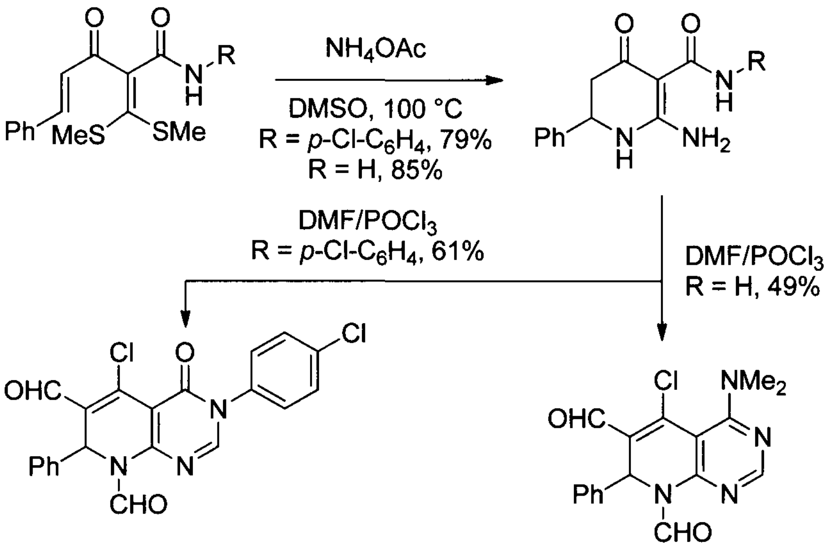
converted to 4-substituted pyrido[2,3-*d*]-pyrimidines upon treatment with a guanidine system with microwave irradiations.

A convenient synthesis of highly functionalized dihydropyrido[2,3-*d*]pyrimidines via a double [5 + 1]-annulations strategy was developed.[33] The double annulation route starts from easily available α-alkenoyl-α-carbamoyl ketene-(*S,S*)-acetals. 2-Amino-3-carbamoyl-5,6-dihydro-4-pyridones was firstly created in excellent yield by a formal [5C + 1N] annulation reaction of ketene-(*S,S*)-acetals with ammonia. In the second step, 7,8-dihydropyrido[2,3-d]pyrimidin-4(3*H*)-ones (when R = aryl) and 7,8-dihydropyrido[2,3-d]pyrimidines (when R = H), were prepared in good yields by reacting 2-amino-3-carbamoyl-5,6-dihydro-4-pyridones with excessive Vilsmeier reagent (DMF/$POCl_3$) via a second [5 + 1] annulation step.



One of the reasons why many reactions were never attempted in water was because of the insolubility of many organic compounds in this media. But at a higher temperature, some reactions become more accessible. In addition to a high temperature, if higher pressures are also applied, then the solubility of organic compounds in water could be even improved in a greater extent. Therefore, the use of the microwave synthesizer, which allows for both high temperatures and higher pressures, may be very beneficial for running reactions when poor solubility is a limiting factor. A preliminary investigation indicated that the reaction of 1,3-diketones with benzamidine hydrochloride afforded pyrimidines in a good yield.[34]