The thesis entitled **"Palladium-Catalyzed Stereo-Controlled Synthesis of 2-Deoxy Aryl-*C*-Glycosides"**demonstrated various methods for the synthesis of 2-deoxy aryl-*C*-glycosides. The content of the thesis has been divided into six chapters including this chapter.

The chapter 1 provides a general introduction to different types of glycosides including *O*-glycosides, *C*-glycosides,*N*-glycosides and *S*-glycosides. Further,their biological relevance and synthetic approaches were discussed.More emphasis has been given on the previous synthetic approaches developed for the preparation of aryl-*C*-glycosides (**Figure 6.1**).

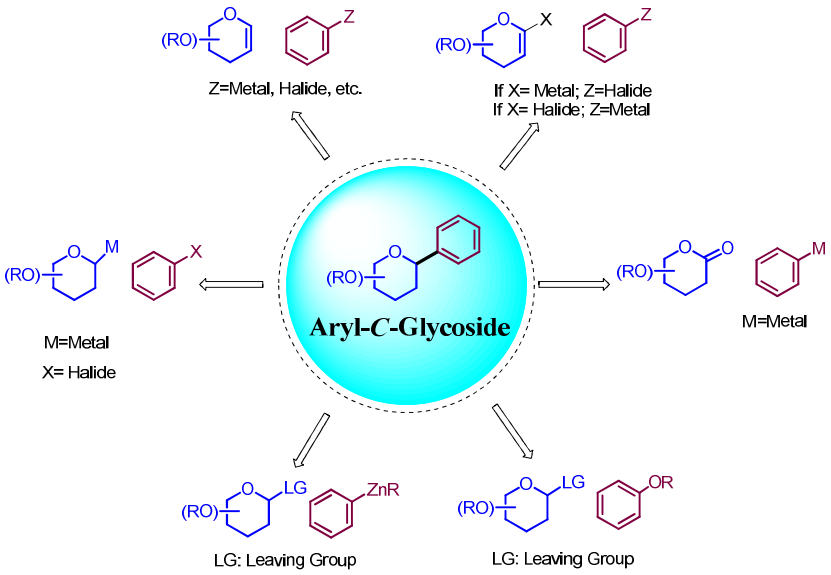
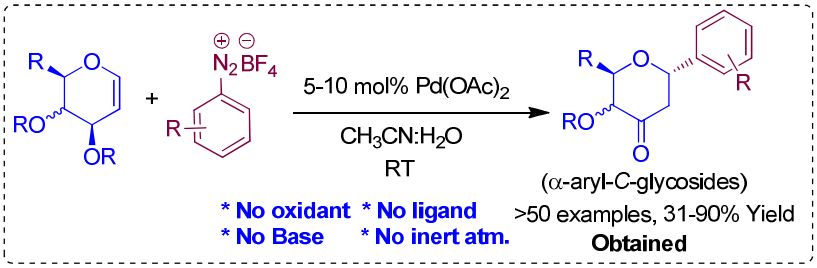


Figure 6.1 Different routes for the synthesis of aryl-*C*-glycosides

The chapter 2 describes the palladium catalyzed stereo-controlled synthesis of α-aryl-*C*-glycosides from glycals and arenediazonium salts at room temperature**.** Arenediazoniumsalts highly reactive aryl donors explored in different organic

transformations. Indeed, arenediazonium saltshave been considered as an efficient alternative to aryl halides and arylboronic acids in many palladium catalyzed cross-coupling reactions thatworks under mild condition in the absence of ligands and additives (**scheme 6.1**).

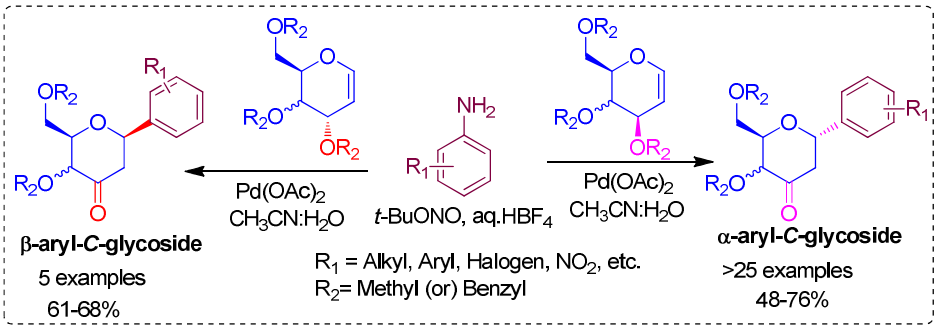


Scheme 6.1 Pictorial presentation of Chapter-2

In this context, here we have investigated the application of arenediazonium salts for the preparation of aryl-*C*-glycosides from glycals in the presence of palladium catalysts. To our delight, a wide range of protected glycals including D-glucals, D-galactals, L-rhamanal, D-xylal and D-ribal underwent stereocontrolled*C*-glycosylation with different arenediazonium tetrafluoroborates bearing electron donating and withdrawing groups. The reactions proceeded at room temperature in the presence of 5-10 mol% of palladium acetate and gave 2-deoxy-3-keto *α*-aryl *C*-glycosides in good to excellent yields in a stereo-controlled manner. Glycals with different protecting groups including methyl, ethyl, benzyl and methoxymethyl (MOM) are compatible under standard reaction condition. This simple method does not require base or ligand or additives, and thus providing scope for wide applications in organic synthesis.

The chapter 3 focused on development of efficient and practical one-pot method for the synthesis of both α- and β-2-deoxy aryl-*C*-glycosides stereospecificallyusing glycals

and anilines in the presence of palladium acetate and *tert*-butyl nitrite (t-BuONO) (Table 3). *tert*-Butyl nitrite (TBN) has been employed as nitroso source for diazotization of anilines. This one-pot procedure overcomes the demerits associated with chapter 2 such as synthesis, isolation and handling of explosive arenediazonium salts. Various protected glycals (e.g. tri-*O*-benzyl-D-glucal, tri-*O*-benzyl-D-galactal, di-*O*-benzyl-L-rhamnal, di-*O*-benzyl-D-rhamnal) underwent *C*-arylation with different anilines in the presence of 10 mol% $Pd(OAc)_2$ and gave corresponding 2,3-deoxy-3-keto α-aryl *C*-glycosides. The yields of the one-pot reaction are comparable to that of arenediazonium salts as described in chapter 1 (**scheme 6.2**).

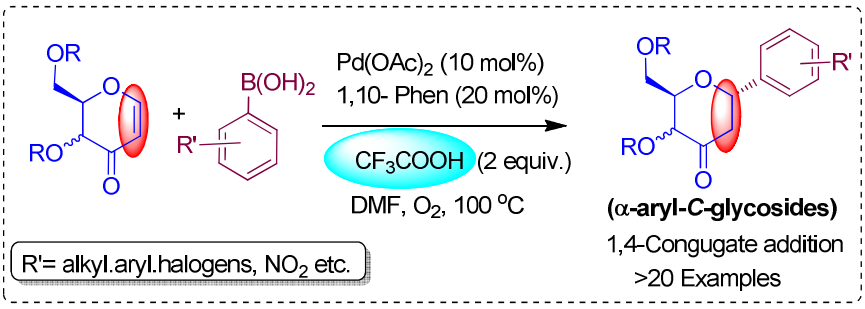


Scheme 6.2 Pictorial presentation of Chapter-3

Further,it was identified that the stereochemistry at the anomeric position is controlled by the stereocenter at *C*-3 position in glycals.To shed the light on mechanism of the reaction, a different C-3 inverted glycals (i.e. *anti*-glycals) have been prepared and subjected to the*C*-arylation under optimized condition. To our delight, this reaction provided 2,3-deoxy-3-keto β-aryl-*C*-glycosides exclusively.

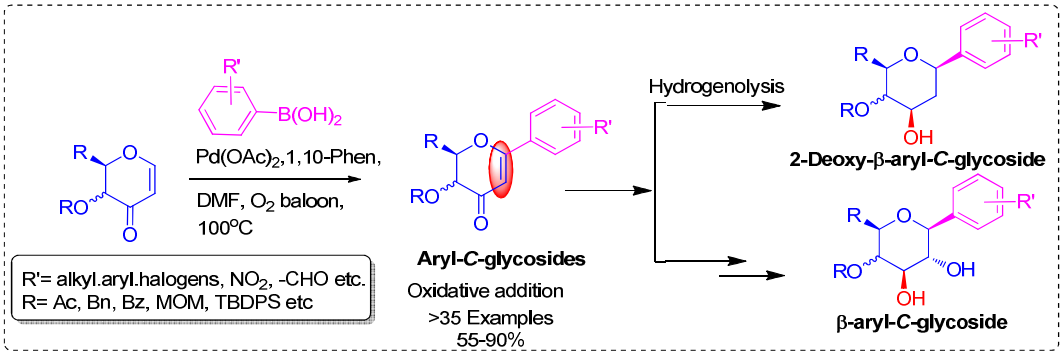
Asymmetric conjugate addition has become a powerful synthetic tool for the assembly of structurally complex organic molecules. **In this context, the chapter 4 describes** the

utility of enones derived from glycal (i.e. glycal-enones) for the synthesis of 2-deoxy-*α*-aryl-*C*-glycosides via 1,4-conjucate addition reaction with arylboronic acids.The reaction was catalyzed by palladium acetate and 1,10-phenanthroline in the presence of acid at 100 ^{o}C. Various benzyl protected enones derived from corresponding glycals (i.e. D-glucal, D-galactal, L-rhamnal and D-rhamnal) were smoothly underwent *C*-glycosylation reactionswith different arylboronic acids bearing electron donating and withdrawing groups.However, a strongly electron-withdrawing group, i.e. -NO_2 substituted arylboronic acid did not participate in the reaction.Different protecting groups including acetyl, MOM and TBS found to be intact under optimized conditions. Overall this protocol provides 2-deoxy-α-aryl-*C*-glycosides in moderate to good yields (**scheme 6.3**).



Scheme 6.3 Pictorial presentation of Chapter-4

The chapter 5 discloses the preparation of 2-deoxy-*β*-aryl-*C*-glycosides from glycal-enones via two-step process i.e. i) palladium catalyzed regioselective oxidative Heck-coupling between arylboronic acids and glycal-enones, and ii) stereoselectivehydrogenation of resulted *C*-1 arylatedglycal-enones (**scheme 6.4**).



Scheme 6.4 Pictorial presentation of Chapter-5

The first step, i.e. preparation of *C*-1 arylatedglycal-enones was achieved using 10 mol% palladium acetate in the presence of 1,10-phenanthroline ligand. The reaction was carried out in DMF solvent under O_2 atmosphere for 4-24 h at 100 °C in the absence of other additives**.** Various enones derived from D-glucal, D-galactal, D-rhamnal, L-rhamnal and L-arabinal bearing different protecting groups underwent oxidative *C*-1 arylation with different arylboronic acids in good to excellent yields. Electron withdrawing group functionalized arylboronic acidstookrelatively longer time in the coupling reaction when compared with electron-donating groups functionalized arylboronic acids. Different traditional protecting groups including benzyl, benzoyl, acetyl, pivaloyl, MOM and TBDMS on enones were foundto be intact during course of coupling reactions.The second step of the protocol, i.e. stereoselectivehydrogenation of *C*-1arylated glycal-enones with Pd-C/Et_3SiH provided 2-deoxy 3-hydroxy-*β*-aryl-*C*-glycosides in excellent yields. On the other hand, fully deprotected 2-deoxy-*β*-aryl-*C*-glycosides were obtained from benzyl-protected *C*-1 aryl enones using Pd-C/H_2 in methanol.

Further, a different synthetic application of *C*-1 arylatedglycal-enones was investigated**.** For instance, a regioselective *C*-2 halogenation (i.e. chlorination, bromination and iodination) of *C*-1 arylatedenone was achieved in excellent yields in the presence of corresponding *N*-halosuccinimides. Likewise, a palladium catalysed regioselective*C*-2 vinylation of *C*-1 arylatedenone was achieved with different styrenes under mild conditions.

Overall, the current thesis describes new synthetic routes for the preparation of 2-deoxy-aryl-*C*-glycosides with high regio- and stereoselectivity under mild conditions. These synthetic methodologies are expected to find promising applications in organic synthesis.