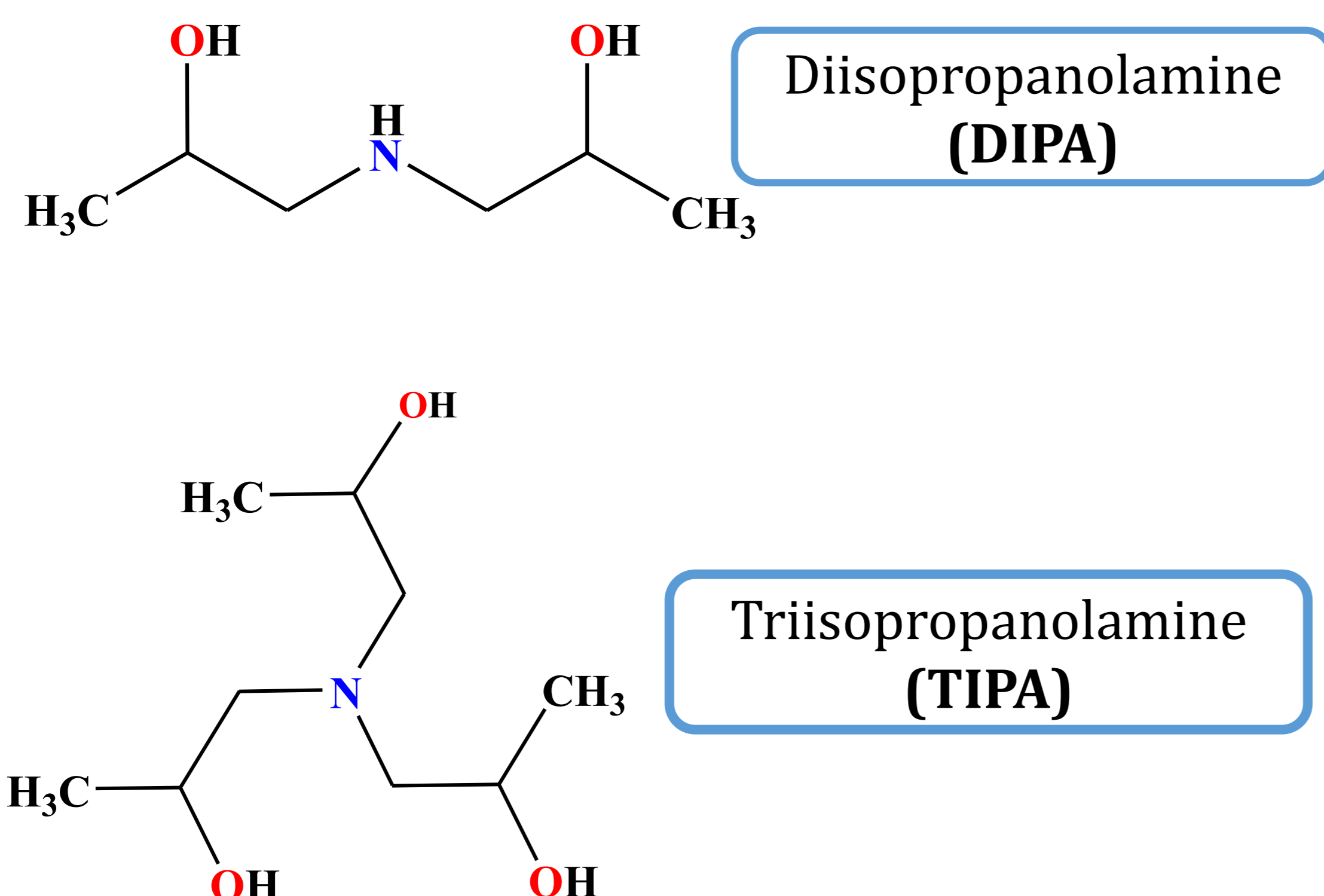
Cu(II)-DIPA, Cu(II)-TIPA, and Cu(II)-bipy compounds were synthesized and characterized by elemental analysis, FT-IR, UV-Visible spectroscopy, and single X-ray crystallography. Solid-state EPR spectra were recorded at 298 K and 123 K and further analyzed using EasySpin simulations in MATLAB. Antibacterial activity was assessed against representative Gram-positive and Gram-negative bacterial strains.

### • Results and Discussion

Cu(II)-DIPA displayed pseudo-axial EPR behavior, whereas Cu(II)-TIPA exhibited rhombic symmetry and stronger g anisotropy. The simulated spectra (Fig. 1) reproduced the experimental profiles and supported the crystallographic interpretation. No inhibition zones (Fig. 2) were observed in the antibacterial assays.



**Fig. 1:** Cu(II)-DIPA EPR feature at room temperature.



**Fig. 2:** Antibacterial activity of Cu(II) compounds

### • Conclusions

- Geometrical coordination environments of Cu(II)-DIPA and Cu(II)-TIPA were delineated.
- The synthesized Cu(II) compounds may be further used in agriculture as plant growth factors.

### References:

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