



**Synthesis of 2-amino 4H- Chromenes derivatives via Three Component Reaction Using Sodiun Benzoate as a green Catalyst.**

Report of a project carried out as a part of curriculum for the Degree of Master of Science in Organic Chemistry

CHO-453

Submitted by

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Submitted to

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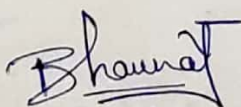
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2021-2022

## DECLARATION BY THE CANDIDATE

I hereby declare that this project entitled "**Synthesis of 2-amino 4H- Chromenes derivatives via Three Component Reaction Using Sodiun Benzoate as a green Catalyst.**" is a confide and genuine project work carried out by us under supervision of **Dr. Amol Haridas Kategaonkar**, Assistant Professor, P.G. Department of Organic Chemistry, M.V.P. Samaj's K.S.K.W. Arts, Commerce and Science College CIDCO, Uttamnagar, Nashik, Maharashtra.

Date- 22.06.2022

Place- Nashik



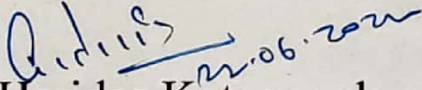
**Miss Bhavna Jayantsingh Yeotikar.**

## CERTIFICATE BY THE SUPERVISOR

This is to certify that entitled "Synthesis of 2-amino 4H-Chromenes derivatives via Three Component Reaction Using Sodiun Benzoate as a green Catalyst." is a bonafide and genuine project work done by MISS BHAVNA JAYANTSINGH YEOTIKAR fulfilment of the requirement for degree of Master of Science (Organic Chemistry)

Date: - 22.06.2022

Place: - Nashik

  
Dr. Amol Haridas Kategaonkar  
Assistant Professor

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College CIDCO, Uttamnagar, Nashik, Maharashtra.




## CERTIFICATE

This is to certify that projected entitled "Synthesis of 2-amino 4H- Chromenes derivatives via Three Component Reaction Using Sodiun Benzoate as a green Catalyst." is a bonafide projected work done by **MISS YEOTIKAR BHAVNA JAYANTSINGH** supervision of Dr. Amol Haridas Kategaonkar.

  
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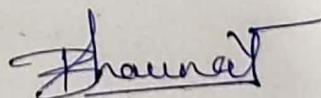
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It is our privilege to express our gratitude and sincere thanks to our family for their unconditional love prayer and moral support.

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Date: - 22-06-2022

Place: - Nashik



**MISS. YEOTIKAR BHAVNA JAYANTSINGH**

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**Synthesis of 2-amino-4H-Chromene Derivatives Via  
three Component Reaction Using Sodium Benzoate as a  
Green Catalyst**



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## **1. Introduction**

Aminochromenes are an important Class of Heterocyclic Compounds and plays very important role in Organic chemistry. They are used as precursors used for the synthesis of Cosmetics, Pigments [1] and potentially biodegradable agrochemicals[2]. Fused Chromenes are used as one of the important Constituents of Pharmacologically Active compounds[3]. These are also major Precursors of medicinal chemistry and chemical biology. They show biological activity such as antimicrobial, Mutagenicity,antiviral, antiproliferative, antitumor,Central nervous system activities (CNS) activities[3]. This are extensively Used as valuable synthetic Organic building blocks. among the various class of the heterocyclic compounds 2H-chromenes are present in vast number of natural products and are used in the synthesis of a variety of bioactive compounds,and find applications as photochromic materials for a variety of applications. the chromene skeleton is an important substructure in the wide range of bioactive heterocyclic compounds showing antimicrobial[4],antibacterial[4], anticancer,anticogulant,antioxidant,antinflamatory,antitubercucular,antiviral[5],,anti diabetic, diuretic, fungucidal, antinaphylatic activity [6]. The increasing attention during the last decades for environmental protection has led modern academic and industrial groups to develop chemical processes with maximum yield and minimum cost whilst using nontoxic reagents, solvents and catalysts [7]. Widespread interest in the 4H-chromene containing structures has led to extensive study of their synthesis.addition, it has high degrees of selectivity, synthetic convergence, atom-economy, synthetic efficiency, simplicity and minimization of cost, energy,time, and waste generation. Hence, the academic and industrial researchers have focused on the use of MCRs to synthesize target molecules in one-step processes from simple substrates.. Due to the important for mentioned properties of chromene derivatives, considerable attention has been focused on the development of environmentally

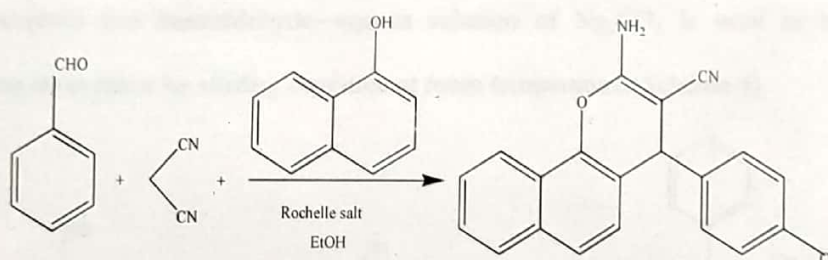


friendly methodologies to synthesize 2-amino-4H-chromene scaffold by cyclization of an aromatic/aliphatic aldehyde, malononitrile and phenols[8]. Therefore, the exploration of MCRs can lead to a new efficient synthetic avenue for the formation of several fine molecules in the field of organic and medicinal chemistry. 4H-Chromenes have been synthesized using microwaveradiation and an electrochemically generated base. One of the tools used to combine economic aspects with the environmental ones is the multicomponent reaction (MCR) strategy; this process consist of two or more synthetic steps which are carried out without isolation of any intermediate, thus reducing time, saving money, energy and raw materials[9]. There is still the need to develop better alternatives that can proceed under mild, simple, efficient, and environmentally benign reaction conditions among various chromene derivatives, 2-amino-4H chromene with cyano-functionality has a potential applications in the treatment of rheumatoid, psoriasis, and cancer. Other properties such as laser dyes, optical brighteners, fluorescence markers, pigments, cosmetics, and potent biodegradable agro chemicals are well known for decades[10]. Recently, a variety of methods for several modified procedures using alkyl ammonium salts, and silica nanoparticles[11] are get performed. One-pot multicomponent reaction have received considerable attention in synthetic chemistry as they can produce target products from readily available starting materials in one reaction step in isolating the intermediate thus reducing reaction times, labour cost and waste production in addition water and ethanol are versatile solvent in organic reactions since it is readily available inexpensive environmentally benign solvents[12]. Aminochromenes have been prepared by refluxing the mixture of malanonitrile, aldehyde and activated phenols or naphthols in present of acetonitrile or DMF in the presence of various base catalysts and various basicionic liquids such [bmim]OH[13]. Although many Synthetic methods to prepared this heterocyclic ring are reported to the best knowledge[13-20],

We are Practicing the use of green solvents in combination of heterogeneous and reusable catalysts in the one pot reaction in the organic synthesis we use here our results in the utility of Sodium Benzoate as a green Catalyst in the three component condensation between aldehydes, active methylene reagents and activated phenols. Sodium benzoate is the sodium salt of benzoic acid, widely used as a food preservative and a pickling agent. It appears as a white crystalline chemical compound.

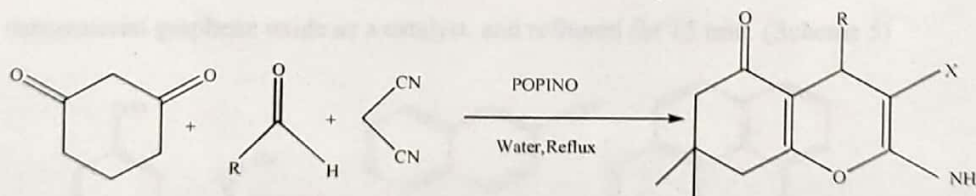
## 2. Literature Review

Awatef Mohammad El-Maghraby[3] Synthesized 2-amino-4-phenyl-4H-benzo(h)chromene-3-carbonitrile by mixing the equimolar quantity of benzaldehyde, Malanonitrile and Resorcinol, and refluxed for 2-4 hours. ethanol and water is used as a solvent and Rochette salt is used as a green Catalyst in the above reaction to give good yield of product. (Scheme 1)



Scheme 1

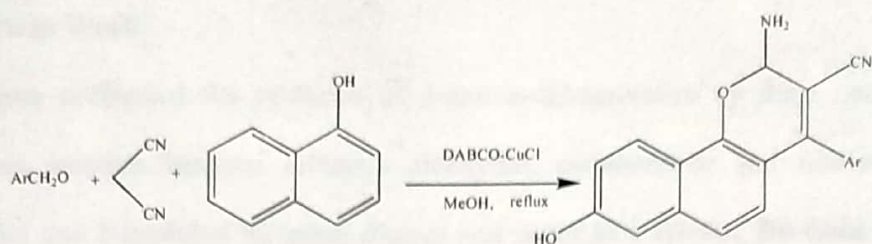
Mohammad G. Dekamin, Mohammad Eslami and Ali Maleki [5] Used Potassium phthalimide-N-Oxyl as a novel catalyst for Synthesis of 2-amino-4H-Chromene by using reactants such as dimedone, benzaldehyde, malanonitrile, in equimolar amount and Water is used as a catalyst. To form product in good yield(Scheme 2).



Scheme 2

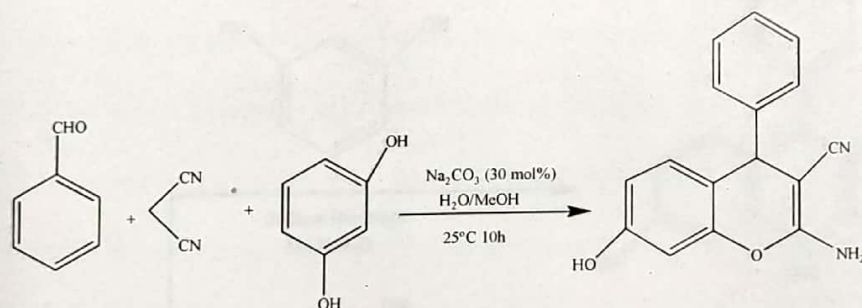
Bitabaghernejad[9] reported synthesis of 2-amino-4-phenyl-4H-benzo[h]chromene-3-carbonitrile by reacting appropriate mixture of benzaldehyde, malanonitrile, and 1 naphthol and methanol is used as solvent DABCO-CuCl complex is used as a catalyst. And reaction mixture is stirred and refluxed for appropriate time high yield of product is obtained. (Scheme 3).





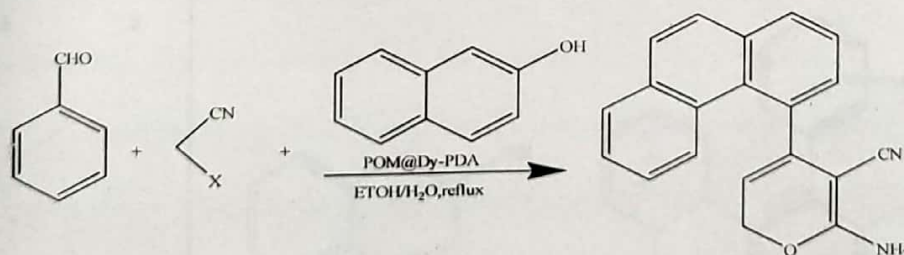
Scheme 3

Ishmael B Masesane, Shetonde O. Mihigo[14] synthesized 2-amino-4phenyl-4H-benzo(h)chromene-3-carbonitrile by reacting an appropriate benzaldehyde (1), malanonitrile and benzaldehyde. aqueous solution of  $\text{Na}_2\text{CO}_3$  is used as catalyst reaction takes place by stirring condition at room temperature.(Scheme 4).



Scheme 4

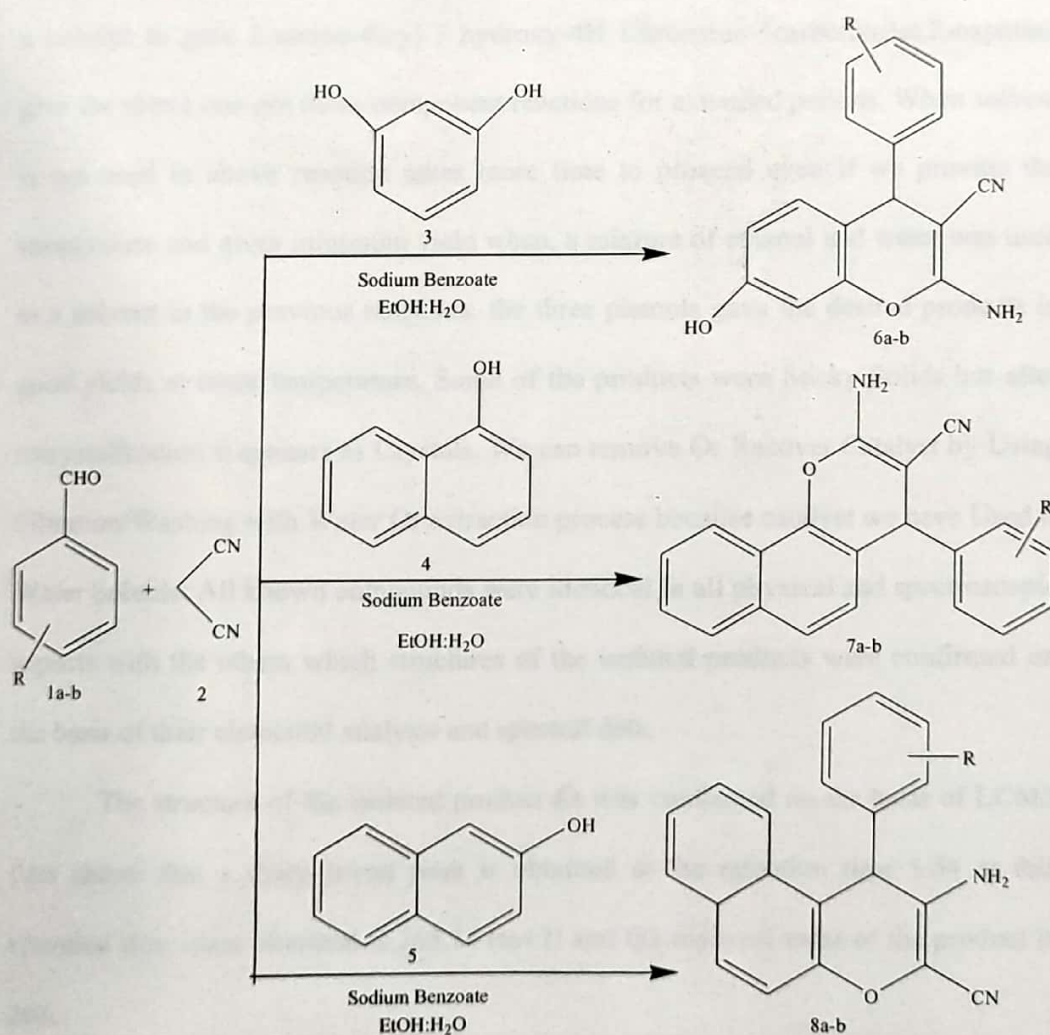
Sara Hosseinzadeh-Baghan[15] describe the synthesis of 2-Amino-4H-chromene by reacting aldehyde, malanonitrile, and resorcinol by using monodispersepd nanomaterial graphene oxide as a catalyst. and refluxed for 15 min. (Scheme 5)



Scheme 5

### 3. Present Work

We have performed the synthesis of 2-amino-4H-derivative by three component efficient reaction between aromatic aldehydes, malanitrile and resorcinol, a-naphthol and b-naphthol by using ethanol and water as a solvent. By using sodium benzoate as an efficient catalyst at room temperature the method provide efficient and improved pathway for the synthesis of chromenes in terms of short reaction time and reusable and green catalyst. The catalyst is soluble in water and easy to recover or remove and reaction proceed in short period of time.





#### 4. Results and Discussion

Our interest is to synthesize the Substituted Chromenes and Benzochromenes By Using Sodium Benzoate as a Green Catalyst and Green Solvent like Ethanol and water. When the solvent is not used reaction takes more time to proceed by using energy efficient procedure. The Synthesis Started with the reaction of a mixture of aromatic aldehydes, malanonitrile and resorcinol in ethanol in equimolar amount (mole ratio 1:1:1) by stirring condition at room temperature containing catalytic amount of Sodium benzoate by using mixture of ethanol and water in the ratio(1:1) as a solvent to give 2-amino-4aryl-7 hydroxy-4H Chromene-3carbonitriles.2-naphthol give the above one-pot three-component reactions for extended periods. When solvent is not used in above reaction takes more time to proceed even if we provide the temperature and gives minimum yield when, a mixture of ethanol and water was used as a solvent in the previous reactions, the three phenols gave the desired products in good yields at room temperature. Some of the products were Sticky Solids but after recrystallization it appears as Crystals. We can remove Or Recover Catalyst by Using Filtration/Washing with Water Or extraction process because catalyst we have Used is Water Soluble. All known compounds were identical in all physical and spectroscopic aspects with the others which structures of the isolated products were confirmed on the basis of their elemental analysis and spectral data.

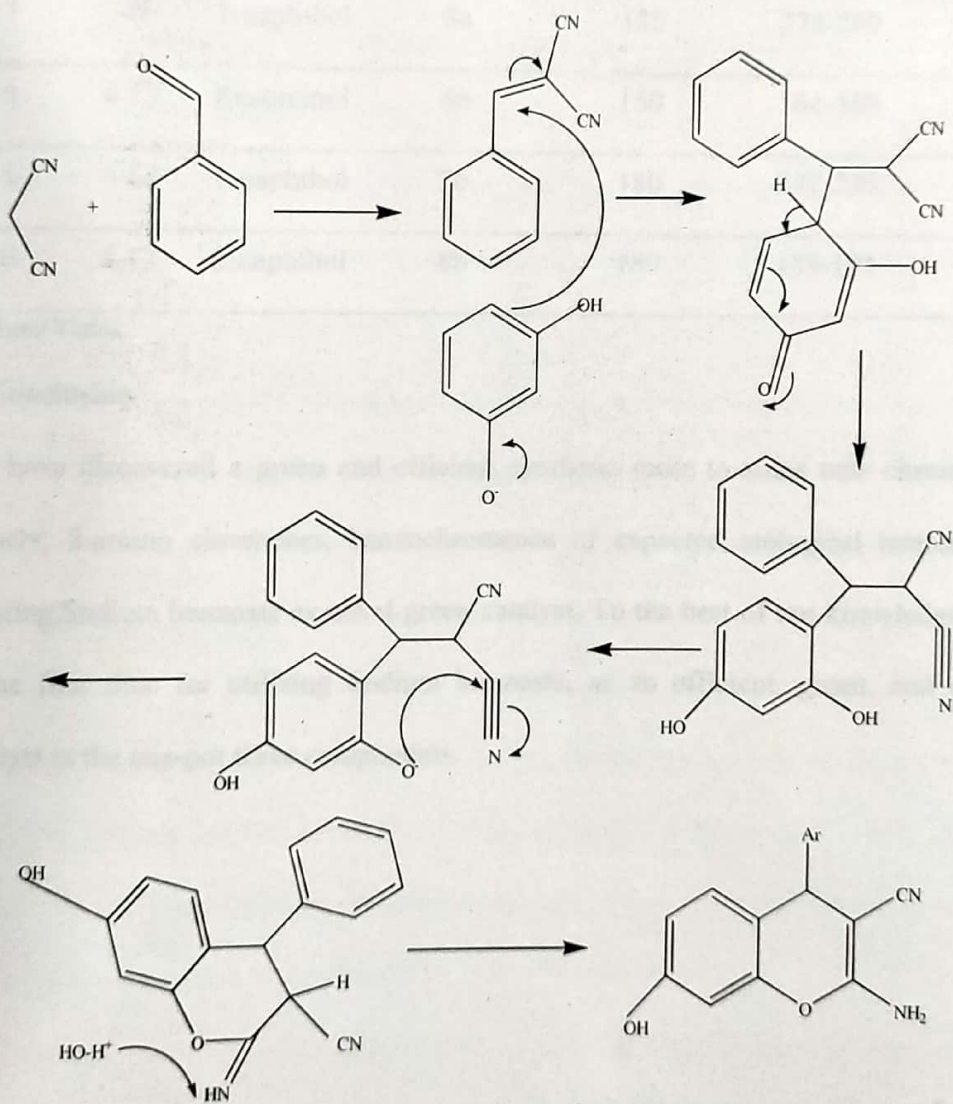
The structure of the isolated product **1a** was confirmed on the basis of LCMS data shows that a sharp broad peak is obtained at the retention time 1.54 at this retention time mass obtained is 265.14 (m+2) and the reported mass of the product is 264.

Furthermore in the  $^1\text{H}$  NMR the presence of aromatic protons shows value in between 7.2-7.4 ppm protons adjacent to the OH group shows value 6.8 ppm and 6.9 ppm The presence of  $\text{NH}_2$  group is confirmed with value 4.8 ppm OH proton give



signal at 9.7ppm. Aromatic protons adjacent to the OH group shows value 6.8ppm and 6.5 ppm. Aromatic protons that are adjacent to the CN group show the value 6.4 ppm due to deshielding effect.

**Mechanism of Reaction-**



**Table No 1:** Synthesis of substituted 2 amino Chromenes by Using Sodium Benzoate

Sr. No.	-R	Substrate	Products	Time (Min)	M.P. [3] (°C)	Yield (%) <sup>a</sup>
1	-H	Resorcinol	6a	150	220-222	90
2	-H	1-naphthol	7a	150	208-210	82
3	-H	2-naphthol	8a	180	278-280	80
4	4-Cl	Resorcinol	6b	150	164-169	92
5	4-Cl	1-naphthol	7b	180	232-234	85
6	4-Cl	2-naphthol	8b	180	188-191	82

<sup>a</sup>Isolated Yields.

## 5. Conclusion

We have discovered a green and efficient synthetic route to some new chromenes, namely, 2-amino chromenes, benzochromenes of expected biological interest, by utilizing, Sodium benzoate as novel green catalyst. To the best of our knowledge, this is the first time for utilizing Sodium benzoate, as an efficient, green, and cheap catalyst in the one-pot three components.



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