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**A Special High-Efficiency Magnesium-Containing Urea Ammonium Nitrate Liquid Fertilizer for Sugarcane.**

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The present invention relates to the technical field of fertilizers, in particular to the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane, its preparation method and application. And the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane comprises the following components in parts by weight: 39.1-41.3% of ammonium nitrate, 29-33.4% of urea, 10% of magnesium sulfate heptahydrate, and 19.3-21.9% of water; and according to the mass fraction, the nitrogen content in the high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer is 28-32% in terms of N, and the magnesium content is 1.6% in terms of MgO. In addition, the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane of the present invention is combined with  $\gamma$ -aminobutyric acid, which can effectively enhance fertilizer efficiency and improve fertilizer utilization rate.

## **DESCRIPTION**

### **A Special High-Efficiency Magnesium-Containing Urea Ammonium Nitrate Liquid Fertilizer for Sugarcane**

## **TECHNICAL FIELD**

The present invention belongs to the technical field of fertilizers, in particular to a special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane, its preparation method and application.

## **BACKGROUND**

Fertilizer refers to the substance that provides essential nutrients for plants, can improve soil properties and soil fertility level, and is one of the material bases of agricultural production. The types of fertilizers mainly include macro element water-soluble fertilizers, medium element fertilizers, trace element fertilizers, biological fertilizers, organic fertilizers, etc.

Nitrogen is a necessary macro nutrient element for plant growth and development. In many cases, affected by soil fertility, texture and other factors, the nitrogen in soil can't meet the needs of crop yield. Therefore, artificial nitrogen application is one of the main effective ways to increase crop yield. Urea is a kind of high-concentration nitrogen fertilizer, which is convenient to use and easy to store. It is a kind of nitrogen fertilizer that is widely used at present. Magnesium is an essential medium nutrient element for plant growth and development. Magnesium and other medium and trace elements can improve soil available nutrients and enhance crop resistance. However, if all kinds of nutrients are simply mixed and applied, the quality of the fertilizer will be unstable, and precipitation will be easily formed, which will affect the application effect. Or the medium and trace elements in the fertilizer are not easily fixed by the soil after being applied to the soil, and are easily lost and not effectively absorbed by crops, which will also affect the utilization rate of the fertilizer.

At present, there are many nitrogenous fertilizers on the market, but there is no report on high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane with stable quality and high utilization rate. LU502995

## SUMMARY

The purpose of the present invention is to provide a special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane, its preparation method and application, so as to overcome the defects of unstable quality and low utilization rate of the existing nitrogen fertilizer for sugarcane.

To achieve the above object, the invention provides a special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane. And it comprises the following components in parts by weight: 39-42 parts of ammonium nitrate, 29-34 parts of urea, 10-11 parts of magnesium sulfate heptahydrate, 0.1-0.3 part of  $\gamma$ -aminobutyric acid and 19-22 parts of water; and according to the mass fraction, the nitrogen content in the high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer is 28-32% in terms of N, and the magnesium content is 1.5-1.7% in terms of MgO.

Another technical solution of this application: The preparation method of the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane comprises the following steps:

- S1, preparing urea solution with the mass fraction of 75% for later use;
- S2, preparing ammonium nitrate solution with the mass fraction of 85% for later use;
- S3, mixing magnesium sulfate heptahydrate with the rest water to prepare magnesium sulfate heptahydrate solution;
- S4: adding urea solution with the concentration of 75% into the reaction kettle, then slowly dropping ammonium nitrate solution with the concentration of 85% and magnesium sulfate heptahydrate solution into the urea solution with the concentration of 75%, and stirring while dropping, and after reacting for 30 minutes, detecting the weight percentage content of nitrogen and magnesium in the product, until the content of N in the product is 28-32% and the content of MgO is 1.5-1.7%, and finishing the reaction to

obtain the magnesium-containing urea ammonium nitrate liquid.

S5, adding  $\gamma$ -aminobutyric acid into the magnesium-containing urea ammonium nitrate liquid in step S4 for polymerization to obtain the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane.

Preferably, in step S4, the reaction temperature is controlled between 25°C and 46°C, and the reaction time is 30 ~ 90 minutes.

Preferably, in step S5, 12kg of  $\gamma$ -aminobutyric acid is added to per ton of magnesium-containing urea ammonium nitrate liquid.

Another technical scheme of the application: the application of the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane.

Preferably, the dosage of the high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer is 50-60kg/mu.

Preferably, the high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer is diluted by 300-500 times and then applied to sugarcane fields.

Compared with the prior technology, the present invention has the following beneficial effects: 1. Compared with the traditional urea-ammonium nitrate liquid fertilizer, the effectiveness of nitrogen and magnesium in the high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer of the invention is more than doubled, and the field application proves that the utilization rate of nitrogen and magnesium reaches 70-80%.

2. The high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer of the invention is combined with  $\gamma$ -aminobutyric acid, which can promote the absorption of trace elements by sugarcane and enhance fertilizer efficiency. At the same time, it can form a protective film on sugarcane roots, improve crop resistance and improve fertilizer utilization rate.

3. The nitrogen content in the high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer produced by the method of the invention is 28-32% in terms of N, and the magnesium content is 1.5-1.7% in terms of MgO. And the fertilizer has stable quality and high utilization rate, which can meet the nutrients and trace

elements needed for sugarcane growth, and can reduce the application amount of fertilizers. LU502995

## **DETAILED DESCRIPTION OF THE INVENTION**

The specific embodiments of the present invention will be described in detail below, but it should be understood that the protection scope of the present invention is not limited by the specific embodiments.

### **Embodiment 1**

The test site is located in Guangxi Academy of Agricultural Sciences, and the sugarcane variety planted is Guitang 44. And setting up four test areas and applying fertilizers according to the following four treatments:

Treatment 1: Applying the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane.

The special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane. And it comprises the following components in parts by weight: 40 parts of ammonium nitrate, 30 parts of urea, 10 parts of magnesium sulfate heptahydrate, 0.2 part of  $\gamma$ -aminobutyric acid and 22 parts of water; and according to the mass fraction, the nitrogen content in the high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer is 30% in terms of N, and the magnesium content is 1.6% in terms of MgO.

The preparation method of the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane comprises the following steps:

S1, preparing urea solution with the mass fraction of 75% for later use;

S2, preparing ammonium nitrate solution with the mass fraction of 85% for later use;

S3, mixing magnesium sulfate heptahydrate with the rest water to prepare magnesium sulfate heptahydrate solution;

S4: adding urea solution with the concentration of 75% into the reaction kettle, then slowly dropping ammonium nitrate solution with the concentration of 85% and magnesium sulfate heptahydrate solution into the urea solution with the concentration of 75%, and stirring while dropping, and after reacting for 30 minutes, detecting the weight percentage content of nitrogen and magnesium in the product, until the content of N in

the product is 28-32% and the content of MgO is 1.5-1.7%, and finishing the reaction to obtain the magnesium-containing urea ammonium nitrate liquid. LU502995

S5, adding  $\gamma$ -aminobutyric acid into the magnesium-containing urea ammonium nitrate liquid in step S4 for polymerization to obtain the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane.

Treatment 2 (control): Applying the commercially available urea ammonium nitrate liquid fertilizer, that is, the fertilizer does not contain magnesium sulfate heptahydrate and  $\gamma$ -aminobutyric acid.

Treatment 3: Applying magnesium-containing urea ammonium nitrate liquid fertilizer without  $\gamma$ -aminobutyric acid. That is, the preparation method of the fertilizer in this treatment is similar to that in treatment 1, except that there is no step S5 and  $\gamma$ -aminobutyric acid is not added.

Treatment 4: Applying containing magnesium urea ammonium nitrate liquid fertilizer obtained by simple mixing. That is, the fertilizer in this treatment has the same formula as that in treatment 3, and it does not contain  $\gamma$ -aminobutyric acid, but only contains ammonium nitrate, urea and magnesium sulfate heptahydrate. However, the preparation method is different from that in treatment 3, and the ammonium nitrate, urea, magnesium sulfate heptahydrate and water are directly put into a reaction kettle for mixing reaction at one time without adjusting the concentration of ammonium nitrate and urea.

Applying fertilizers according to the above different treatments, and applying the same amount of nitrogen in the basal fertilizer application period, wherein, applying 50 kg of high-efficiency potassium polyphosphate fertilizer of the application per mu, diluting the fertilizer by 400 times and then applying the diluted fertilizer to sugarcane fields, and applying the rest treatments with the same amount of nitrogen as treatment 1, and then planting and managing according to conventional methods. The yield of sugarcane is obviously different, see Table 1 for details.

Table 1 Comparison of sugarcane planting effects with different treatment methods

Treatments	Sugarcane yield(kg/mu)	Increased yield(kg/mu)	Increased yield rate(%)
Treatment1	8217	2198	36.5
Treatment2	6019		
Treatment3	7025	1006	16.7
Treatment4	6638	619	10.3

As can be seen from Table 1, compared with the treatment 2 applied with common urea-ammonium nitrate liquid fertilizer, the nitrogen fertilizer utilization rate in the treatment 1 applied with the high-efficiency magnesium-containing urea-ammonium nitrate liquid fertilizer in this application is significantly improved, and the sugarcane yield increases by 2198kg/mu, with the increased yield rate of 36.5%. And treatment 3 and treatment 4 are not as effective as treatment 1, which indicates that  $\gamma$ -aminobutyric acid has a good synergistic effect. The difference between treatment 3 and treatment 4 also indicates that the fertilizer preparation method of the application is more stable in quality and better in applying effect than the conventional fertilizer prepared by simple mixing.

#### Embodiment 2

The test site is located in Longan County, Nanning, Guangxi, and the sugarcane variety planted is Guitang 44. And setting up four test areas and applying fertilizers according to the following four treatments:

Treatment 1: Applying the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane.

The special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane. And it comprises the following components in parts by weight: 39 parts of ammonium nitrate, 34 parts of urea, 10 parts of magnesium sulfate heptahydrate, 0.3 part of  $\gamma$ -aminobutyric acid and 20 parts of water; and according to the mass fraction, the nitrogen content in the high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer is 32% in terms of N, and the magnesium content is 1.6% in terms of

MgO.

The preparation method of the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane comprises the following steps:

S1, preparing urea solution with the mass fraction of 75% for later use;

S2, preparing ammonium nitrate solution with the mass fraction of 85% for later use;

S3, mixing magnesium sulfate heptahydrate with the rest water to prepare magnesium sulfate heptahydrate solution;

S4: adding urea solution with the concentration of 75% into the reaction kettle, then slowly dropping ammonium nitrate solution with the concentration of 85% and magnesium sulfate heptahydrate solution into the urea solution with the concentration of 75%, and stirring while dropping, and after reacting for 30 minutes, detecting the weight percentage content of nitrogen and magnesium in the product, until the content of N in the product is 28-32% and the content of MgO is 1.5-1.7%, and finishing the reaction to obtain the magnesium-containing urea ammonium nitrate liquid.

S5, adding  $\gamma$ -aminobutyric acid into the magnesium-containing urea ammonium nitrate liquid in step S4 for polymerization to obtain the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane.

Treatment 2 (control): Applying the commercially available urea ammonium nitrate liquid fertilizer, that is, the fertilizer does not contain magnesium sulfate heptahydrate and  $\gamma$ -aminobutyric acid.

Treatment 3: Applying magnesium-containing urea ammonium nitrate liquid fertilizer without  $\gamma$ -aminobutyric acid. That is, the preparation method of the fertilizer in this treatment is similar to that in treatment 1, except that there is no step S5 and  $\gamma$ -aminobutyric acid is not added.

Treatment 4: Only applying urea.

Applying fertilizers according to the above different treatments. In the basal fertilizer application period, applying 60kg of the high-efficiency potassium polyphosphate fertilizer of the application per mu, diluting it by 500 times, and then applying the diluted fertilizer to sugarcane fields. And applying all treatments with the same amount of nitrogen respectively, and planting and managing according to conventional methods.

The yield of sugarcane is obviously different, see Table 2 for details.

Table 2 Comparison of sugarcane planting effects with different treatment methods

Treatments	Sugarcane yield(kg/mu)	Increased yield(kg/mu)	Increased yield rate(%)
Treatment1	8367	2260	37.0
Treatment2 (control)	6107		
Treatment3	7102	995	16.3
Treatment4	5325		

As can be seen from Table 2, compared with the treatment 2 applied with common urea-ammonium nitrate liquid fertilizer, the nitrogen fertilizer utilization rate in the treatment 1 applied with the high-efficiency magnesium-containing urea-ammonium nitrate liquid fertilizer in this application is significantly improved, and the sugarcane yield increases by 2260 kg/mu, with the increased yield rate of 37%. The effect of treatment 4 only applied with urea is the worst.

### Embodiment 3

The test site is located in Yongning District, Nanning City, Guangxi, and the sugarcane variety planted is Guitang 42. And setting up four test areas and applying fertilizers according to the following four treatments:

Treatment 1: Applying the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane.

The special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane. And it comprises the following components in parts by weight: 42 parts of ammonium nitrate, 29 parts of urea, 11 parts of magnesium sulfate heptahydrate, 0.1 part of  $\gamma$ -aminobutyric acid and 19 parts of water; and according to the mass fraction, the nitrogen content in the high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer is 29% in terms of N, and the magnesium content is 1.7% in terms of MgO.

The preparation method of the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane comprises the following steps:

S1, preparing urea solution with the mass fraction of 75% for later use;

S2, preparing ammonium nitrate solution with the mass fraction of 85% for later use;

S3, mixing magnesium sulfate heptahydrate with the rest water to prepare magnesium sulfate heptahydrate solution;

S4: adding urea solution with the concentration of 75% into the reaction kettle, then slowly dropping ammonium nitrate solution with the concentration of 85% and magnesium sulfate heptahydrate solution into the urea solution with the concentration of 75%, and stirring while dropping, and after reacting for 30 minutes, detecting the weight percentage content of nitrogen and magnesium in the product, until the content of N in the product is 28-32% and the content of MgO is 1.5-1.7%, and finishing the reaction to obtain the magnesium-containing urea ammonium nitrate liquid.

S5, adding  $\gamma$ -aminobutyric acid into the magnesium-containing urea ammonium nitrate liquid in step S4 for polymerization to obtain the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane.

Treatment 2 (control): Applying the commercially available urea ammonium nitrate liquid fertilizer, that is, the fertilizer does not contain magnesium sulfate heptahydrate and  $\gamma$ -aminobutyric acid.

Treatment 3: Applying magnesium-containing urea ammonium nitrate liquid fertilizer without  $\gamma$ -aminobutyric acid. That is, the preparation method of the fertilizer in this treatment is similar to that in treatment 1, except that there is no step S5 and  $\gamma$ -aminobutyric acid is not added.

Treatment 4: Only applying urea and organic fertilizer.

Applying fertilizers according to the above different treatments, and applying 50 kg of high-efficiency potassium polyphosphate fertilizer of the application per mu, diluting the fertilizer by 400 times and then applying the diluted fertilizer to sugarcane fields, and applying the rest treatments with the same amount of nitrogen as treatment 1, and then planting and managing according to conventional methods. The yield of sugarcane is obviously different, see Table 3 for details.

Table 3 Comparison of sugarcane planting effects with different treatment methods

Treatments	Sugarcane yield(kg/mu)	Increased yield(kg/mu)	Increased yield rate(%)
Treatment1	8174	2072	34.0
Treatment2 (control)	6102		
Treatment3	7089	987	16.2
Treatment4	6528	426	7.0

As can be seen from Table 3, compared with the treatment 2 applied with common urea-ammonium nitrate liquid fertilizer, the nitrogen fertilizer utilization rate in the treatment 1 applied with the high-efficiency magnesium-containing urea-ammonium nitrate liquid fertilizer in this application is significantly improved, and the sugarcane yield increases by 2072kg/mu, with the increased yield rate of 34%. And treatment 4 only applied with urea and organic fertilizer is not as effective as treatment 1.

In addition, based on the difference between the treatment applied with the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane and the blank control, and the difference between the treatment applied with the urea ammonium nitrate liquid fertilizer and the blank control, it shows that the nitrogen utilization rate of urea ammonium nitrate liquid fertilizer is 70-80%.

To sum up, the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane of the present invention is combined with  $\gamma$ -aminobutyric acid, which can effectively enhance fertilizer efficiency and improve fertilizer utilization rate. Compared with urea-ammonium nitrate liquid fertilizer, the effectiveness of nitrogen and magnesium in the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane in this application has more than doubled, and the field application proves that the utilization rate of nitrogen and magnesium reaches 70-80%.

The foregoing description of specific exemplary embodiments of the present

invention is for the purpose of illustration and explanation. These descriptions are not intended to limit the invention to the precise form disclosed, and it is obvious that many changes and variations are possible in light of the above teachings. The purpose of choosing and describing the exemplary embodiments is to explain the specific principles of the invention and its practical application, so as to enable those skilled in the field to make and use various exemplary embodiments and various choices and changes of the invention. The scope of the invention is intended to be defined by the claims and their equivalents.

## CLAIMS

1. A special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane is characterized in that it comprises the following components in parts by weight: 39-42 parts of ammonium nitrate, 29-34 parts of urea, 10-11 parts of magnesium sulfate heptahydrate, 0.1-0.3 part of  $\gamma$ -aminobutyric acid and 19-22 parts of water; and according to the mass fraction, the nitrogen content in the high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer is 28-32% in terms of N, and the magnesium content is 1.5-1.7% in terms of MgO.

2. The preparation method of the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane according to claim 1 is characterized in that it comprises the following steps:

S1, preparing urea solution with the mass fraction of 75% for later use;

S2, preparing ammonium nitrate solution with the mass fraction of 85% for later use;

S3, mixing magnesium sulfate heptahydrate with the rest water to prepare magnesium sulfate heptahydrate solution;

S4: adding urea solution with the concentration of 75% into the reaction kettle, then slowly dropping ammonium nitrate solution with the concentration of 85% and magnesium sulfate heptahydrate solution into the urea solution with the concentration of 75%, and stirring while dropping, and after reacting for 30 minutes, detecting the weight percentage content of nitrogen and magnesium in the product, until the content of N in the product is 28-32% and the content of MgO is 1.5-1.7%, and finishing the reaction to obtain the magnesium-containing urea ammonium nitrate liquid;

S5, adding  $\gamma$ -aminobutyric acid into the magnesium-containing urea ammonium nitrate liquid in step S4 for polymerization to obtain the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane.

3. The preparation method according to claim 2 is characterized in that the preparation method of ammonium nitrate solution with the concentration of 85% is as follows: under the conditions of pressure of 0.4-0.5MPa and temperature of 175-180°C, introducing ammonia gas into nitric acid with the concentration of 50-60%, and then neutralizing it to the pH of 3-4, and then introducing ammonia gas continuously, and

adjusting the pH to 7 to obtain the ammonium nitrate solution with the concentration of 85%.

4. The preparation method according to claim 2 is characterized in that in step S4, the reaction temperature is controlled between 25°C and 46°C, and the reaction time is 30 ~ 90 minutes.

5. The preparation method according to claim 2 is characterized in that in step S5, 12kg of  $\gamma$ -aminobutyric acid is added to per ton of magnesium-containing urea ammonium nitrate liquid.

6. The application of the special high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer for sugarcane according to any one of the claims 1-5.

7. The application according to claim 6 is characterized in that the dosage of the high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer is 50-60kg/mu.

8. The application according to claim 7 is characterized in that the high-efficiency magnesium-containing urea ammonium nitrate liquid fertilizer is diluted by 300-500 times and then applied to sugarcane fields.

1. Un engrais liquide spécial à base de nitrate d'ammonium et d'urée contenant du magnésium à haut rendement pour la canne à sucre est caractérisé en ce qu'il comprend les composants suivants en parties en poids: 39-42 parties de nitrate d'ammonium, 29-34 parties d'urée, 10-11 parties de sulfate de magnésium heptahydraté, 0,1-0,3 partie d'acide  $\gamma$ -aminobutyrique et 19-22 parties d'eau; et selon la fraction massique, la teneur en azote dans l'engrais liquide à base de nitrate d'ammonium et d'urée contenant du magnésium à haut rendement est de 28 à 32% en termes de N, et la teneur en magnésium est de 1,5 à 1,7 % en termes de MgO.

2. Le procédé de préparation de l'engrais liquide spécial urée-nitrate d'ammonium à haut rendement magnésien pour la canne à sucre selon la revendication 1 est caractérisé en ce qu'il comprend les étapes suivantes:

S1, préparation d'une solution d'urée avec la fraction massique de 75 % pour une utilisation ultérieure ;

S2, préparation d'une solution de nitrate d'ammonium avec la fraction massique de 85 % pour une utilisation ultérieure ;

S3, mélange de sulfate de magnésium heptahydraté avec le reste d'eau pour préparer une solution de sulfate de magnésium heptahydraté ;

S4 : ajouter une solution d'urée avec une concentration de 75% dans la bouilloire de réaction, puis laisser tomber lentement une solution de nitrate d'ammonium avec une concentration de 85% et une solution d'heptahydrate de sulfate de magnésium dans la solution d'urée avec une concentration de 75%, et agiter tout en laissant tomber, et après 30 minutes de réaction, détection de la teneur en pourcentage en poids d'azote et de magnésium dans le produit, jusqu'à ce que la teneur en N dans le produit soit de 28 à 32 % et que la teneur en MgO soit de 1,5 à 1,7 %, et finition de la réaction pour obtenir le liquide de nitrate d'urée et d'ammonium contenant du magnésium;

S5, ajouter de l'acide  $\gamma$ -aminobutyrique dans le liquide de nitrate d'urée et d'ammonium contenant du magnésium à l'étape S4 pour la polymérisation afin d'obtenir

l'engrais liquide spécial à haut rendement contenant du nitrate d'urée et d'ammonium <sup>W502995</sup> pour la canne à sucre.

3. Procédé de préparation selon la revendication 2, caractérisé en ce que le procédé de préparation d'une solution de nitrate d'ammonium à la concentration de 85% est le suivant : dans des conditions de pression de 0,4-0,5 MPa et de température de 175-180°C , introduction de gaz ammoniac dans l'acide nitrique avec une concentration de 50-60%, puis en le neutralisant au pH de 3-4, puis en introduisant en continu du gaz ammoniac et en ajustant le pH à 7 pour obtenir la solution de nitrate d'ammonium avec une concentration de 85%.

4. Procédé de préparation selon la revendication 2, caractérisé en ce qu'à l'étape S4, la température de réaction est contrôlée entre 25°C et 46°C, et le temps de réaction est de 30 à 90 minutes.

5. Le procédé de préparation selon la revendication 2 est caractérisé en ce qu'à l'étape S5, 12 kg d'acide  $\gamma$ -aminobutyrique sont ajoutés par tonne d'urée contenant du magnésium liquide de nitrate d'ammonium.

6. L'application de l'engrais liquide spécial à base de nitrate d'ammonium et d'urée contenant du magnésium à haut rendement pour la canne à sucre selon l'une quelconque des revendications 1 à 5.

7. L'application selon la revendication 6 est caractérisée en ce que le dosage de l'engrais liquide à base de nitrate d'ammonium et d'urée contenant du magnésium à haut rendement est de 50 à 60 kg/mu.

8. L'application selon la revendication 7 est caractérisée en ce que l'engrais liquide à base de nitrate d'ammonium et d'urée contenant du magnésium à haut rendement est dilué de 300 à 500 fois, puis appliqué sur les champs de canne à sucre.