Application solution of cations in glyphosate by ion chromatography

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Foreword

It is understood that the low-end glyphosate salt in the market is usually posed as the high-end glyphosate salt, which people can make huge profits from it and disturbs the market environment of glyphosate preparations.Taking 30%glyphosate solution as an example, 33% glyphosate ammonium salt solution is commonly used as 41% glyphosate isopropylamine salt solution.The dates show that there is 60-70 percent of 41% solution which have the above situation.

Pure glyphosate is not soluble in water, but glyphosate salt is soluble in water and easy to use.It is usually made into glyphosate ammonium salt,such as isopropylamine salt and dimethylamine salt,and can also be made into sodium salt.Glyphosate salt can be dissolved in water. Glyphosate is white or yellowish crystalline powder,and soluble in water, acetone, chlorobenzene, ethanol, kerosene and xylene.By detecting the content of cations in glyphosate, we can accurately judge the types of glyphosate preparations, and provide a basis for cracking down on illegal profit-making.

Standard introduction

New standard GB/T 20684-2017 *Glyphosate aqueous solution* mainly has the following changes:

—Glyphosate mass fraction is changed from marked value to specific value;

—Increase the corresponding cation control index and analysis method;

—Formaldehyde control index is revised from no more than 10g/kg to no more than 0.6g/kg;

—Increasing the control index and corresponding analytical method of nitroso glyphosate;

Among them, the cation analysis method is ion chromatography, mainly for sodium, potassium, ammonium, dimethylamine, isopropylamine and so on.The specific control indicators are as follows:

Table1 Glyphosate aqueous solution cations control item indicator

Item	Indicator			
	30%	35%	41%	46%

Glyphosate mass fraction/%	30.0±1.5	35.0±1.8	41.0±2.1	46.0±2.3
Sodium ion mass fraction/%，≥	3.9	4.5	5.3	5.9
potassium ion mass fraction/%，≥	6.6	7.7	9.0	10.1
ammonium ion mass fraction/%，≥	3.0	3.5	4.2	4.7
Dimethylamine ion mass fraction /%，≥	7.8	9.1	10.6	11.9
Isopropylamine ion mass fraction/%，≥	10.1	11.8	13.8	15.5

GB/T 20686-2017 *Glyphosate water soluble powders (granules)* as an alternative to GB/T 20686-2006 *Glyphosate water soluble powders (granules)* mainly has the following changes:

—Glyphosate mass fraction is changed from marked value to specific value;

—Increase the corresponding cation control index and analysis method;

—Increasing the control index and corresponding analytical method of nitroso glyphosate;

—Increasing the control index and corresponding analytical method of Glyphosate water soluble powders (granules) ;

—The pH value control index was cancelled.

Among them, the cation analysis method is ion chromatography, mainly for sodium, potassium, ammonium, dimethylamine, isopropylamine and so on.

Table 2 Glyphosate water soluble powders (granules) cations control item indicator

Item	Indicator				
	30%	50%	58%	65%	80%
Glyphosate mass fraction/%	30.0±1.5	50.0±2.5	58.0±2.5	65.0±2.5	
Sodium ion mass fraction/%，≥	3.9	6.5	7.5	8.5	
potassium ion mass fraction/%，≥	6.6	11.0	12.8	14.5	
ammonium ion mass fraction/%，≥	3.0	5.1	5.9	6.7	8.3
Isopropylamine ion mass fraction/%，≥	10.1	16.9	19.7	22.2	

Table 2 Glyphosate water soluble powders (granules) cations control item indicator

Item	Indicator					
	50%	58%	63%	68%	80%	86%
Glyphosate mass fraction/%	50.0±2.5	58.0±2.5	63.0±2.5	68.0±2.5	80.0±2.5	86.0±2.5
Sodium ion mass fraction/%，≥	6.5	7.5	8.5	8.9		
potassium ion mass fraction/%，≥	11.0	12.8	14.5	15.1		

ammonium ion mass fraction/%，≥	5.1	5.9	6.5	7.0	8.3	8.9
Dimethylamine ion mass fraction/%，≥	12.9	15.1	16.5	17.9		
Isopropylamine ion mass fraction/%，≥	16.9	19.7	21.5	23.3		

Test method

The test of sodium,potassium ,ammonium,dimethylamineand isopropylamine :

Ion chromatography(the only method)： The sample is dissolve with water, methanesulfonic acid aqueous solution is regarded as mobile phase and use ion chromatograph with cation analysis column and conductivity detector to separate and detect sodium,potassium ,ammonium,dimethylamineand isopropylamine.

Pretreatment

Weigh 0.1g sample (accurate to 0.0001g), place it in a 100mL volumetric flask, dilute it to the scale, then shake it up.Absorb the above solution 5mL with a suction pipet and put it in 50mL volumetric flask, dilute it to scale, and shake well.Before the sample is tested,please use 0.45μm membrane to filter and then directly detect the sample which is filtered.

Chromatographic condition

- IC type：CIC-D120
- Analysis column：SH-CC-3
- Guard column：SH-G-1

- Eluent：3.0 mM Methane sulfonic acid
- Flow rate：1.0 mL/min
- Detection method：Suppressed conductivity detection

Sample determination

Under the above chromatographic conditions, several needles of sodium chloride (potassium chloride, ammonium chloride, dimethylamine hydrochloride, isopropylamine) standard solution were injected continuously until the relative change of peak area of adjacent two needles of sodium ions (potassium ion, ammonium ion, dimethylamine ion, isopropylamine ion) was less than 2%.Then according to the sequence of standard liquid,test solution,test solution,standard liquid,detect.

Application case

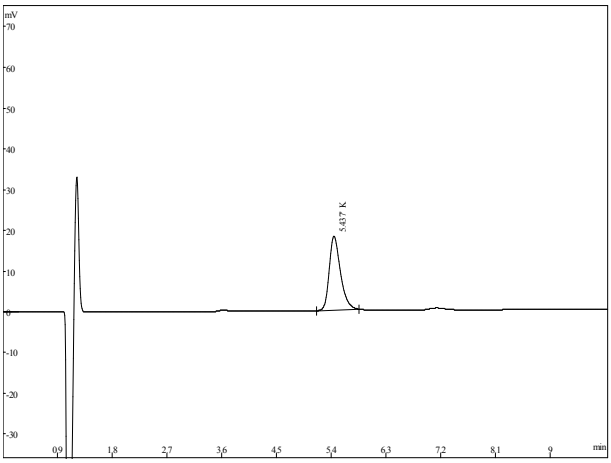

Table1 glyphosate potassium salt sample chromatogram

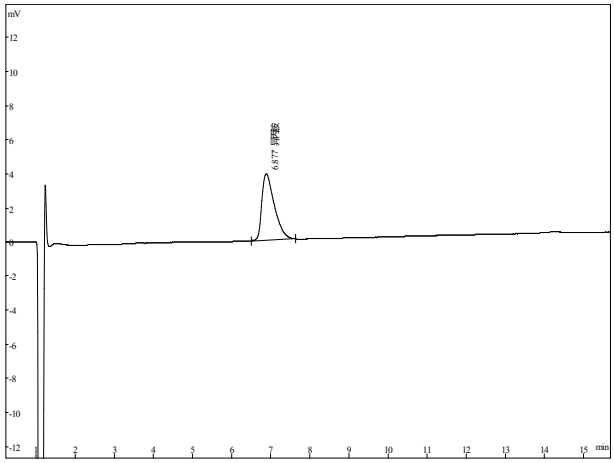

Table 2 glyphosate isopropylamine salt sample chromatogram

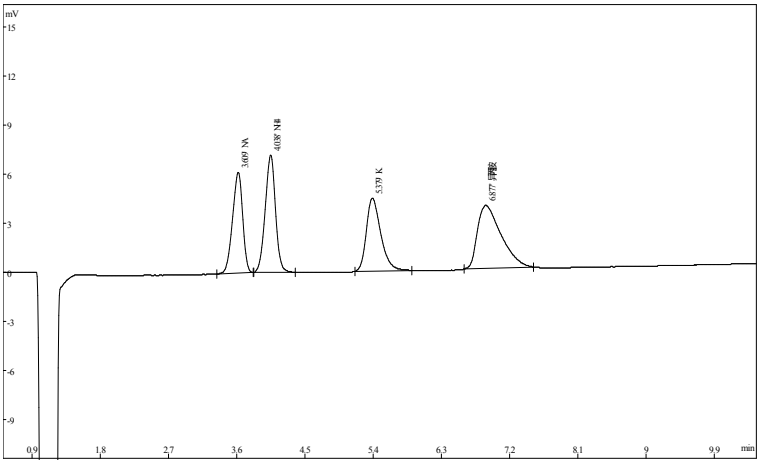

Table3 Chromatogram of The Mixed sample(glyphosate isopropylamine salt,ammonium salt,potassium salt,sodium salt)