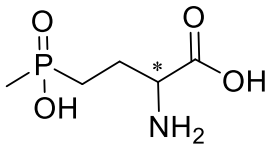
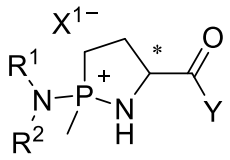
CLAIMS

1. A method of preparing glufosinate represented by formula (I) or its salt or enantiomer, or a mixture of its enantiomers in any ratio, **characterized** in that it comprises:



(I)

hydrolyzing a compound of formula (III) to generate a compound of formula (I);



(III)

wherein:

X^1 is halogen;

Y is $-OR^3$ or $-N(R^4)(R^5)$;

R^1 and R^2 are each independently selected from hydrogen, a C_1-C_6 alkyl group, a C_2-C_6 alkenyl group, a C_2-C_6 alkynyl group, a C_3-C_6 cycloalkyl group, a three-membered to six-membered heterocycloalkyl group, a C_6-C_{10} aryl group, or a five-membered to ten-membered heteroaryl group, or R^1 and R^2 form a three-membered to six-membered heterocycloalkyl group together with the N atom to which they are attached, wherein the C_1-C_6 alkyl group, the C_2-C_6 alkenyl group, the C_2-C_6 alkynyl group, the C_3-C_6 cycloalkyl group, the three-membered to six-membered heterocycloalkyl group, the C_6-C_{10} aryl group, or the five-membered to ten-membered heteroaryl group is optionally substituted by halogen, a carboxyl group, a hydroxyl group, a cyano group, an amino group, a nitro group, a C_1-C_3 alkyl group, a C_1-C_3 haloalkyl group, a C_1-C_3 alkoxy group, a C_3-C_6 cycloalkyl group, or a C_6-C_{10} aryl group;

R^3, R^4, and R^5 are each independently selected from hydrogen, a C_1-C_6 alkyl group, a C_2-C_6 alkenyl group, a C_2-C_6 alkynyl group, a C_3-C_6 cycloalkyl group, a three-membered to six-membered heterocycloalkyl group, a C_6-C_{10} aryl group, or a five-membered to ten-membered heteroaryl group, or R^4 and R^5 form a three-membered to six-membered heterocycloalkyl group together with the N atom to which they are

attached, wherein the C_1-C_6 alkyl group, the C_2-C_6 alkenyl group, the C_2-C_6 alkynyl group, the C_3-C_6 cycloalkyl group, the three-membered to six-membered heterocycloalkyl group, the C_6-C_{10} aryl group, or the five-membered to ten-membered heteroaryl group is optionally substituted by halogen, a carboxyl group, a hydroxyl group, a cyano group, an amino group, a nitro group, a C_1-C_3 alkyl group, a C_1-C_3 haloalkyl group, a C_1-C_3 alkoxy group, a C_3-C_6 cycloalkyl group, or a C_6-C_{10} aryl group; and

* denotes a chiral carbon atom.

2. The method according to claim 1, **characterized** in that the hydrolysis is performed in presence of an acid or an alkali.

3. The method according to claim 2, **characterized** in that the acid is at least one selected from hydrochloric acid, sulfuric acid, hydrobromic acid, hydroiodic acid, phosphoric acid, nitric acid, formic acid, and acetic acid, and is preferably hydrochloric acid or sulfuric acid.

4. The method according to claim 2, **characterized** in that the alkali is selected from hydroxide, carbonate, bicarbonate or basic carbonate of alkali metal or alkaline earth metal, ammonia, organic alkali, or organic amine, and is preferably sodium hydroxide or triethylamine.

5. The method according to claim 1, **characterized** in that the hydrolysis is performed at a temperature of 30°C to 140°C or preferably 70°C to 110°C.

6. The method according to claim 1, **characterized** in that the enantiomer of the glufosinate is L-glufosinate or D-glufosinate.

7. The method according to claim 1, **characterized** in that the mixture of its enantiomers in any ratio comprises L-glufosinate and D-glufosinate in a ratio of 0.1: 99.9 to 99.9: 0.1, or preferably in a ratio of 50: 50 to 99.9: 0.1.

8. The method according to claim 1, **characterized** in that

the halogen is selected from fluorine, chlorine, or bromine;

the C_1-C_6 alkyl group is selected from a methyl group, an ethyl group, a propyl group, or an isopropyl group;

the C_2-C_6 alkenyl group is selected from a vinyl group, a propenyl group, a 1-butenyl group, a 2-butenyl group, or an isobutenyl group;

the C_2-C_6 alkynyl group is selected from an ethynyl group, a propynyl group, a 1-butynyl group, or 2-butynyl group;

the C_3-C_6 cycloalkyl group is selected from a cyclopropyl group, a cyclobutyl group, a cyclopentyl group, or a cyclohexyl group;

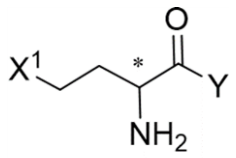
the three-membered to six-membered heterocycloalkyl group is selected from a cyclopropyl group, a cyclobutyl group, a cyclopentyl group, or a cyclohexyl group comprising at least one heteroatom of N, O, or S;

the C_6-C_{10} aryl group is selected from a phenyl group or a naphthyl group; and/or

the five-membered to ten-membered heteroaryl group is selected from a pyrazinyl group, a pyrazolyl group, a pyrrolyl group, a furyl group, a thienyl group, a thiazolyl group, or a pyridyl group.

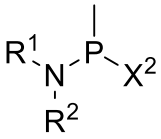
9. The method according to claim 1, **characterized** in that R^1, R^2, R^3, R^4, and R^5 are each independently selected from hydrogen, a C_1-C_6 alkyl group, or a C_3-C_6 cycloalkyl group, and is preferably hydrogen, a methyl group, an ethyl group, a propyl group, an isopropyl group, a butyl group, an isobutyl group, a tert-butyl group, a pentyl group, a hexyl group, a cyclopropyl group, a cyclobutyl group, a cyclopentyl group, or a cyclohexyl group.

10. The method according to claim 1, **characterized** in that the compound of formula (III) is prepared by subjecting a compound of formula (II)

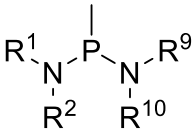


(II)

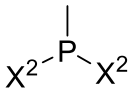
to a reaction with any one of the following compounds or mixtures: a compound of formula (IV); a compound of formula (V); a compound of formula (IV) and a compound of formula (V); a compound of formula (IV) and a compound of formula (VII); a compound of formula (V) and a compound of formula (VII); or a compound of formula (IV), a compound of formula (V), and a compound of formula (VII);



(IV)



(V)



(VII)

wherein:

X^2 is halogen;

R^1, R^2, X^1, Y, and * are as defined in any one of claims 1, 8 or 9; and

R^9 and R^{10} are each independently selected from hydrogen, a C_1-C_6 alkyl group, a C_2-C_6 alkenyl group, a C_2-C_6 alkynyl group, a C_3-C_6 cycloalkyl group, a three-membered to six-membered heterocycloalkyl group, a C_6-C_{10} aryl group, or a five-

membered to ten-membered heteroaryl group, or R^9 and R^{10} form a three-membered to six-membered heterocycloalkyl group together with the N atom to which they are attached, wherein the C_1-C_6 alkyl group, the C_2-C_6 alkenyl group, the C_2-C_6 alkynyl group, the C_3-C_6 cycloalkyl group, the three-membered to six-membered heterocycloalkyl group, the C_6-C_{10} aryl group, or the five-membered to ten-membered heteroaryl group is optionally substituted by halogen, a carboxyl group, a hydroxyl group, a cyano group, an amino group, a nitro group, a C_1-C_3 alkyl group, a C_1-C_3 haloalkyl group, a C_1-C_3 alkoxy group, a C_3-C_6 cycloalkyl group, or a C_6-C_{10} aryl group.

11. The method according to claim 10, **characterized** in that the reaction is performed in presence of a deacid reagent.

12. The method according to claim 11, **characterized** in that the deacid reagent is selected from $NR^{11}R^{12}R^{13}$, wherein R^{11}, R^{12}, and R^{13} are each independently selected from hydrogen, a C_1-C_6 alkyl group, a C_2-C_6 alkenyl group, a C_2-C_6 alkynyl group, a C_3-C_6 cycloalkyl group, a three-membered to six-membered heterocycloalkyl group, a C_6-C_{10} aryl group, or a five-membered to ten-membered heteroaryl group, or any two of R^{11}, R^{12}, and R^{13} form a three-membered to six-membered heterocycloalkyl group together with the N atom to which they are attached, wherein the C_1-C_6 alkyl group, the C_2-C_6 alkenyl group, the C_2-C_6 alkynyl group, the C_3-C_6 cycloalkyl group, the three-membered to six-membered heterocycloalkyl group, the C_6-C_{10} aryl group, or the five-membered to ten-membered heteroaryl group is optionally substituted by halogen, a carboxyl group, a hydroxyl group, a cyano group, an amino group, a nitro group, a C_1-C_3 alkyl group, a C_1-C_3 haloalkyl group, a C_1-C_3 alkoxy group, a C_3-C_6 cycloalkyl group, or a C_6-C_{10} aryl group.

13. The method according to claim 11, **characterized** in that a molar ratio among the compound of formula (II), total usage of the compounds of formulas (IV), (V) and (VII), and the deacid reagent is 1: (0.9-5): (0.9-5), or preferably 1: (1.05-1.5): (1.05-1.5).

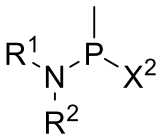
14. The method according to claim 10, **characterized** in that the reaction is performed in absence of a solvent or in presence of an organic solvent.

15. The method according to claim 14, **characterized** in that the organic solvent is selected from an aromatic hydrocarbon solvent, an alkane solvent, a halogenated hydrocarbon solvent, an ether solvent, an ester solvent, an amide solvent, or a sulfur-containing solvent, and preferably, the organic solvent is at least one selected from toluene and chlorobenzene.

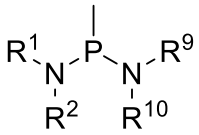
16. The method according to claim 10, **characterized** in that the reaction is performed at a temperature of -20°C to 10°C for 1 to 15 hours, and then at 10°C to 120°C for 0.5 to 24 hours.

17. The method according to claim 1, **characterized** in that the compound of formula (III) is prepared by a method comprising the following steps:

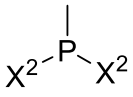
a) subjecting a compound of formula (II) to a reaction with any one of the following compounds or mixtures: a compound of formula (IV); a compound of formula (V); a compound of formula (IV) and a compound of formula (V); a compound of formula (IV) and a compound of formula (VII); a compound of formula (V) and a compound of formula (VII); or a compound of formula (IV), a compound of formula (V), and a compound of formula (VII);



(IV)

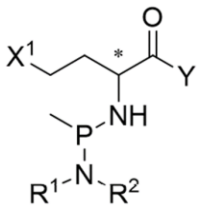


(V)



(VII)

to obtain the compound of formula (VI);



(VI)

and

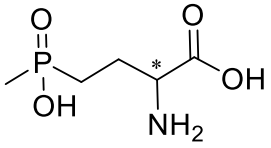
b) preparing the compound of formula (III) via a reaction with the compound of formula (VI);

wherein X^1, X^2, Y, R^1, R^2, R^9, R^{10}, and * are as defined in claim 10.

18. The method according to claim 17, **characterized** in that the reaction in step a) is performed at a temperature of -20°C to 10°C for 1 to 15 hours.

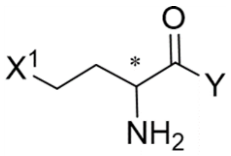
19. The method according to claim 17, **characterized** in that the reaction in step b) is performed at a temperature of 10°C to 120°C for 0.5 to 24 hours.

20. A method of preparing glufosinate represented by formula (I) or its salt or enantiomer, or a mixture of its enantiomers in any ratio, **characterized** in that it comprises the following steps:



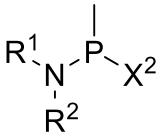
(I)

in absence of a solvent or in presence of an organic solvent, subjecting a compound of formula (II)

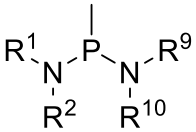


(II)

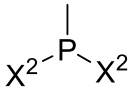
to a reaction with any one of the following compounds or mixtures: a compound of formula (IV); a compound of formula (V); a compound of formula (IV) and a compound of formula (V); a compound of formula (IV) and a compound of formula (VII); a compound of formula (V) and a compound of formula (VII); or a compound of formula (IV), a compound of formula (V), and a compound of formula (VII), to obtain an intermediate; and



(IV)



(V)



(VII)

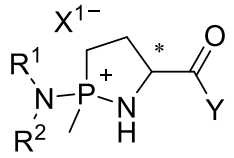
hydrolyzing the intermediate under an acidic, neutral, or alkaline condition, to obtain a compound of formula (I);

wherein X^1, X^2, Y, R^1, R^2, R^9, R^{10}, and * are as described in claim 10.

21. A method according to claim 20, **characterized** in that the compound of formula (IV), the compound of formula (V), and the compound of formula (VII) are obtained by in situ reaction, preferably, the compound of formula (IV) is obtained by the in-situ reaction of the compound of formula (VII) and the compound of formula (VIII) NHR^1R^2; the compound of formula (IV) is obtained by the in-situ reaction of the compound of formula (V) and the compound of formula (VII); and/or the compound of formula (V) is obtained by the in-situ reaction of the compound of formula (VII) and the compound of formula (VIII) NHR^1R^2, and R^9 and R^{10} correspond to R^1 and R^2, respectively.

22. A compound formula (III) or its salt or enantiomer, or a mixture of its

enantiomers in any ratio;

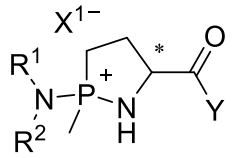


(III)

characterized in that X^1, Y, R^1, R^2, and * are as defined in any one of claims 1, 8 or 9.

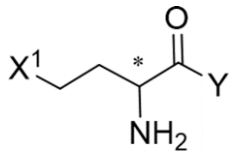
23. The compound of formula (III) or its salt or enantiomer, or the mixture of its enantiomers in any ratio according to claim 22, **characterized** in that the compound of formula (III) or its salt or enantiomer, or the mixture of its enantiomers in any ratio is prepared by the steps in the method of any one of claims 10 to 19.

24. A method of preparing a compound of formula (III) or its salt or enantiomer, or a mixture of its enantiomers in any ratio, **characterized** in that it comprises:



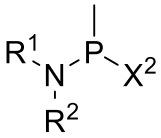
(III)

subjecting a compound of formula (II)

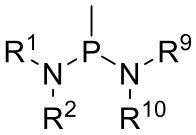


(II)

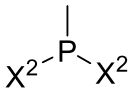
to a reaction with any one of the following compounds or mixtures: a compound of formula (IV); a compound of formula (V); a compound of formula (IV) and a compound of formula (V); a compound of formula (IV) and a compound of formula (VII); a compound of formula (V) and a compound of formula (VII); or a compound of formula (IV), a compound of formula (V), and a compound of formula (VII);



(IV)



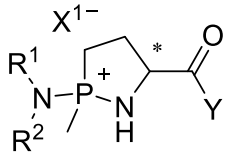
(V)



(VII)

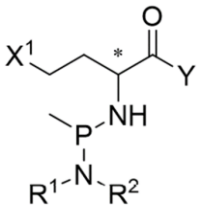
wherein X^1, X^2, Y, R^1, R^2, R^9, R^{10}, and * are as described in claim 10.

25. A method of preparing a compound of formula (III) or its salt or enantiomer, or a mixture of its enantiomers in any ratio, **characterized** in that it comprises:



(III)

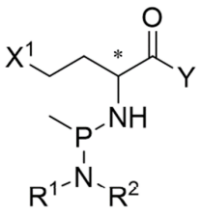
preparing the compound of formula (III) from a reaction with the compound of formula (VI);



(VI)

wherein X^1, Y, R^1, R^2, and * are as described in claim 10.

26. A compound formula (VI) or its salt or enantiomer, or a mixture of its enantiomers in any ratio;

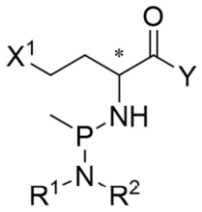


(VI)

characterized in that X^1, Y, R^1, R^2, and * are as described in any one of claims 1, 8 or 9.

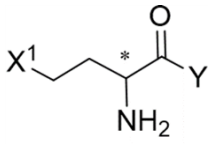
27. The compound of formula (VI) or its salt or enantiomer, or the mixture of its enantiomers in any ratio according to claim 26, **characterized** in that the compound of formula (VI) or its salt or enantiomer, or the mixture of its enantiomers in any ratio is prepared by the steps in the method as defined in any one of claims 17 to 19.

28. A method of preparing a compound of formula (VI) or its salt or enantiomer, or a mixture of its enantiomers in any ratio, **characterized** in that it comprises:



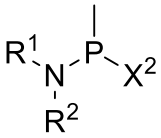
(VI)

subjecting a compound of formula (II)

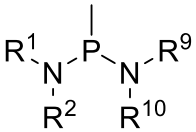


(II)

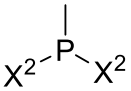
to a reaction with any one of the following compounds or mixtures: a compound of formula (IV); a compound of formula (V); a compound of formula (IV) and a compound of formula (V); a compound of formula (IV) and a compound of formula (VII); a compound of formula (V) and a compound of formula (VII); or a compound of formula (IV), a compound of formula (V), and a compound of formula (VII);



(IV)



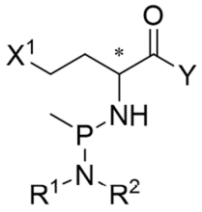
(V)



(VII)

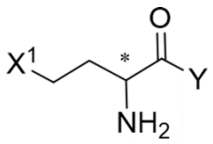
wherein X^1, X^2, Y, R^1, R^2, R^9, R^{10}, and * are as described in claim 10.

29. A method of preparing a compound of formula (VI) or its salt or enantiomer, or a mixture of its enantiomers in any ratio, **characterized** in that it comprises:



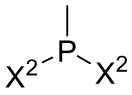
(VI)

subjecting a compound of formula (II)

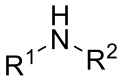


(II)

to a reaction with a compound of formula (VII) and a compound of formula (VIII)



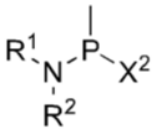
(VII)



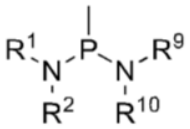
(VIII)

wherein X^1, X^2, Y, R^1, R^2, and * are as described in claim 10.

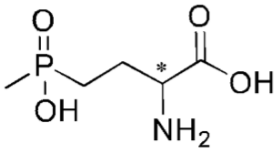
30. Use of a compound of formula (IV) or a compound of formula (V), **characterized** in that it is in the preparation of glufosinate represented by formula (I) or its salt or enantiomer, or a mixture of its enantiomers in any ratio:



(IV)



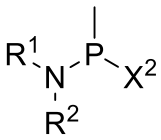
(V)



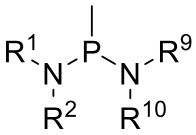
(I)

wherein X2, R1, R2, R9, R10, and * are as described in claim 10.

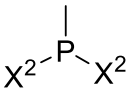
31. A composition, **characterized** in that it comprises a compound of formula (IV) and a compound of formula (V); a compound of formula (IV) and a compound of formula (VII); or a compound of formula (IV), a compound of formula (V), and a compound of formula (VII);



(IV)



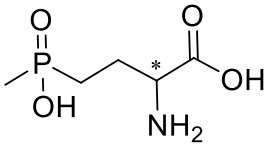
(V)



(VII)

wherein X^2, R^1, R^2, R^9, R^{10}, and * are as described in claim 10.

32. Use of the composition as defined in claim 31 **characterized** in that it is in preparation of glufosinate represented by formula (I) or its salt or enantiomer, or a mixture of its enantiomers in any ratio:



(I)

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