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Thiamine hydrochloride (vitamin B1) catalyzed greener synthesis of thiazolidin-4-one derivatives

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ABSTRACT

Eco-friendly synthesis of thiazolidin-4-one scaffolds has been accomplished by the one-pot protocol. Thiazolidin-4-one scaffolds were obtained by multicomponent cyclo condensation of aromatic amine, a carbonyl compound, and a thioglycolic acid in thiamine hydrochloride (vitamin B1) as a biodegradable catalyst in acetonitrile solvent. The structure of the synthesized thiazolidin-4-one was elucidated by FT-IR, Proton nuclear magnetic resonance, and HR-MS spectral techniques. The reported route possesses outstanding features includes; efficient, cost-effective, easy work-up procedure, high yield, and biodegradable catalyst.

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1. Introduction:

One-pot synthesis is one of the parts of the multicomponent reactions (MCRs) which are useful in synthetic organic chemistry for designing and synthesis new heterocyclic scaffolds in chemical libraries. The MCRs are used for the synthesis of simple to complex molecules with a high degree of molecular diversity, due to the number of benefits over multistep reactions [1]. The five-membered heterocyclic compound thiazolidine (**1**) contains nitrogen and sulfur heteroatom. 1,3-thiazolidin-4-ones (**2**) possess (>C=O) carbonyl functional group. Thiazolidine is a type five-membered ring that contains a thioether group (—S—) and an amine group (—NH—) in the 1 and 3 positions. The 1,3-thiazolidin-4-ones are present in well-known drugs such as Pioglitazone (**3**) and Penicillin (**4**). Pioglitazone is an antihyperglycemic, antidiabetic drug and it decreases blood sugar for the treatment of diabetes disease. Penicillin is a broad-spectrum antibiotic that is used to control gram-positive and gram-negative bacteria [2]. The structure of these bioactive scaffolds is given in Fig. 1.

In the last three decades, the scientific community focused on the creation of bioactive heterocyclic motifs. Synthesized heterocycles have great importance in medicinal chemistry which provides the solution to numerous diseases. Nitrogen and sulfur-containing five members and six members heterocycles are building blocks of the numerous drug scaffolds [3]. Few significant thiazolidines containing heterocyclic scaffolds include; (*Z*)-3-(2-aminoethyl)-5-(4-ethoxybenzylidene)thiazolidine-2,4-dione (**5**) show greater selectivity for inhibiting the proliferation of melanoma cells bearing active ERK signaling activity [4], *N*-(5-Methyl-4-oxo-thiazolidin-3-yl)-nicotinamide (**6**) derivatives showed excellent antibacterial activity [5]. 2-imino-3-(4-arylthiazol-2-yl)-thiazolidin-4-ones (**7**) possess excellent fungicidal activity obtained from acetophenone and thiourea [6]. 2-aryl-3-(4,5,6-trimethylpyrimidin-2-yl)thiazolidin-4-one derivatives (**8**) show HIV-RT inhibitory activity [7]. 2-(4-fluorophenyl)thiazolidin-4-one (**9**) shows antioxidant activity [8]. The of the bioactive motifs are provided in Fig. 2.

The bio-heterocycles containing N, O, F, and S are among the most frequently encountered candidates in drug and pharmaceutical fields. Thiazolidinones are an important class of heterocyclic compounds that possess five-membered heterocyclic rings containing nitrogen and sulfur heteroatom. It has been considered an important building block that shows a wide range of biological activity. The derivatives of thiazolidine show pharmacological activities such as antiproliferative [9], antimicrobial [10], anti-

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