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Effects of Different Proportions of Controlled Release Urea and Ordinary Urea on Peanut Yield

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Abstract [Objectives] To study the effects of different proportions of controlled release urea and ordinary urea on peanut yield. [Methods] A total of 5 treatments were set up according to different proportions of controlled release urea and ordinary urea, randomly arranged in blocks and repeated 3 times. [Results] The test results of field districts showed that different proportions of controlled release urea and conventional urea had different effects on peanut yield. On the basis of applying 50 kg/666.7 m² of calcium superphosphate and 17 kg/666.7 m² of potassium sulfate, 13.34 kg/666.7 m² of pure nitrogen was applied. The optimal ratio of controlled release urea to ordinary urea was 75 : 25, followed by 50 : 50. The output was 379.83 and 371.83 kg/666.7 m², separately increased by 6.74% and 4.50% compared to the application of ordinary urea. [Conclusions] The combined application of controlled release urea and ordinary urea in peanuts can significantly increase peanut yield compared to just applying ordinary urea.

Key words Peanut, Controlled release nitrogen fertilizer, Ordinary nitrogen fertilizer, Yield increase

1 Introduction

The backward shift technology of nitrogen fertilizer for wheat is very mature, while the technology for peanut is still under research^[1]. Due to the promotion and application of plastic film covering technology in peanut cultivation, topdressing during the peanut growth period is limited. According to the characteristics of peanut cultivation, the application of controlled release fertilizer can achieve a later shift in fertilizer efficiency, prevent early senescence of peanuts in the later stage, reduce the harm of leaf spot disease, and promote plump pods^[2]. In order to clarify the effects of different ratios of controlled release urea and ordinary urea on peanut yield, "Linhua No. 6" was used as the test material, and test results were as below.

2 Materials and methods

2.1 Test materials Resin coated controlled release urea (42% of pure N) with a release period of 3 months was produced by Shandong Jinzhengda Ecological Co., Ltd. Ordinary urea (46% of pure N); calcium superphosphate (containing 12% of P₂O₅); potassium sulfate (containing 50% of K₂O).

2.2 Experimental design A total of 5 treatments were set up according to different proportions of controlled release urea and ordinary urea in the experiment (Table 1), randomly arranged in blocks and repeated 3 times. The area of district was 13.3 m², and the tested peanut variety was Linhua No. 6.

Table 1 Different proportions of controlled release urea and ordinary urea

Treatment	Nitrogen fertilizer ratio//%		Nitrogen application amount//666.7 m ²	
	Control released urea	Ordinary urea	Control released urea	Ordinary urea
T1	100	0	31.76	0
T2	75	25	23.83	7.25
T3	50	50	15.88	14.50
T4	25	75	7.94	21.75
T5 (CK)	0	100	0	29.00

2.3 Test method The experimental site was located in the peanut experimental field of Linyi Academy of Agricultural Sciences. The experimental site had a flat terrain, consistent previous crops (wheat-soybean), moderate fertility, uniform soil fertility, and good drainage and irrigation conditions. On May 7, the rotary tillage was carried out twice. On May 9, the ridge was made with a width of 83.4 cm and a length of 8 m, and there were two ridges in a plot. Fertilization on May 11: according to the different proportions of controlled release urea and ordinary urea, 13.34 kg/666.7 m² of pure N, 50 kg/666.7 m² of calcium superphosphate, and 17 kg/666.7 m² of potassium sulfate were applied. Various fertilizers were accurately weighed according to the ridge. A ditch was open in the middle of the ridge, and various fertilizers were applied centrally. There were two rows per ridge, with a small row spacing of 20 cm. There were two grains per hole, with a hole spacing of 17 cm. In early July, 35% phoxim microcapsules were applied to control white grubs. In the late flowering stage, "peanut six no worries" were applied for chemical control. Other management was the same as in the field.

During harvest, seed testing and yield calculation were conducted, and the obtained data was analyzed using Excel software.

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3 Results and analysis

3.1 Effects of controlled release urea on the main economic traits of peanuts Seen from Table 2, number of pods per plant in T1, T2, T3, and T4 was 1.8, 1.1, 0.7 and 0.9 more than control, and number of full fruits increased by 0.7, 0.5, 0.2 and 0.9, and shelling rate was improved by 0.7%, 1.3%, 0.7% and 0.9%. Controlled release urea had little impact on other economic traits.

Table 2 Effects of controlled release urea on the main economic traits of peanuts

Treatment	Main stem height//cm	Lateral branch length//cm	Number of branches	Number of fruiting branches	Number of pods per plant	Number of full fruits	Kilograms-pod-number	Kilograms-kernel-number	100-pod weight//g	Kernel weight//g	Shelling rate//%
T1	32.4	36.4	14.4	7.0	15.9	14.0	574	1 222	171.3	82.53	75.3
T2	31.3	33.5	14.5	6.9	15.2	13.8	518	1 088	201.0	86.39	75.9
T3	34.5	38.1	14.3	6.5	14.8	13.5	520	1 178	194.1	82.66	75.3
T4	30.4	33.7	13.3	6.8	15.0	14.2	524	1 180	205.9	89.89	75.5
T5 (CK)	31.4	32.8	14.5	6.6	14.1	13.3	528	1 198	195.0	85.32	74.6

3.2 Effects of controlled release urea on peanut yield Seen from Table 3, T2 treatment had the highest peanut yield and the best yield increase effect. Its yield reached 379.83 kg/666.7 m², increased by 6.74% than control. After analysis of variance and the new multiple range test, the difference between the two reached a very significant level. T3 treatment increased yield by 4.50%, and there was no significant difference compared to T2 treatment.

When applying ordinary urea, the supply of nitrogen fertilizer is significant insufficient during the pod-pin stage, affecting the growth and development of peanuts. After proportionally increasing the application of controlled release urea, the nitrogen fertilizer supply is relatively balanced during the growth and development period of peanuts, which is the main reason for peanut yield increase.

Table 3 Effects of controlled release urea on peanut yield

Treatment	Average yield of the plot//kg	Yield of 666.7 m ² //kg	Yield increase compared to the control//%
T1	7.37	368.67 bABC	3.61
T2	7.60	379.83 aA	6.74
T3	7.44	371.83 abAB	4.50
T4	7.28	364.00 bcBC	2.30
T5 (CK)	7.12	355.83 cC	–

Note: Lowercase letters indicate that the difference reaches a significant level, and uppercase letters indicate that the difference reaches an extremely significant level.

After the emergence of Linhua No.6, it enters the flowering period after about 25 – 30 d. Peanuts require a large amount of fertilizer during this period, which has a significant impact on the number of peanut fruits and the plumpness of their pods. The release period of coated controlled-release urea is 30 d, which meets the fertilizer needs of peanut flowering period. The number of fruits per plant, the number of full fruits, and the rice yield can be increased and improved.

4 Conclusions

The combined application of controlled release urea and ordinary urea in peanuts can significantly increase peanut yield compared to just applying ordinary urea^[3]. The optimal proportion of controlled release urea and ordinary urea was 75 : 25, followed by 50 : 50. Under the conditions of this experiment, on the basis of 50 kg/666.7 m² of calcium superphosphate (12% of P₂O₅) and 17 kg/666.7 m² of potassium sulfate (50% of K₂O), 13.34 kg/666.7 m² of pure N was used. When the proportion of controlled release urea and ordinary urea was 75 : 25 or 50 : 50, the peanut yield was 379.83 and 371.83 kg/666.7 m², which increased by 6.74% and 4.50% compared to the application of ordinary urea. This proportion can be referenced for large-scale promotion in production.

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