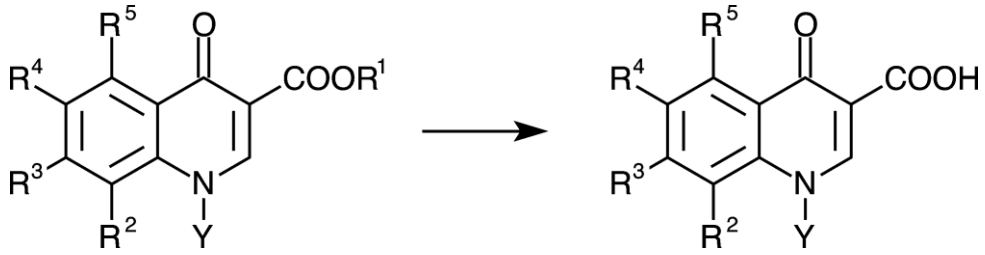
Claims

1. A method for hydrolysis of one or more quinolonecarboxylic esters of formula (II) to obtain one or more quinolonecarboxylic acids of formula (I):



(II) (I)

wherein in formula (II) R^1 is C_1-C_4-alkyl and

concordantly in formulae (I) and (II):

R^2 is hydrogen, C_1-C_4-alkyl, C_1-C_4-alkoxy, halogen, nitro or cyano,

R^3 and R^4 are each a halogen,

R^5 is hydrogen, C_1-C_4-alkyl, halogen or nitro, and

Y is C_1-C_6-alkyl, cyclopropyl or phenyl, each of which can optionally be substituted by halogen,

wherein R^2 and Y together can also be a $-CH_2-CH_2-O-$ or $-CH(CH_3)-CH_2-O-$ bridge bonded to the nitrogen atom by a carbon atom and

wherein at least one of the radicals R^2 to R^5 is fluorine,

comprising:

A) reacting one or more compounds of formula (II) with a mixture comprising acetic acid, sulfuric acid and water

wherein

in A), ≥ 30 to ≤ 40 mol of acetic acid, ≥ 0.3 to ≤ 1 mol of sulfuric acid and ≥ 0.9 to ≤ 2.5 mol of water are used per mole of compounds of formula (II).

2. The method according to Claim 1, wherein in A) ≥ 95 mol% of the compounds of formula (II) used are converted to one or more compounds of formula (I).

3. The method according to Claim 1, wherein the reaction in A) is carried out at a temperature of ≥ 90 to ≤ 99°C.

4. The method according to Claim 1, wherein concordantly in formulae (I) and (II):

R^2 is hydrogen, methyl, methoxy, fluorine, chlorine, nitro or cyano,

R^3 is fluorine or chlorine,

R^4 is fluorine,

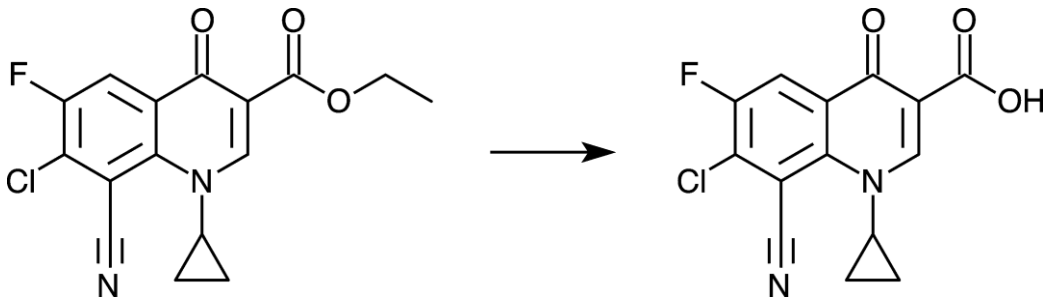
R^5 is hydrogen, methyl, fluorine, chlorine or nitro,

Y is methyl, ethyl, isopropyl, cyclopropyl, fluorocyclopropyl, 4-fluorophenyl or 2,4-difluorophenyl

and in formula (I) R^1 is methyl or ethyl.

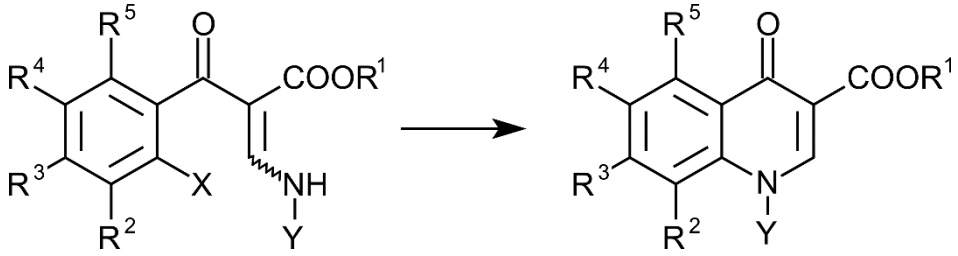
5. The method according to Claim 1, wherein formula (I) is 1-cyclopropyl-6,7,8-trifluoro-1,4-dihydro-4-oxo-3-quinolinecarboxylic acid, 1-cyclopropyl-6,7-difluoro-1,4-dihydro-4-oxo-3-quinolinecarboxylic acid, 1-cyclopropyl-6,7-difluoro-8-cyano-1,4-dihydro-4-oxo-3-quinolinecarboxylic acid, 1-(2-fluoro)cyclopropyl-6,7-difluoro-1,4-dihydro-4-oxo-3-quinolinecarboxylic acid, 1-cyclopropyl-8-chloro-6,7-difluoro-1,4-dihydro-4-oxo-3-quinolinecarboxylic acid, 1-ethyl-6,7,8-trifluoro-1,4-dihydro-4-oxo-3-quinolinecarboxylic acid or 1-cyclopropyl-6-fluoro-7-chloro-8-cyano-1,4-dihydro-4-oxo-3-quinolinecarboxylic acid.

6. The method according to Claim 1, wherein formulae (II) and (I) have the following definition according to formulae (II-1) and (I-1) respectively:



(II-1) (I-1)

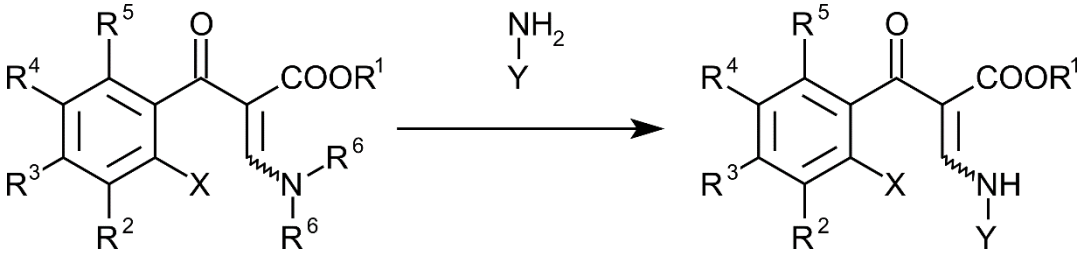
7. The method according to Claim 1, wherein the one or more compounds of formula (II) are obtainable by reacting one or more compounds of formula (III):



(III) (II)

wherein X is halogen.

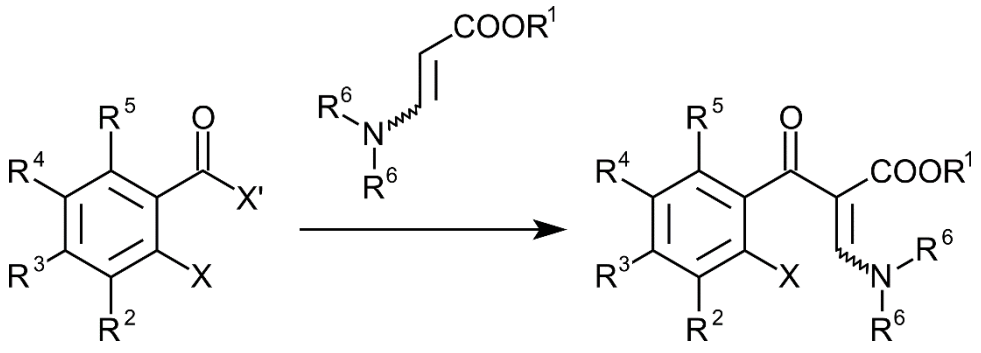
8. The method according to Claim 7, wherein the one or more compounds of formula (III) are obtainable by reacting one or more compounds of formula (IV):



(IV) (III)

and wherein R^6 is C_1-C_4-alkyl.

9. The method according to Claim 8, wherein the one or more compounds of formula (IV) are obtainable by reacting one or more compounds of formula (V):



(V) (IV)

and wherein X' is halogen.