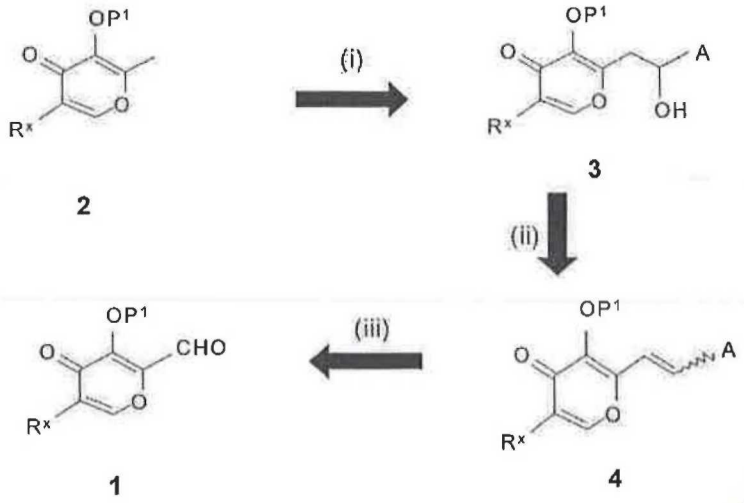
What is claimed is:

1. A process of producing an aldehyde of the formula **1**:



wherein

P^1 is hydrogen or a hydroxyl protecting group;

R^x is hydrogen, halo , or R^2-X-NR^1-C(O)-;

R^1 is hydrogen or lower alkyl;

X is a single bond, a heteroatom group selected from O, S, SO, SO_2, and NH or loweralkylene or lowerlalkylene wherein each may be intervened by a heteroatom;

R^2 is optionally substituted aryl; and

A is alkyl or aryl,

which comprises the steps of:

i) reacting pyrone **2** with an aldehyde of formula A-CHO to produce the alcohol **3**;

ii) reacting the alcohol **3** with a dehydrating reagent to produce the triene **4**; and

iii) reacting the triene **4** with an oxidating reagent to produce the aldehyde of formula **1**.

2. The process of Claim 1, wherein P^1 is a hydroxyl protecting group and and R^x is hydrogen, A is phenyl and the wavy line bond in triene **4** is a trans bond.

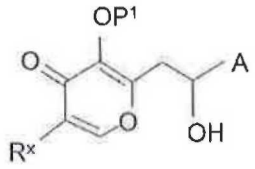
3. The process of Claim 1, wherein step (i) is conducted in the presence of a base.

4. The process of Claim 1, wherein step (ii) is conducted in the presence of base.

5. The process of Claim 1, wherein the oxidating reagent is ruthenium reagent .

6. The process of Claim 6, wherein the ruthenium reagent is ruthenium tetroxide generated in situ.

7. An alcohol of the following formula **3**:



3

. wherein

P^1 is hydrogen or a hydroxyl protecting group;

R^x is hydrogen, halo , or R^2-X-NR^1-C(O)-;

R^1 is hydrogen or lower alkyl;

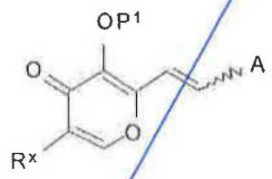
X is a single bond, a heteroatom group selected from O, S, SO, SO_2, and NH or loweralkylene or lowerlalkylene wherein each may be intervened by a heteroatom;

R^2 is optionally substituted aryl; and

A is alkyl or aryl

8. The alcohol of Claim 7, wherein P^1 is a hydroxyl protecting group and R^x is hydrogen, and A is phenyl

9. A triene of the following formula **4**:



4

wherein

P^1 is hydrogen or a hydroxyl protecting group;

R^x is hydrogen, halo , or R^2-X-NR^1-C(O)-;

R^1 is hydrogen or lower alkyl;

X is a single bond, a heteroatom group selected from O, S, SO, SO_2, and NH or loweralkylene or lowerlalkylene wherein each may be intervened by a heteroatom;

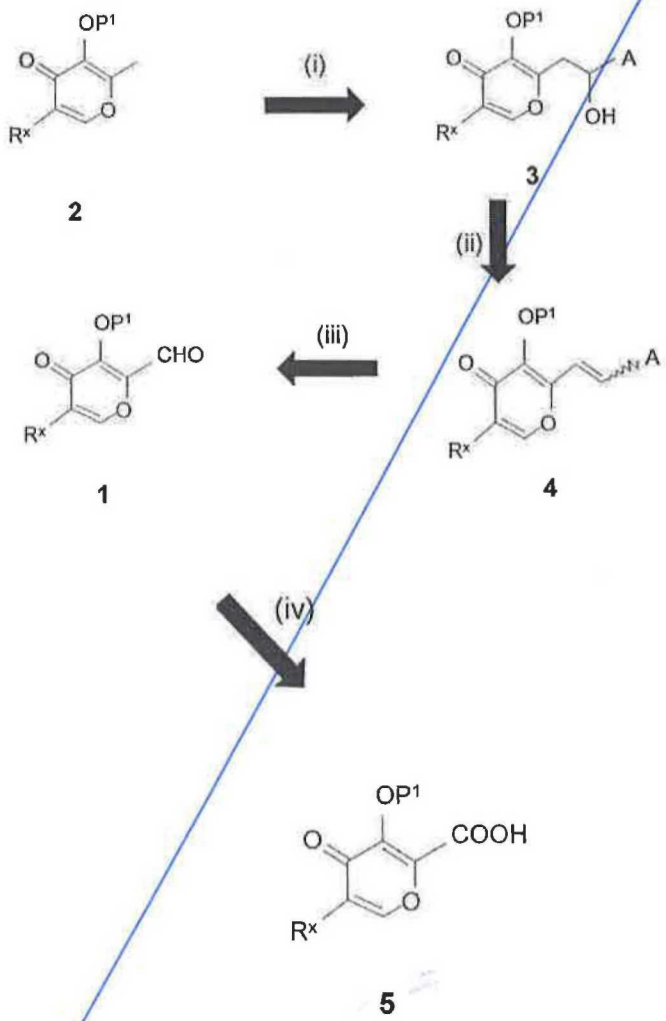
R^2 is optionally substituted aryl; and

A is alkyl or aryl; and

the wavy line bond is either cis or trans.

10. The triene of Claim 9, wherein P^1 is a hydroxyl protecting group and R^x is hydrogen, A is phenyl and the wavy line bond is trans.

11. A process of producing a carboxylic acid of the following formula **5**:



wherein

P^1 is hydrogen or a hydroxyl protecting group;

R^x is hydrogen, halo , or R^2-X-NR^1-C(O)-;

R^1 is hydrogen or lower alkyl;

X is a single bond, a heteroatom group selected from O, S, SO, SO_2, and NH or loweralkylene or lowerlalkylene wherein each may be intervened by a heteroatom;

R^2 is optionally substituted aryl; and

A is alkyl or aryl,

which comprises the steps of:

i) reacting pyrone **2** with an aldehyde of formula A-CHO to produce the alcohol **3**;

ii) reacting the alcohol **3** with a dehydrating reagent to produce the triene **4**;

iii) reacting the triene **4** with an oxidating reagent to produce the aldehyde of formula **1**: and

iV) oxidizing the aldhyde of formul **1** to produce the carboxylic acid of formula **5**.

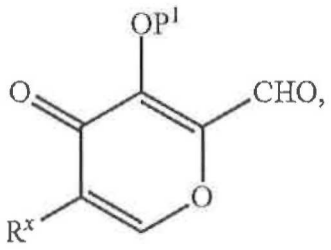
12. A process of producing a carboxylic acid of the following formula **5**: which comprises the steps of:

iii) reacting the triene **4** with an oxidating reagent to produce the aldehyde of formula **1**: and

iV) oxidizing the aldhyde of formul **1** to produce the carboxylic acid of formula **5**.

What is claimed is:

1. A process of producing an aldehyde of formula 1,

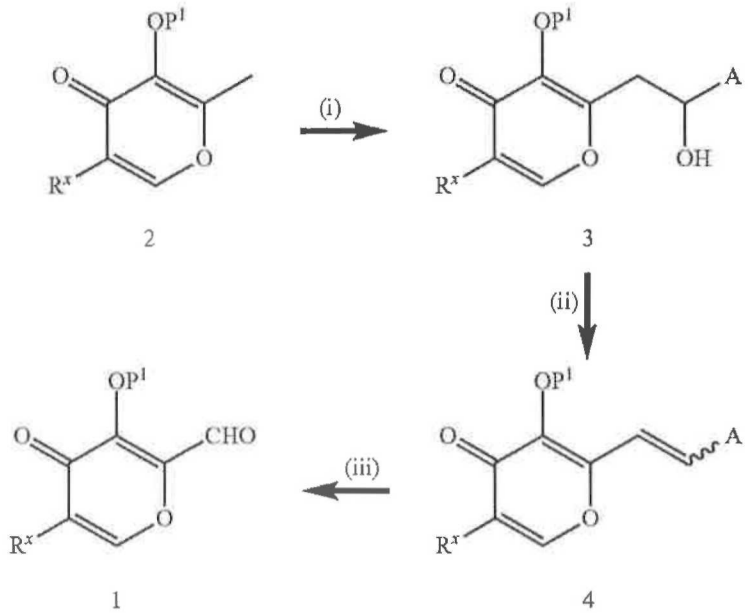


which comprises the steps of:

(i) reacting a pyrone of formula 2 with an aldehyde of formula A-CHO to produce an alcohol of formula 3;

(ii) reacting the alcohol of the formula 3 with a dehydrating reagent to produce a triene of formula 4; and

(iii) reacting the triene of the formula 4 with an oxidating reagent to produce the aldehyde of the formula 1,



wherein:

P^1 is hydrogen or a hydroxyl protecting group;

R^x is halogen or R^2—X—NR^1—C(O)—;

R^1 is hydrogen or lower alkyl;

X is a single bond, a heteroatom group selected from the group consisting of O, S, SO, SO_2 and NH, a loweralkylene or a loweralkylene wherein each alkyl may be intervened by a heteroatom;

R^2 is optionally substituted aryl; and

A is aryl.

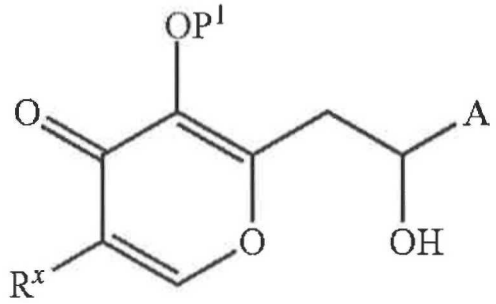
2. The process of claim 1, wherein step (i) is reacted in the presence of a base.

3. The process of claim 1, wherein step (ii) is reacted in the presence of a base.

4. The process of claim 1, wherein the oxidating reagent is a ruthenium reagent.

5. The process of claim 1, wherein the ruthenium reagent is ruthenium tetroxide generated in situ.

6. An alcohol of the following formula 3:



wherein:

P^1 is hydrogen or a hydroxyl protecting group;

R^x is halogen or R^2—X—NR^1—C(O)—;

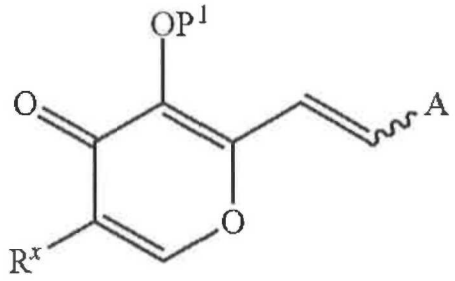
R^1 is hydrogen or lower alkyl;

X is a single bond, a heteroatom group selected from the group consisting of O, S, SO, SO_2 and NH, a loweralkylene or a loweralkylene wherein each alkyl may be intervened by a heteroatom;

R^2 is optionally substituted aryl; and

A is aryl.

7. A triene of the following formula 4:



wherein:

P^1 is hydrogen or a hydroxyl protecting group;

R^x is halogen or R^2—X—NR^1—C(O)—;

R^1 is hydrogen or lower alkyl;

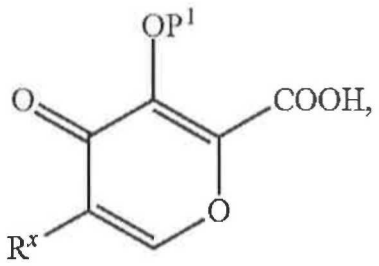
X is a single bond, a heteroatom group selected from the group consisting of O, S, SO, SO_2 and NH, a loweralkylene or lowerlalkylene a loweralkylene wherein each alkyl may be intervened by a heteroatom;

R^2 is optionally substituted aryl;

A is aryl; and

the wavy line bond is either cis or trans.

8. A process of producing a carboxylic acid of formula 5,



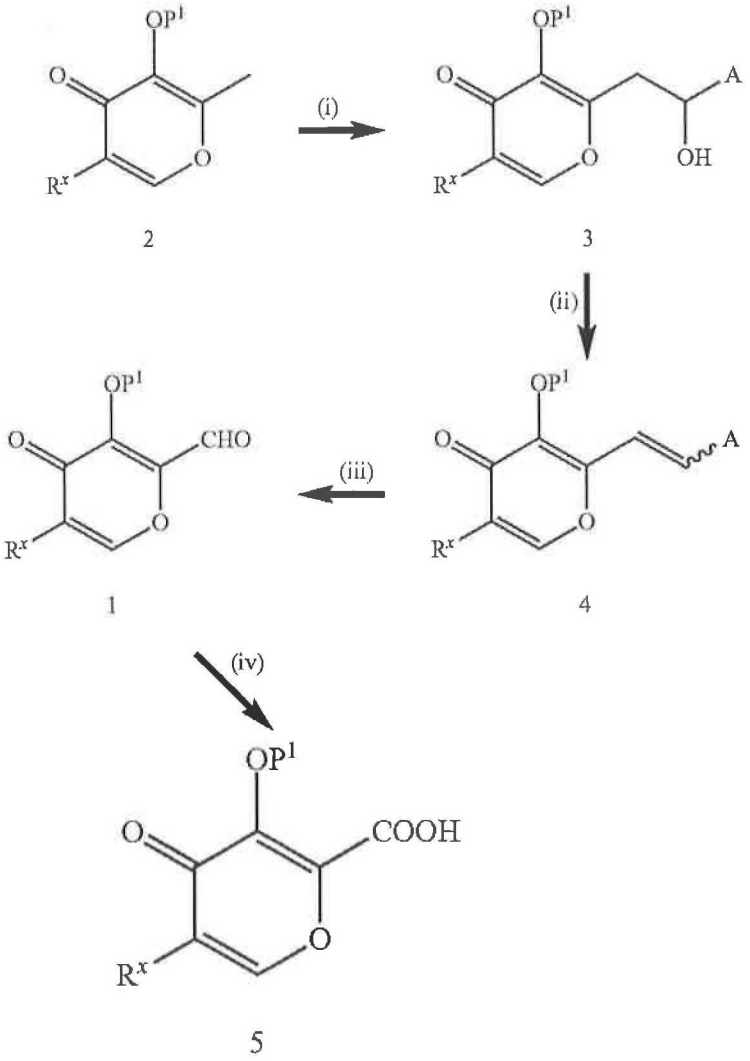
which comprises the steps of:

(i) reacting a pyrone of formula 2 with an aldehyde of formula A-CHO to produce an alcohol of formula 3;

(ii) reacting the alcohol of the formula 3 with a dehydrating reagent to produce a triene of formula 4;

(iii) reacting the triene of the formula 4 with an oxidating reagent to produce an aldehyde of formula 1: and

(iv) oxidizing the aldehyde of the formula 1 to produce the carboxylic acid of the formula 5,



wherein:

P^1 is hydrogen or a hydroxyl protecting group;

R^x is halogen or R^2—X—NR^1—C(O)—;

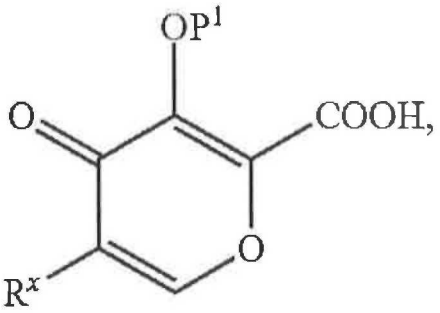
R^1 is hydrogen or lower alkyl;

X is a single bond, a heteroatom group selected from the group consisting of O, S, SO, SO_2--and NH, a loweralkylene or lowerlalkylene a loweralkylene wherein each alkyl may be intervened by a heteroatom;

R^2 is optionally substituted aryl; and

A is aryl.

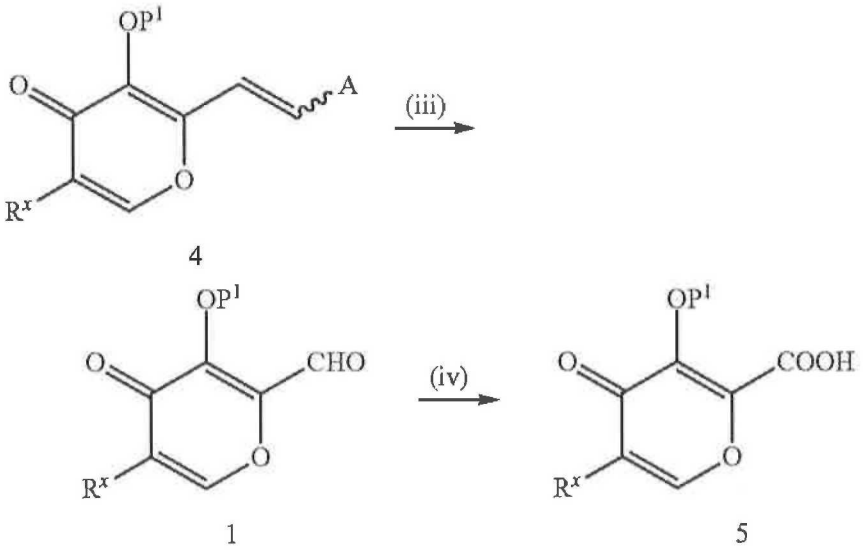
9. A process of producing a carboxylic acid of formula 5,



which comprises the steps of:

(iii) reacting a triene of formula 4 with an oxidating reagent to produce an aldehyde of formula 1; and

(iv) oxidizing the aldehyde of the formula 1 to produce the carboxylic acid of the formula 5,



wherein:

P^1 is hydrogen or a hydroxyl protecting group;

R^x is halogen or R^2—X—NR^1—C(O)—;

R^1 is hydrogen or lower alkyl;

X is a single bond, a heteroatom group selected from the group consisting of O, S, SO, SO_2 and NH, a loweralkylene or a loweralkylene wherein each alkyl may be intervened by a heteroatom;

R^2 is optionally substituted aryl; and

A is aryl.