18th National and 3rd International Conference of Iranian Biophysical chemistry

هجدهمین همایش ملی و سومین همایش بین المللی بیوشیمی فیزیک ایران

25-26 Des, 2024, University of Hormozgan

۶-۵ دی ماه ۱۴۰۳، دانشگاه هرمزگان

The use of copper nanoparticles stabilized by *C. Tinctorius* plant extract in the Kinugasa reaction for the synthesis of β-lactams as potential antibacterial agents

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Abstract

Besides the extensive medical application with high importance of the β-lactam antibiotics, β-lactams (۲-azetidinones) have also represented other biological activities. Due to biological application of ۲-azetidinones and their utility as synthetic intermediates, several methods for the preparation of ۲-azetidinones have been presented. One of the applicable methodologies for the synthesis of ۲-azetidinones is the Kinugasa reaction. The Kinugasa reaction is the direct synthesis of β-lactams from copper acetylides and nitrones which provides some advantages including its optimal atom economy and its employment of readily accessible starting materials. Recently, nanoparticles have been widely used in various biological applications and organic reactions because of low toxicity, easy preparation without the need for filtration step, large surface area ratio and increase the efficiency of catalytic activity. Today, a considerable number of reports have shown that the addition of rhus and safflower in food or water can have valuable effects on human and animal health. Safflower has been used for a long time as a basis for dietary fat, food coloring, and Chinese medicines.

The goal of our work is to produce Cu nanoparticles by Carthamus tinctorius extract through green synthetic pathways which has been used in the synthesis of β-lactams from nitrones and alkynes using Kinugasa reaction. Due to the presence of β-lactam ring and various substitutions, the products can exhibit antibacterial properties and other biological activities.

Key words: β-lactam, ۲-azetidinone, antibacterial, Cu nanoparticles, Kinugasa reaction

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