

An Efficient Synthesis of 2,4,5-Triaryl-1*H*-Imidazole Derivatives Catalyzed by Boric Acid IN Green Condition

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Abstract: Boric acid (BO_3H_3) is an inexpensive, efficient and mild catalyst for the synthesis of 2,4,5-triaryl-1*H*-imidazoles in excellent yields from the one-pot three-component condensation of benzil/benzoin, an aldehydes and ammonium acetate in aqueous media under ultrasound at room temperature. The remarkable advantages offered by this method are green catalyst, mild reaction conditions, simple procedures, much faster reactions and excellent yield of products.

Keywords: 2,4,5-Triaryl-1*H*-imidazole, Boric acid, Aqueous media, Ultrasound irradiation

REFERENCES

- [1]. J.J. Li, Ed. Heterocyclic Chemistry in Drug Discovery, John Wiley & Sons: Hoboken, **2013**. [Google Scholar], [Publisher]
- [2]. D.D. Patil, D.K. Mhaske, G.C. Wadhawa, *J. Adv. Pharm. Educ. Res.*, 2011, 2, 104-112. [Google Scholar], [Publisher]
- [3]. W.A. Denny, G.W. Rewcastle, B.C. Baguley, *J. Med. Chem.*, **1990**, 33, 814–819. [Crossref], [Google Scholar], [Publisher]
- [4]. N.A. Mirgane, V.S. Shivankar, S.B. Kotwal, G.C. Wadhawa, M.C. Sonawale, *Mater. Today: Proceedings*, **2021**, 37, 849-853. [Crossref], [Google Scholar], [Publisher]
- [5]. S.S. Nayak, N.A. Mirgane, V.S. Shivankar, K.B. Pathade, G.C. Wadhawa, *Mater. Today: Proc.*, **2021**, 37, 2302-2305. [Crossref], [Google Scholar], [Publisher]
- [6]. N.A. Mirgane, V.S. Shivankar, S.B. Kotwal, G.C. Wadhawa, M.C. Sonawale, *Mater. Today: Proc.*, **2021**, 37, 886-889. [Crossref], [Google Scholar], [Publisher]
- [7]. N.A. Mirgane, A. Chandore, V. Shivankar, Y. Gaikwad, G.C. Wadhawa, *Res. J. Pharm. Technol.*, **2021**, 14, 2686-2690. [Crossref], [Google Scholar], [Publisher]
- [8]. S.S. Nayak, N.A. Mirgane, K.B. Pathade, V.S. Shivankar, G.C. Wadhawa, *Plant Sci. Today*, **2021**, 8, 425-428. [Crossref], [Google Scholar], [Publisher]
- [9]. A.K. Valvi, S.S. Nayak, V.S. Shivankar, G.C. Wadhawa, *Mater. Today: Proc.*, **2021**. [Crossref], [Google Scholar], [Publisher]
- [10]. D. Davey, P.W. Erhardt, W.C. Lumma Jr., J. Wiggins, M. Sullivan, D. Pang, E. Cantor, *J. Med. Chem.*, **1987**, 30, 1337–1342. [Crossref], [Google Scholar], [Publisher]
- [11]. B.E. Tomczuk, C.R. Taylor Jr., L.M. Moses, D.B. Sutherland, Y.S. Lo, D.N., Johnson, W.B. Kinnier, B.F. Kilpatrick, *J. Med. Chem.*, **1991**, 34, 2993–3006. [Crossref], [Google Scholar], [Publisher]
- [12]. A.A. Spasov, I.N. Yozhitsa, L.I. Bugaeva, V.A. Anisimova, *Pharm. Chem. J.*, **1999**, 33, 232–243. [Crossref], [Google Scholar], [Publisher]
- [13]. S.S. Nayak, G.C. Wadhawa, V.S. Shivankar, D.D. Patil, M.C. Sonawale, N.A. Mirgane, *Mater. Today: Proc.*, **2021**, 37, 2490-2494. [Crossref], [Google Scholar], [Publisher]

- [14]. M. Shaharyar, A. Mazumder, M.J. Ahsan, *Arabian J. Chem.*, **2014**, *7*, 418–424. [Crossref], [Google Scholar], [Publisher]
- [15]. D.K. Mhaske, D.D. Patil, G.C. Wadhawa, *Int J Pharm Biomed Res*, **2011**, *2*, 107-11. [Google Scholar], [Publisher]
- [16]. D. Kumar, D.N. Kommi, R. Chebolu, S.K. Garg, R. Kumar, A.K.Chakraborti, *RSC Adv.*, **2013**, *3*, 91–98. [Crossref], [Google Scholar], [Publisher]
- [17]. S.B. Rathod, M.K. Lande, B.R. Arbad, *Bull. Korean Chem. Soc.*, **2010**, *31*, 2835-2840. [Crossref], [Google Scholar], [Publisher]
- [18]. S.S. Nayak, N.A. Mirgane, V.S. Shivankar, K.B. Pathade, G.C. Wadhawa, *Mater. Today: Proc.*, **2021**, *37*, 2427-2431. [Crossref], [Google Scholar], [Publisher]
- [19]. P.S. Gaikar, V.S. Shivankar, P.A. Patil, A.U. Chavan, G.C. Wadhawa, *Int. J. Aquatic Sci.*, **2021**, *12*, 4973-4980. [Google Scholar], [Publisher]
- [20]. E. Mentese, H. Bektaş, S. Ülker, O. Bekircan, B. Kahveci, *J. Enzyme Inhib. Med. Chem.*, **2014**, *29*, 64–68. [Crossref], [Google Scholar], [Publisher]
- [21]. D. Secci, A. Bolasco, M. D'Ascenzio, F. dellaSala, M. Yáñez, S. Carradori, *J. Heterocyclic Chem.*, **2012**, *49*, 1187. [Crossref], [Publisher]
- [22]. J.P. Tripathi, V.K. Kasana, *Int. J. Res. Appl. Sci. Eng. Tech.*, **2018**, *6*, 64-68. [Google Scholar], [Publisher]
- [23]. S.S. Nayak, G.C. Wadhawa, K.B. Pathade, V.S. Shivankar, N.A. Mirgane, *Plant Science Today*, **2021**, *8*, 380-385. [Crossref], [Google Scholar], [Publisher]
- [24]. A. Rao, A. Chimirri, S. Ferro, A.M. Monforte, P. Monforte, M. Zappalà, *ARKIVOC*, **2004**, *5*, 147-155. [Crossref], [Google Scholar], [Publisher]
- [25]. G.C. Wadhawa, V.S. Shivankar, S.S. Patil, Y.A. Gaikwad, A.V. Satere, B. Rode, C.H. Gill, L.V. Gavali, *Rasayan J. Chem.*, **2017**, *10*, 3-15. [Google Scholar], [Publisher]
- [26]. H.T.B. Bui, Q.T.K. Ha, W.K. Oh, D.D. Vo, Y.N. Chau, C.T. Tu, E.C. Pham, P.T. Tran, L.T. Tran, Van Mai H., *Tetrahedron Lett.*, **2016**, *57*, 887–891. [Crossref], [Google Scholar], [Publisher]
- [27]. J.S. Yadav, Y.K. Srivastava, *Rasayan J. Chem.*, **2010**, *3*, 726-730. [Google Scholar], [Publisher]
- [28]. D.D. Rishipathak, S.C. PAL, **2007**, *19*, 3242-3244. [Google Scholar], [Publisher]
- [29]. D.D. Patil, D.K. Mhaske, G.C. Wadhawa, *Int. J. Pharm. Sci. Res.*, **2011**, *2*, 2750-2752. [Google Scholar], [Publisher]
- [30]. R. Javahershenas, J. Khalafy, R. Herman Prager, *J. Chem. Rev.*, **2019**, *1*, 233-242. [Crossref], [Google Scholar], [Publisher]
- [31]. B. Kahveci, N. Sosan, E. Mentese, F. Yilmaz, *Rev. Roum. Chim.*, **2013**, *58*, 511-515. [Google Scholar], [Publisher]
- [32]. D.D. Patil, D.K. Mhaske, G.C. Wadhawa, *Int. J. Pharm. Sci. Res.*, **2011**, *2*, 1464-1466. [Crossref], [Google Scholar], [Publisher]
- [33]. G. Navarrete-Vázquez, H. Moreno-Díaz, S. Estrada-Soto, M. Torres-Piedra, I. León-Rivera, H. Tlahuext, O. Muñoz-Muñiz, H. Torres-Gómez, *Synth. Commun.*, **2007**, *37*, 2815–2825. [Crossref], [Google Scholar], [Publisher]
- [34]. C.H. Gill, G.C. Wadhawa, L. Gavali, V.S. Shivankar, K. Pawar, *Res. J. Pharm. Pharm.*, **2018**, *10*, 103-104. [Crossref], [Google Scholar], [Publisher]
- [35]. A.T. Khan, T. Parvin, L.H. Choudhury, *Synth. Commun.*, **2009**, *39*, 2339–2346. [Crossref], [Google Scholar], [Publisher]
- [36]. G.C. Wadhawa, V.S. Shivankar, Y.A.G. Charansingh, H. Gill, L.V. Gavali, *World J. Pharm. Res.*, **2018**, *7*, 483-495. [Google Scholar], [Publisher]
- [37]. Z. Li, H. Huang, H. Sun, H. Jiang, H. Liu, *J. Comb. Chem.*, **2008**, *10*, 484-486. [Crossref], [Google Scholar], [Publisher]
- [38]. A. Saberi, *Iran. J. Sci. Technol.*, **2015**, *39*, 7-10. [Crossref], [Google Scholar], [Publisher]

- [39]. A. Valvi, G.C. Wadhawa, S.S. Nayak, V.S. Shivankar, *Int. J. Aquat. Science*, **2021**, 12, 4769-4775. [Google Scholar], [Publisher]
- [40]. H. Naeimi, Z. babaei, *Green Chem. Lett. Rev.*, **2017**, 10, 129–133. [Crossref], [Google Scholar], [Publisher]
- [41]. G.C.Wadhawa, V.S. Shivankar, D.D. Patil, Y.A. Gaikwad, L.V. Gavali, C.H. Gill, *World J. Pharm. Pharm. Sci.* **2016**, 5, 624-656. [Crossref], [Google Scholar], [Publisher]
- [42]. G.S. Getvoldsen, N. Elander, A.A. Stone-Elander, *Chem. Eur. J.*, **2002**, 8, 2255-2260. [Crossref], [Google Scholar], [Publisher]
- [43]. N. Boufatah, A. Gellis, J. Maldonado, P. Vanelle, *Tetrahedron*, **2004**, 60, 9131-9137. [Crossref], [Google Scholar], [Publisher]
- [44]. S. Sajjadifar, H. Hamidi, K. Pal, *J. Chem. Rev.*, **2019**, 1, 35-46. [Crossref], [Google Scholar], [Publisher]
- [45]. R. Martinez-Palou, L.G. Zepeda, H. Höpfl, A. Montoya, D.J. Guzman-Lucero, J. Guzman, *Mol Divers.*, **2005**, 9, 361-369. [Crossref], [Google Scholar], [Publisher]
- [46]. G.C. Wadhawa, V.S. Shivankar, D.D. Patil, Y.A. Gaikwad, L.V. Gavali Gill , C.H., *World J. Pharm. Pharm. Sci.*, **2016**, 5, 624-656. [Google Scholar], [Publisher]
- [47]. S.Y. Lin, Y. Isome, E. Stewart, J.F. Liu, D. Yohannes, L. Yu, *Tetrahedron Lett.*, **2006**, 47, 2883-2886. [Crossref], [Google Scholar], [Publisher]
- [48]. A. Belgasem Mezoughi, W. Abdussalam Mohammed, Z. O. Ettarhouni, *J. Chem. Rev.*, **2021**, 3, 196-218. [Crossref], [Google Scholar], [Publisher]
- [49]. O. Algul, A. Kaessler, Y. Apcin, A. Yilmaz, J. Jose, *Molecules*, **2008**, 13, 736-748. [Crossref], [Google Scholar], [Publisher]
- [50]. K.M. Hosamani, H.R. Seetharamareddy, R.S. Keri, M.S. Hanamanthagouda, M.G. Moloney, *J. Enzyme Inhib. Med. Chem.*, **2009**, 24, 1095-1100. [Crossref], [Google Scholar], [Publisher]
- [51]. S. Asirvatham; E. Thakor; H. Jain, *J. Chem. Rev.*, **2021**, 3, 247-272. [Crossref], [Publisher]
- [52]. A. Ben-Alloum, S. Bakkas, M. Soufiaoui, *Tetrahedron Lett.*, **1998**, 39, 4481-4484. [Crossref], [Google Scholar], [Publisher]
- [53]. M.A.H. Zahran, F.A.A. El-Essawy, S.M. Yassin, T.A.R. Salem, N.M. Boshta, *Archive der Pharmzie.*, **2007**, 340, 591-598. [Crossref], [Google Scholar], [Publisher]
- [54]. D.D. Patil, G.C. Wadhawa, A.K. Deshmukh, K.B. Pathade, P.B. Shinde, P.B. Chordiya, A.S. Kulal, **2010**. [Google Scholar]
- [55]. X. Wen, J. El Bakali, R. Deprez-Poulain, B. Deprez, *Tetrahedron Lett.*, **2012**, 53, 2440-2443. [Crossref], [Google Scholar], [Publisher]
- [56]. G. Wadhawa, V.S. Shivankar, Y.A. Gaikwad, N.S. Dhumale, C.H. Gill, L.V. Gavali, *World J. Pharm. Pharm. Sci.*, **2017**, 7, 1013-1019. [Google Scholar], [Publisher]
- [57]. K. Niknam, A. Fatehi-Raviz, *Iran. Chem. Soc.*, **2007**, 4, 438-443. [Crossref], [Google Scholar], [Publisher]
- [58]. D. Rajiv, S.K. Sonwane, S.K. Srivastava, S.D. Srivastava, *Chem. Pharm. Res.*, **2010**, 2, 415-423. [Google Scholar], [Publisher]
- [59]. V.S. Devi, M.G. Rao, *World J. Pharm. Pharm. Sci.*, **2014**, 3, 1516-1525. [Google Scholar], [Publisher]
- [60]. Z.H. Zhang, L. Yin, Y.M. Wang, *Catal. Commun.*, **2007**, 8, 1126-1131. [Crossref], [Google Scholar], [Publisher]