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A New Route to 3,4-Dihydro-2*H*-1-Benzopyrans Substituted at 3-Position *Via* Palladium-Catalysed Reactions

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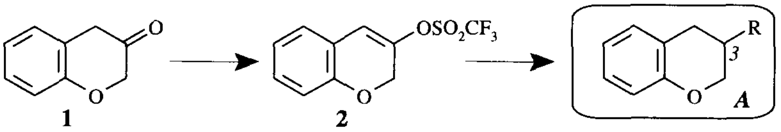
Abstract: 3,4-Dihydro-2*H*-1-benzopyrans substituted at 3-position were prepared *via* palladium-catalysed reactions between a triflate and several coupling reagents (alkyl or aryl tin reagents and borane derivatives) according to Stille or Suzuki methodologies. © 1997 Published by Elsevier Science Ltd.

As far as we know, only two examples corresponding to the formula *A* were described in the literature (Scheme 1). On the one hand, Burali *et al*[1] prepared 3-phenyl-3,4-dihydro-2*H*-1-benzopyran in four steps and moderate overall yield from 2-hydroxybenzylalcohol. On the other hand, Beckwith *et al*[2] reported the synthesis of 3-methyl-3,4-dihydro-2*H*-1-benzopyrans *via* a radical reaction with the corresponding bromoarene. In this way the authors obtained a mixture of benzopyran and benzofuran derivatives with modest yields. Moreover, with this methodology the benzofurans were isolated as major products.

Scheme 1



R = alkyl or aryl

Herein, we report the preparation of 3,4-dihydro-2*H*-1-benzopyrans substituted at the 3-position by different alkyl or aryl groups using chromanone **1**[3] as starting material (Scheme 1). Numerous attempts to introduce methyl or ethyl groups *via* a Wittig reaction were unsuccessful, leading predominantly to degradation products. Consequently, we decided to run a palladium-catalysed reaction between triflate **2**, generated directly from the chromanone **1**, and several coupling reagents owing to Stille and Suzuki methodologies (Scheme 2).[4,5]

The triflate **2** was obtained in a satisfactory yield starting from the the chromanone **1** using triflic anhydride and diisopropylethylamine in methylene chloride.[6] Scheme 2 reports the synthesis of compounds **3** - **12** prepared in two steps from the triflate **2**. The first reaction entails a coupling procedure between compound **2** either with trialkyltin derivatives in hexamethylphosphoramide with bis(triphenylphosphine)palladium (II) chloride at 65°C, or with boric acid derivatives in a mixture of

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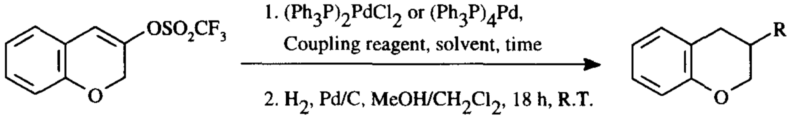
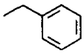
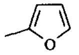
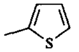
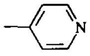
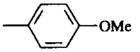
toluene/ethanol with tetrakis(triphenylphosphine)palladium (0) under reflux. The second reaction involved an hydrogenation of the unsaturated intermediates providing respectively the expected compounds **3** - **9** and **10** - **12**.

Scheme 2



2 **3 - 12**

Cpd[a]	R	Coupling reagent	Time (h)	Yield (%)[b]
3		benzyltributyltin[c]	3	70
4		2-(tributylstannyl)furan	2	78[d]
5		2-(tributylstannyl)thiophene	2	74
6	CH_3	tetramethyltin	3	42
7	CH_2CH_3	tributyl(vinyl)tin	1	75
8	$(CH_2)_2CH_3$	allyltributyltin	3	57
9	$(CH_2)_3CH_3$	tetrabutyltin	3	38
10		4-pyridinylboric acid[e]	4	86
11	Ph	phenylboric acid	2.5	92
12		4-methoxyphenylboric acid	2	80

*a) For compounds **3-9** we used $(Ph_3P)_2PdCl_2$ as catalyst in HMPA at 65°C, for **10-12** we used $(Ph_3P)_4Pd$ in a mixture of toluene/ EtOH in the presence of Na_2CO_3 under reflux. b) Yields of isolated products calculated after coupling and hydrogenation reactions. c) For the synthesis of benzyltributyltin see reference 4b. d) The reaction time for hydrogenation was 4 hours instead of 18 hours. e) For the synthesis of 4-pyridinylboric acid see reference 7.*

In this paper, we have reported a convenient preparation of 3-alkyl- or aryl-3,4-dihydro-2*H*-1-benzopyran derivatives **3** - **12**[8] using palladium catalysed reaction.

References and notes

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8. All new compounds have been fully characterised and their spectral data are in accord with the proposed structures.

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