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Research Article

Efficient and Recyclable [EMIM]OAc Catalyzed Aqueous Synthesis of 2,3-Dihydroquinazolin-4(1H)-ones

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ABSTRACT

The present study describes a sustainable and efficient protocol for the synthesis of quinazolinone derivatives using recyclable 1-ethyl-3-methylimidazolium acetate ([EMIM]OAc) as a green ionic liquid catalyst. The cyclocondensation of 2-aminobenzamide with various substituted benzaldehydes was successfully achieved in water at 80°C, affording excellent yields under environmentally benign conditions. Systematic optimization of catalyst loading, temperature, and comparative catalytic performance established the optimal reaction conditions. The catalyst exhibited remarkable recyclability with minimal loss of activity over successive cycles, highlighting its robustness and practical applicability. A plausible mechanistic pathway has also been proposed to elucidate the catalytic role of [EMIM]OAc in promoting the transformation. The protocol offers a simple, high-yielding, and eco-friendly approach for the synthesis of diverse quinazolinone derivatives.

Keywords: Quinazolinone derivatives, Ionic liquid catalyst, [EMIM]Oac, Green synthesis, Cyclocondensation.

INTRODUCTION

2,3-Dihydroquinazolin-4(1H)-ones are an important class of nitrogen-containing heterocycles with diverse biological and pharmacological activities. Their structural versatility and therapeutic relevance make them valuable scaffolds in pharmaceuticals, agrochemicals, and natural product analogues [1,2]. These compounds commonly exhibit antimicrobial, anticancer, and anti-inflammatory activities, while their facile synthesis and functionalization further enhance their significance in drug discovery. In addition to medicinal applications, certain derivatives have also been explored as luminescent materials and molecular imaging probes [3,4]. Their occurrence in natural alkaloids further emphasizes their importance in bioactive molecules [5].

The development of efficient synthetic methods employing readily available reagents remains a major focus in organic synthesis. In this regard, heterogeneous catalysis has emerged as an effective strategy due to its ability to improve yields, minimize waste, and avoid hazardous materials, thereby supporting sustainable chemistry [6]. Among nitrogen-containing heterocycles, quinazolinone derivatives, particularly 2,3-dihydroquinazolinones and quinazolin-4(3H)-ones, are highly significant because of their structural diversity and broad pharmacological profiles [7].

Quinazolinone derivatives display a wide range of biological activities, including anticonvulsant [8], anticancer [9], hypnotic and sedative [10], antimalarial [11], antibacterial, antioxidant [12], antifungal, cytotoxic [13], antiproliferative [14], and α-glucosidase inhibitory properties [15]. Their pharmaceutical importance is highlighted by the presence of the 2,3-dihydroquinazolinone core in several marketed drugs. These frameworks are also found in naturally occurring alkaloids and therapeutic agents such as evodiamine, febrifugine, isofebrifugine, metolazone, quinethazone, afloqualone, raltitrexed, and nolatrexed, which exhibit anticonvulsant [16], antiparkinsonian [17], antihypertensive [18], antibacterial [19], anticancer [20], and diuretic activities [21]. Additionally, some derivatives have shown potential as plant growth regulators [22].

From a synthetic viewpoint, 2,3-dihydroquinazolin-4(1H)-ones are valuable intermediates that can be readily oxidized to quinazolin-4(3H)-ones [23,24]. Both scaffolds are recognized as privileged structures in medicinal chemistry [25]. Three-component reactions involving isatoic anhydride, aldehydes, and amines are among the most efficient methods for synthesizing 2,3-dihydroquinazolin-4(1H)-ones due to their operational simplicity and high atom economy [26,27]. Other synthetic approaches include reduction–cyclization of o-nitrobenzamides with aldehydes or orthoformates [28], and reduction of quinazolin-4(3H)-ones to 2,3-dihydroquinazolinones [29]. Increasing emphasis on environmentally benign methodologies has further encouraged the adoption of green chemistry principles aimed at minimizing hazardous waste and improving sustainability [30].

Among the various synthetic methods, the cyclocondensation of 2-aminobenzamide with carbonyl compounds remains one of the most practical and widely employed approaches for the synthesis of quinazolinone derivatives [31]. Numerous catalytic systems have been reported for this transformation, including $(N_2H_5)_2SiF_6$ [32], metal–organic frameworks (MOFs) [33], spirocyclic SPINOL phosphoric acid [34], carbon nanodots [35], and AuNP-supported catalysts [36]. Although effective, many of these protocols suffer from limitations such as toxic or expensive reagents, difficult work-up procedures, poor catalyst recyclability, and harsh reaction conditions, thereby necessitating the development of greener and more efficient methodologies [37]. Non-metallic and organocatalytic systems have also attracted attention for this transformation. Catalysts such as NH_4Cl [37], [Bmim]PF_6[38], cellulose-SO_3H [39], $NaHSO_4$[40], and morpholinoethanesulfonic acid [41] have been successfully utilized. Despite their advantages, these methods often require prolonged reaction times, elevated temperatures, costly reagents, or tedious purification procedures. Recent studies have further expanded catalytic strategies using iodine [42], $ZrCl_4$[43], nanocrystalline sulfated zirconia [44], and ionic liquids [45]. While these approaches provide improved yields and reaction efficiencies, issues including moisture sensitivity, catalyst preparation, and environmental concerns still remain.

In recent years, ionic liquids have emerged as attractive catalysts and reaction media in organic synthesis due to their tunable structures, excellent solvating ability, and recyclability. Their dual role as solvent and catalyst enables efficient promotion of multicomponent reactions, cyclizations, and condensations under mild and environmentally benign conditions. Moreover, ionic liquids can accelerate reactions, stabilize intermediates, and be reused over multiple cycles without significant loss of activity, making them promising candidates for sustainable synthesis.

In accordance with green chemistry principles, the present work describes a novel and recyclable ionic liquid catalytic system using [EMIM]OAc (1-ethyl-3-methylimidazolium acetate) for the synthesis of quinazolinone derivatives from 2-aminobenzamide and substituted benzaldehydes. The reaction proceeds efficiently in water at 80°C, avoiding the use of strong acids, metal catalysts, and hazardous organic solvents. Optimization studies involving catalyst loading, temperature, and comparison with other catalytic systems demonstrated the superior performance of [EMIM]OAc. The catalyst also showed excellent recyclability with minimal loss of activity over successive cycles. On the basis of experimental observations, a plausible reaction mechanism has been proposed.

MATERIAL AND METHOD

Material

All reagents and solvents utilized in the synthesis of 2,3-dihydroquinazolin-4(1H)-ones were of analytical grade with a minimum purity of 99%. [EMIM]OAc was sourced from Sigma-Aldrich and used as received without additional purification. Melting points were measured by the open capillary method and are reported without correction. The progress of each reaction was routinely monitored by thin-layer chromatography (TLC) on silica gel plates, employing a hexane:ethyl acetate mixture (6:4) as the mobile phase. Structural characterization of the purified products was performed using infrared (IR) spectroscopy and nuclear magnetic resonance (NMR) spectroscopy, with tetramethylsilane (TMS) serving as the internal reference standard.

General procedure for the synthesis of dihydroquinazolinone

In a typical procedure, 2-aminobenzamide (1 mmol) and the respective aromatic aldehyde (1 mmol) were combined in 5 mL of distilled water. [EMIM]OAc (10 mol%) was then introduced as the catalyst, and the resulting mixture was stirred at 80°C for the predetermined reaction time, with progress monitored by thin-layer chromatography (TLC). Upon completion, additional water was added to facilitate phase separation, and the solid product was isolated from the ionic liquid–aqueous phase by simple filtration. The recovered ionic liquid phase was subjected to water removal by heating at 100°C for 4 hours, yielding the anhydrous [EMIM]OAc, which was weighed and reused in subsequent reaction cycles without significant loss of activity. The crude product was further purified by recrystallization from hot ethanol, affording the corresponding 2-aryl-2,3-dihydroquinazolin-4(1H)-one in high purity (Fig 1).

RESULT AND DISCUSSION

Catalytic activity

The synthesis of 2-aryl-2,3-dihydroquinazolin-4(1H)-ones was optimized using benzaldehyde and 2-aminobenzamide as model substrates. In the absence of a catalyst, only trace amounts of product were obtained, even at elevated temperature, indicating that thermal activation alone was insufficient. The catalytic activity of [EMIM]OAc increased significantly with catalyst loading, and the best result was achieved with 10 mol% catalyst, affording 73% yield in 3 hours. Further increase in catalyst loading provided no significant improvement. Solvent screening revealed a strong influence on the reaction efficiency, with water proving superior to benzene, DCM, and DMF. Under the optimized conditions (10 mol% [EMIM]OAc in water at 80°C), the desired product was obtained in 84% yield within 2 hours. These results highlight the effectiveness of [EMIM]OAc as a recyclable catalyst and water as a green reaction medium for the efficient synthesis of dihydroquinazolinone derivatives. The result is declared in Table 1.

The catalytic performance of [EMIM]OAc was compared with several reported catalysts for the synthesis of 2-aryl-2,3-dihydroquinazolin-4(1H)-ones. Conventional catalysts such as L-proline, Fe_3O_4@SiO_2, ethylene glycol, montmorillonite K-10, β-cyclodextrin, silica sulfuric acid, p-TsOH, and $SnCl_4$ afforded moderate to good yields (38–75%) with reaction times ranging from 3–5 hours. Among them, silica sulfuric acid showed the best performance, giving 75% yield in 3 h. However, [EMIM]OAc proved to be the most efficient catalyst, providing an 84% yield within only 2 hours. The enhanced activity is attributed to its dual role as a catalyst and ionic medium, facilitating efficient aldehyde activation and cyclization. In addition, its aqueous compatibility and recyclability make [EMIM]OAc an attractive and sustainable catalyst for dihydroquinazolinone synthesis. The result is declared in Table 2.

Table 1: Optimization of reaction condition for Dihydroquinazolinones using [EMIM]OAc as a catalyst

Entry	*Catalyst*	*Quantity (mol%)*	*Solvent*	*Temp. (^{0}C)*	*Time (hr)*	*Yield (%)^X*
1	-	-	-	RT	24	Trace
2	-	-	-	80 ^{0}C	12	5
3	-	-	-	80 ^{0}C	24	8
4	[EMIM]OAc	2.5	-	RT	12	18
5	[EMIM]OAc	5	-	80 ^{0}C	6	30
6	[EMIM]OAc	7.5	-	80 ^{0}C	4	48
7	[EMIM]OAc	10	-	80 ^{0}C	3	73
8	[EMIM]OAc	12.5	-	80 ^{0}C	3	75
9	[EMIM]OAc	15	-	80 ^{0}C	3	76
10	[EMIM]OAc	10	Benzene	80 ^{0}C	6	45
11	[EMIM]OAc	10	DCM	80 ^{0}C	6	52
12	[EMIM]OAc	10	DMF	80 ^{0}C	4	66
13	[EMIM]OAc	10	Water	80 ^{0}C	2	84

X indicate isolated yield of the product.

Table 2: Impact on yield of product by comparing [EMIM]OAc with other reported catalyst

Entry	*Catalyst*	*Time (hr)*	*Yield (%)^X*
1	L-Proline	4	63
2	Fe_3O_4@SiO_2	4	72
3	Ethylene Glycol	5	38
4	Montmorillonite K-10	4	48
5	β-Cyclodextrin	3	68
6	Silica Sulphuric acid	3	75
7	P-TsOH	3.5	45
8	$SnCl_4$	4	65
9	[EMIM]OAc	2	84

X indicate isolated yield of the product.

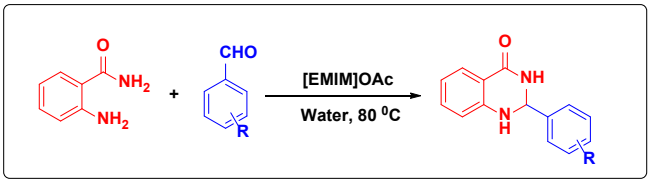
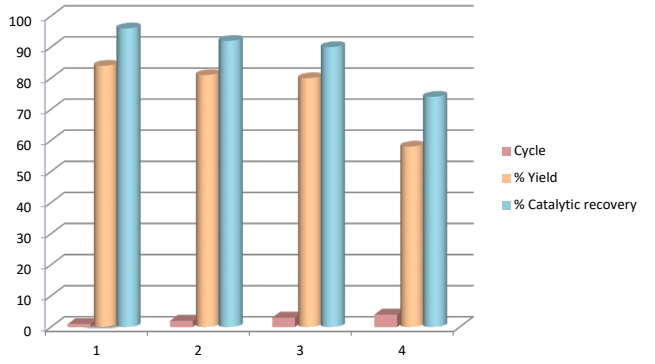


Figure 1: Synthesis of 2 ,3-Dihydroquinazolin-4(1H)-ones derivative catalyzed by [EMIM]OAc under aqueous condition

To systematically assess catalytic efficiency in the synthesis of dihydroquinazolinone derivatives, various readily accessible catalysts were initially evaluated. Among them, the ionic liquid [EMIM]OAc was selected for further study owing to its operational simplicity, green reaction profile, and promising preliminary results. The catalytic performance of [EMIM]OAc was investigated in the cyclocondensation of aminobenzamide with a diverse range of commercially available aromatic aldehydes under optimized conditions. The outcomes are summarized in Table 3.



Cycle	1	2	3	4
% Yield	84	81	80	58
% Catalytic recovery	96	92	90	74

Figure 2: Recyclability study of [EMIM]OAc catalyst

As illustrated in Table 3, all examined aldehydes underwent smooth cyclization with aminobenzamide to afford the desired products in yields ranging from 76 to 94%. The model reaction, employing benzaldehyde and aminobenzamide in water at 80°C with 10 mol% [EMIM]OAc, furnished dihydroquinazolinone in 84% yield within 2 h (Table-3, entry 1).

The influence of electron-donating substituents was examined using 3-methylbenzaldehyde, 2-hydroxybenzaldehyde, 4-hydroxybenzaldehyde, 4-methoxybenzaldehyde, and 2,4-dimethoxybenzaldehyde. Under identical conditions, these substrates afforded the corresponding products in good yields (76–82%), albeit with slightly extended reaction times of 2.5–3.0 h (Table-3, entries 2–6). The modest decrease in yields and slower conversions can be rationalized by the electron-donating substituents diminishing the electrophilicity of the aldehyde carbonyl, thereby reducing the reaction rate.

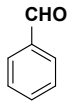
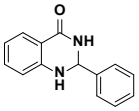
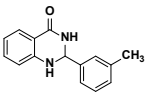
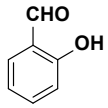
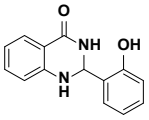
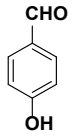
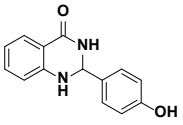
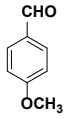
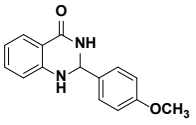
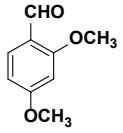
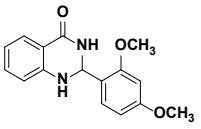
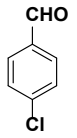
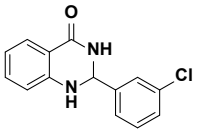
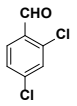
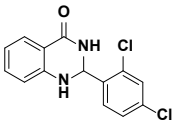
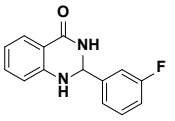
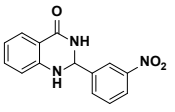
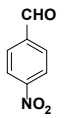
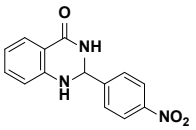
Conversely, aldehydes bearing electron-withdrawing substituents, including 4-chlorobenzaldehyde, 2,4-dichlorobenzaldehyde, 4-bromobenzaldehyde, 3-fluorobenzaldehyde, 3-nitrobenzaldehyde, and 4-nitrobenzaldehyde, exhibited enhanced reactivity. These substrates delivered the corresponding products in excellent yields (85–94%) within significantly reduced reaction times of 1–2 hours (Table-3, entries 7–11). The increased electrophilicity imparted by the electron-withdrawing groups likely facilitates nucleophilic attack during cyclization, accounting for the improved kinetics.

Overall, these findings underscore the pivotal role of electronic effects in dictating both the rate and yield of dihydroquinazolinone formation. The ability of [EMIM]OAc to efficiently catalyze reactions in aqueous medium across a wide substrate scope highlights its potential as a sustainable, high-performance catalyst for the green synthesis of biologically relevant heterocycles.

Recyclability of [EMIM]OAc Catalyst

After completion of the reaction, the product was separated by simple filtration following the addition of water, while the ionic liquid remained in the aqueous phase. The catalyst was regenerated by evaporating water at 100 °C and reused in subsequent cycles.

Table 3: Optimization of Substrate Scope Using [EMIM]OAc Catalyst for the Synthesis of Dihydroquinazolinones.

Entry	*Aldehyde*	*Product*	*Time (hr.)*	*Yield*[x] *(%)*	*M.P.*	
					Obs.	*Rep.*[46-49]
1			2	84	215–216	216–218
2			2.5	82	211–212	210–212
3			3	76	219–220	221–223
4			2.5	79	278–280	279–280
5			2.5	81	178–180	177–179
6			3	78	186–188	184–186
7			1.5	88	199–201	199–201
8			2	85	166–168	167–169
9			1.5	90	187–188	185–187
10			1	94	195–196	196–198
11			1.5	92	198–201	198–200

X indicate isolated yield of the product.

[EMIM]OAc maintained high catalytic activity over the first three cycles, with only a gradual decrease in yield and recovery efficiency, reaching about 58% recovery by the third cycle. Its easy regeneration, continued effectiveness, and compatibility with aqueous media highlight its potential as a recyclable and environmentally friendly catalyst for sustainable dihydroquinazolinone synthesis (Fig 2).

Spectral data of some selected synthesized compounds

The structures of the synthesized compounds were confirmed by spectral analysis, with the observed data closely matching their anticipated physical characteristics and aligning well with previously reported literature values [46-49].

2-Phenyl-2,3-dihydroquinazolin-4(1H)-one (Table 3, Entry 1)

FT-IR (KBr, cm^{-1}): 1610, 1651, 3181, 3312. ^{1}H NMR (DMSO-d_6) δ (ppm): 5.80 (s, 1H), 6.65 (t, 1H), 6.77 (d, 1H), 7.10 (s, 1H), 7.23–7.28 (m, 1H), 7.34–7.42 (m, 3H), 7.48 (d, 2H), 7.59 (t, 1H), 8.24 (s, 1H). ^{13}C NMR (DMSO-d_6) δ (ppm): 66, 114, 115, 116, 117, 127, 127, 128, 129, 133, 141, 146, 163. HRMS (ESI): m/z: 224 $[M+H]^+$.

2-(3-Methylphenyl)-2,3-dihydroquinazolin-4(1H)-one (Table 3, Entry 2)

^{1}H NMR (DMSO-d_6) δ (ppm): 2.32 (s, 3H), 5.73 (s, 1H), 6.69 (t, 1H), 6.76 (d, 1H), 7.17 (t, 1H), 7.24–7.29 (m, 4H), 7.33 (br, 1H), 7.63 (dd, 1H), 8.26 (br, 1H). ^{13}C NMR (DMSO-d_6) δ (ppm): 22, 67, 115, 115, 124, 128, 129, 130, 134, 138, 142, 148, 164. HRMS (ESI): m/z: 239 $[M+H]^+$.

2-(2-Hydroxylphenyl)-2, 3-dihydro-4(1H)-quinazolinone (Table 3, Entry 3)

FT-IR (KBr, cm^{-1}): 742, 848, 1153, 1326, 1458, 1502, 1608, 1642, 3149, 3402. ^{1}H NMR (DMSO-d_6) δ (ppm): 6.00 (s, 1H), 6.65 (t, 1H), 6.72–6.80 (m, 3H), 6.86 (d, 1H), 7.14 (t, 1H), 7.22 (t, 1H), 7.34 (d, 1H), 7.60 (d, 1H), 7.92 (s, 1H), 9.80 (s, 1H) HRMS (ESI): m/z: 241 $[M+H]^+$.

2-(4-Hydroxylphenyl)-2,3-dihydroquinazolin-4(1H)-one (Table 3, Entry 4)

FT-IR (KBr, cm^{-1}): 1232, 1601, 1662, 3189, 3329, 3407. ^{1}H NMR (DMSO-d_6) δ (ppm): 5.80 (s, 1H), 6.74 (d, 1H), 6.74 (t, 1H), 7.15 (s, 1H), 7.24–7.28 (m, 1H), 7.38 (d, 2H), 7.60–7.62 (m, 3H), 8.30 (s, 1H), 9.45 (s, 1H). ^{13}C NMR (DMSO-d_6) δ (ppm): 67, 114, 115, 119, 125, 127, 128, 129, 130, 140, 148, 163. HRMS (ESI): m/z: 240 $[M+H]^+$.

CONCLUSION

In conclusion, this study introduces a novel, environmentally sustainable strategy for the synthesis of quinazolinone derivatives using 1-ethyl-3-methylimidazolium acetate ([EMIM]OAc) as both an efficient and recyclable ionic liquid catalyst. Unlike conventional methods that often rely on hazardous solvents and metal-based catalysts, the present protocol uniquely combines water as a green reaction medium with a low-cost, reusable catalytic system, thus minimizing waste and improving sustainability. Importantly, [EMIM]OAc can be conveniently separated by simple filtration, regenerated by mild water evaporation, and effectively reused for at least three consecutive cycles without any notable decline in catalytic efficiency. The methodology provides consistently high yields (76–94%) across a broad range of 2,3-dihydroquinazolin-4(1H)-one derivatives, underscoring its robustness and versatility. Moreover, the reliance on readily available substrates such as 2-aminobenzamide and substituted benzaldehydes, coupled with the ability to rapidly generate structurally diverse quinazolinone scaffolds, highlights its potential novelty as a practical platform for combinatorial synthesis and early-stage drug discovery.

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CONFLICT OF INTERESTS

The authors declare no competing interests.

REFERENCES

1. Ghosh P, Ganguly B, Das S. C–H functionalization of quinazolinones by transition metal catalysis. Org Biomol Chem. 2020;18(24):4497-4518. https://doi.org/10.1039/D0OB00742K
2. Auti PS, George G, Paul AT. Recent advances in the pharmacological diversification of quinazoline/quinazolinone hybrids. RSC Adv. 2020;10(68):41353-41392. https://doi.org/10.1039/D0RA06642G
3. Xing Z, Wu W, Miao Y, Tang Y, Zhou Y, Zheng L, Fu Y, Song Z, Peng Y. Recent advances in quinazolinones as an emerging molecular platform for luminescent materials and bioimaging. Org Chem Front. 2021;8:1867-1889. https://doi.org/10.1039/D0QO01425G
4. Yao W, Duan ZC, Zhang Y, Sang X, Xia XF, Wang D. Iridium supported on phosphorus-doped porous organic polymers: active and recyclable catalyst for acceptorless dehydrogenation and borrowing hydrogen reaction. Adv Synth Catal. 2019;361(24):5695-5703. https://doi.org/10.1002/adsc.201900929
5. Kshirsagar UA. Recent developments in the chemistry of quinazolinone alkaloids. Org Biomol Chem. 2015;13(35):9336-9352. https://doi.org/10.1039/C5OB01379H
6. Climent MJ, Corma A, Iborra S. Homogeneous and heterogeneous catalysts for multicomponent reactions. RSC Adv. 2012;2(1):16-58. https://doi.org/10.1039/C1RA00807B
7. Belen'kii LI, Gramenitskaya VN, Evdokimenkova YB. The literature of heterocyclic chemistry, Part X, 2005–2007. Adv Heterocycl Chem. 2011;102:1-137. https://doi.org/10.1016/B978-0-12-385464-3.00001-7
8. Wolfe JF, Rathman TL, Sleevi MC, Campbell JA, Greenwood TD. Synthesis and anticonvulsant activity of some new 2-substituted 3-aryl-4(3H)-quinazolinones. J Med Chem. 1990;33(1):161-166. https://doi.org/10.1021/jm00163a027
9. Kamal A, Azhar MA, Shaik GB, Shankaraiah M, Ramu M. Quinazoline-based therapeutics for anticancer activity: synthesis and biological evaluation. Eur J Med Chem. 2011;46(2):691-703. https://doi.org/10.1016/j.ejmech.2010.11.039
10. Abdel-Alim AAM, El-Hashash MA, Helal AA. Synthesis of some new quinazolinone derivatives and their reactions. Collect Czech Chem Commun. 1993;58(9):1963-1968. https://doi.org/10.1135/CCCC19931963

11. Kumar NP, Sharma P, Reddy TS, Shankaraiah N, Bhargava SK, Kamal A. Microwave-assisted one-pot synthesis of new phenanthrene fused-tetrahydrodibenzo-acridinones as potential cytotoxic and apoptosis inducing agents. Eur J Med Chem. 2018;151:173-185. https://doi.org/10.1016/j.ejmech.2018.03.069
12. Dabiri M, Salehi P, Otokesh S, Baghbanzadeh M, Kozehgary G, Mohammadi AA. Efficient synthesis of mono- and disubstituted 2,3-dihydroquinazolin-4(1H)-ones using $KAl(SO_4)_2 \cdot 12H_2O$ as a reusable catalyst in water and ethanol. Tet Lett. 2005;46(36):6123-6126. https://doi.org/10.1016/j.tetlet.2005.07.017
13. Deshmukh SU, Kharat KR, Kadam GG, Pawar RP. Synthesis of quinazolinones derivatives an antiproliferative agent against human lung carcinoma cells. Eur J Chem. 2017;8(3):317-320. https://doi.org/10.5155/eurjchem.8.3.317-320.1586
14. Wei M, Zhang L, Gao X, Yang Y, Wu H. Recent advances in the synthesis and biological activities of quinazolinone derivatives. Bioorg Med Chem. 2017;25(3):1303-1312.
15. Gangwal NA, Kothawade UR, Galande AD, Pharande DS, Dhake AS. Synthesis of 1-substituted-2-chloromethyl-4(1H)-quinazolinones as antimicrobial agents. Indian J Heterocycl Chem. 2001;10(4):291-294.
16. Kumar A, Tyagi M, Shrivastava VK. Newer potential quinazolinones as hypotensive agents. Indian J Chem Sect B. 2003;42(9):2142-2145. https://doi.org/10.1002/chin.200352170
17. Kung PP, Casper MD, Cook KL, Wilson-Lingardo L, Risen LM, Vickers TA, Rankin R, Blyn LB, Wyatt JR, Cook PD, Ecker DJ. Antisense inhibition of respiratory syncytial virus replication by phosphorothioate oligodeoxyribonucleotides targeted to the NS2 gene. J Med Chem. 1999;42(22):4705-4713. https://doi.org/10.1021/jm990334o
18. Hour MJ, Huang LJ, Kuo SC, Xia Y, Bastow KF, Nakanishi Y, Hamel E, Lee KH. 6-Alkylamino- and 2,3-dihydro-3′-methoxy-2-phenyl-4-quinazolinones and related compounds: their synthesis, cytotoxicity, and inhibition of tubulin polymerization. J Med Chem. 2000;43(23):4479-4487. https://doi.org/10.1021/jm000151c
19. Parish HA Jr, Gilliom RD, Purcell WP, Browne RK, Spirk RF, White HD. Syntheses and diuretic activity of 1,2-dihydro-2-(3-pyridyl)-3H-pyrido[2,3-d]pyrimidin-4-one and related compounds. J Med Chem. 1982;25(1):98-102. https://doi.org/10.1021/jm00343a022
20. Hamel E, Lin CM, Day BW, Jansen SA. Antitumor 2,3-dihydro-2-(aryl)-4(1H)-quinazolinone derivatives. Interactions with tubulin. Biochem Pharmacol. 1996;51(1):53-59. https://doi.org/10.1016/0006-2952(95)02150-6
21. Kamal A, Azhar MA, Shankaraiah M, Reddy KS, Reddy KS, Shankaraiah N. Synthesis and biological evaluation of novel quinazolinone derivatives as potential anticancer agents. Bioorg Med Chem Lett. 2004;14(19):4923-4926.
22. Matysiak J, Urbańska A, Najda A. Synthesis and antiproliferative activity of novel 2,3-disubstituted quinazolin-4(3H)-one derivatives. Acta Pol Pharm. 2013;70(2):383-389.
23. Romero AH, Salazar J, López SE. A Simple One-Pot Synthesis of 2-Substituted Quinazolin-4(3H)-ones from 2-Nitrobenzamides by Using Sodium Dithionite. Synthesis. 2013;45(14):2043-2050. https://doi.org/10.1055/s-0033-1338854
24. Liu JF, Lee J, Dalton AM, Bi G, Yu L, Baldino CM, McElory E, Brown M. Microwave-assisted one-pot synthesis of 2,3-disubstituted 3H-quinazolin-4-ones. Tetrahedron Lett. 2005;46(8):1241-1244. https://doi.org/10.1016/j.tetlet.2005.01.008
25. Amini M, Shirini F, Abedini M. Silica sulfuric acid as an efficient and reusable catalyst for the synthesis of 2,3-dihydroquinazolin-4(1H)-ones under solvent-free conditions. J Iran Chem Soc. 2009;6(1):187-190.
26. Chen J, Su W, Wu H, Liu M, Jin C. Green and efficient synthesis of quinazolinone derivatives in ionic liquids. Green Chem. 2007;9(9):972-975. https://doi.org/10.1039/B702451A
27. Surpur MP, Singh PR, Patil SB, Samant SD. Montmorillonite KSF clay: an efficient catalyst for the synthesis of quinazolin-4(3H)-ones under solvent-free conditions. Synth Commun. 2007;37(12):1965-1972. https://doi.org/10.1080/00397910701264341
28. Shi D, Rong L, Wang J, Zhuang Q, Wang X, Hu H. One-pot synthesis of quinazoline derivatives under microwave irradiation. Tetrahedron Lett. 2003;44(16):3199-3201. https://doi.org/10.1016/S0040-4039(03)00618-3
29. Li SW, Nair MG, Edwards DM, Kisliuk RL, Gaumont Y, Dev IK, Duch DS, Humphreys J, Smith GK, Ferone R. Synthesis and antitumor activity of quinazoline antifolates as thymidylate synthase inhibitors. J Med Chem. 1991;34(9):2746-2754. https://doi.org/10.1021/jm00113a018
30. Sheldon RA. Green solvents for sustainable organic synthesis: state of the art. Green Chem. 2005;7(5):267-278. https://doi.org/10.1039/B418069K
31. Balaji S, Balamurugan G, Ramesh R, Semeril D. Ruthenium(II) complexes containing N-heterocyclic carbene ligands: synthesis, characterization and catalytic applications. Organometallics. 2021;40(5):725-734. https://doi.org/10.1021/acs.organomet.0c00789
32. El Hajri F, Benzekri Z, Anahmadi H, Zahri I, Bougrin A. Metal-based catalysts for heterocyclic synthesis: recent advances and applications. Inorg Chim Acta. 2022;536:120915. https://doi.org/10.1016/j.ica.2022.120915
33. Xia Q, Zhang S, Zhang Y, Pan Y, Wu X, Li Y, Xu J. Metal–organic framework-derived nanocatalysts for efficient organic transformations. ACS Appl Nano Mater. 2021;4(11):12108-12117. https://doi.org/10.1021/acsanm.1c02714
34. Guo Y, Gao Z, Li J, Zhang Y, Liu X, Zu L. Organocatalytic synthesis of quinazolinone derivatives under mild conditions. Org Biomol Chem. 2021;19(19):4146-4151. https://doi.org/10.1039/D1OB00456A
35. Majumdar B, Mandani S, Bhattacharya T, Shah H, Paul A, Manna D. Catalyst-free synthesis of biologically relevant quinazolinones through tandem cyclization strategies. J Org Chem. 2017;82(4):2097-2106. https://doi.org/10.1021/acs.joc.6b02987
36. Didó CA, Mass EB, Pereira MB, Silveira PC, Bueno LR. Green synthesis of quinazolinone derivatives using colloidal catalytic systems: characterization and catalytic performance. Colloids Surf A Physicochem Eng Asp. 2020;589:124455. https://doi.org/10.1016/j.colsurfa.2019.124455
37. Hemalatha K, Madhumitha G, Vasavi CS, Usha K. Photocatalytic synthesis and antimicrobial evaluation of quinazolinone derivatives using metal oxide nanoparticles. J Photochem Photobiol B. 2015;143:139-143. https://doi.org/10.1016/j.jphotobiol.2014.12.018
38. Wang XS, Sheng J, Lu L, Tian Y. Combinatorial synthesis of substituted quinazolinones via a one-pot multicomponent reaction. ACS Comb Sci. 2011;13(3):196-202. https://doi.org/10.1021/co100110m
39. Liu X, Hu DH, Shen H. Efficient synthesis of quinazolin-4(3H)-one derivatives under catalyst-free conditions. Asian J Chem. 2012;24(3):1365-1367.
40. Labade VB, Shinde PV, Shingare MS. One-pot synthesis of quinazolinone derivatives promoted by reusable heterogeneous catalyst. Tetrahedron Lett. 2013;54(43):5778-5780. https://doi.org/10.1016/j.tetlet.2013.08.041
41. Arunkumar S, Chidambara S, Lakshmanan S, Antony SA. Synthesis, characterization and biological evaluation of quinazolinone derivatives under eco-friendly conditions. Asian J Chem. 2020;32(9):2377-2382. https://doi.org/10.14233/ajchem.2020.22780

42. Wang XS, Zhou J, Tu SJ. One-pot three-component synthesis of quinazolinone derivatives under solvent-free conditions. J Comb Chem. 2010;12(3):417-421. https://doi.org/10.1021/cc900181u
43. Abdollahi-Alibeik M, Shabani E. Silica-supported sulfuric acid as an efficient reusable catalyst for the synthesis of 2,3-dihydroquinazolin-4(1H)-ones. Chin Chem Lett. 2011;22(10):1163-1166. https://doi.org/10.1016/j.cclet.2011.05.021
44. Abdollahi-Alibeik M, Shabani E. Sulfonic acid functionalized silica-coated magnetic nanoparticles as a recyclable catalyst for the synthesis of quinazolinone derivatives. J Iran Chem Soc. 2014;11(2):351-359. https://doi.org/10.1007/s13738-013-0316-8
45. Shaterian HR, Aghakhanizadeh M. Highly efficient synthesis of quinazolinone derivatives using heterogeneous acidic catalysts under solvent-free conditions. Res Chem Intermed. 2014;40(5):1655-1668. https://doi.org/10.1007/s11164-013-1085-8
46. Wang M, Zhang TT, Song ZG. Efficient one-pot synthesis of 2,3-dihydroquinazolin-4(1H)-ones catalyzed by recyclable acidic ionic liquids. Chin Chem Lett. 2011;22(4):427-430. https://doi.org/10.1016/j.cclet.2010.11.032
47. Zhaleh S, Hazeri N, Maghsoodlou MT. One-pot synthesis of quinazolinone derivatives using a recyclable heterogeneous catalyst under green reaction conditions. Res Chem Intermed. 2016;42(8):6381-6390. https://doi.org/10.1007/s11164-016-2486-4
48. Safari J, Gandomi-Ravandi S. A practical and green synthesis of quinazolinone derivatives: recent advances and applications. C R Chim. 2013;16(12):1158-1167. https://doi.org/10.1016/j.crci.2013.05.004
49. Safaei-Ghomi J, Teymuri R, Bakhtiari A. A highly efficient and reusable nanocatalyst for the synthesis of quinazolinone derivatives under solvent-free conditions. BMC Chem. 2019;13(1):1-11. https://doi.org/10.1186/s13065-019-0618-4

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