Research based on the Effect of Different Fertilizer Proportions in the Growth of Dryland Spring Maize

Ningning Zhang *, Zhichao Zhang

Agricultural College of Northwest Agricultural and Forestry University, Yangling712100, China

Email: 807010020@qq.com

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Abstract: Corn is the third largest food crop in China after rice and wheat. It is mainly used in animal husbandry and processing industries. It is of great significance for enriching citizens' food bags and the combined use of "grain, economy, and feeding". Especially in the semi-humid and semi-arid regions of northwest China such as Ningxia, Shaanxi, Gansu, and Inner Mongolia, corn is an important food crop, but facing unfavorable environments such as drought and low rainfall, the yield is not high. The growth of corn is also inseparable with the application of fertilizers such as nitrogen, phosphorus, and potassium. Therefore, this article studies different combinations of nitrogen, phosphorus, potassium, and other fertilizers in order to achieve the purpose of increasing yield and efficiency of corn under adverse conditions such as dry farming. The contradiction between the supply and demand of fertilizer.

1. Materials and Methods

1.1 Experimental Site

The test site was selected in Hejialiang Village, Miaogoumen Town, Fugu County, Shaanxi Province. The soil in this village is yellow soil type, the soil pH is around 7.2, and the organic matter content is 3.4%. The nitrogen, phosphorus, and potassium used in the test were: nitrogen fertilizer with 46% urea produced by Shaanxi Rising Chemical Group; phosphate fertilizer by diammonium phosphate produced by Shaanxi Shaanhua Chemical Group; potassium chloride (content 60%) by Hanzhong Far East Produced by Chemical Fertilizer Co., Ltd.

1.2 Source of Materials

The tested corn was Xianyu 335. The test is divided into 6 treatments, and the N, P, K fertilizer allocation for each treatment is shown in Table 1.

Table 1 Proportion of fertilization based on their different treatments

Process	Urea (kg / hectare)	Diammonium phosphate (kg / hectare)	Potash fertilizer (kg / hectare)
Process 1	375Kg / ha	350Kg /ha	0
Process 2	410Kg /ha	209Kg/ha	180Kg/ha
Process 3	350Kg /ha	360Kg/ha	0
Process 4	435Kg /ha	209Kg/ha	0
Process 5	375KKg /ha	358Kg /ha	180Kg/ha
CK	0	0	0

1.3 Seeding and Management

This experiment was conducted on April 3, 2018 at the test site. Corn was harvested in August and fertilized a total of 3 times during the entire growing season of corn. In addition to the intermediate fertilization process, other corn cultivation management measures and field cultivation corn management Measures are consistent, such as regular watering, spraying herbicides to control weeds, and timely control of various diseases and insect pests in corn.

1.4 Measurement Index

After seeding for 30 days, the corn seedling height, stem thickness, root number, and leaf number were measured. After heading, the ear length, grain number, ear thickness, yield and other indicators of corn with different fertilization ratios were measured.

2 Results and Analysis

2.1 Impact on Corn Growth Indicators

Table 1 shows the effects of different fertilization ratios on growth indexes such as corn seedling height, root length, stem thickness, and leaf number. As for the seedling height, the corn seedling height of treatment 2 was the highest, reaching 28.5cm, which was 10.8cm more than the control, and the increase reached 47.36%. Followed by treatments 3 and 5, they were 24.8cm and 24.6cm, respectively, which were 7.1cm and 6.9cm more than the control, with an increase of 31.14% and 30.26%. The lowest seedling height was treatment 1, which had a height of 22.8cm and an increase of only 22.36%. Regarding the root length of corn, it was still the highest in treatment 2, reaching 16.3 cm, which was an increase of 56.7% over the control; followed by treatment 1, treatment 3, treatment 4, and treatment 5, respectively, 14.5 cm and 14.2. cm, 13.8cm, 12.7cm, which were respectively increased by 5.3cm, 5cm, 4.8cm and 3.5cm compared with the control. For the corn stalk thickness, the order of the five different fertilizer ratio treatments was treatment 2, treatment 4, treatment 1, treatment 3, and treatment 5, of which the stem thickness of treatment 2 reached 2.2 cm, which was 0.8 cm higher than the control. . For the number of leaves, treatment 2 was the most, with an average number of 12.7 pieces, an increase of 7.1 pieces over the control; followed by treatment 3, the number of leaves was 9.8 cm, which was an increase of 4.2 pieces compared with the control average; 4, the average number of leaves was 9.2, an increase of 3.6 pieces compared to the control; the fourth place was treatment 1, the average number of leaves was 8.9, an increase of 3.3 pieces compared to the control, the least fertilization ratio was treatment 5 The average number of leaves is only 8.7, which is 3.1 more than the control.

Table 2 Determination of the effects of different fertilization ratios on corn growth indicators

Process	High plant （cm）	Root length (cm)	Thick stem (cm)	Number of leaves (piece)
Process 1	22.8	14.5	1.8	8.9
Process 2	28.5	16.3	2.2	12.7
Process 3	24.8	14.2	1.7	9.8
Process 4	23.2	13.8	1.8	9.2
Process 5	24.6	12.7	1.7	8.7
CK	17.7	9.2	1.4	5.6

2.2 Impact on Corn Yield Indicators

Table 2 shows the effects of five different fertilization ratios on corn yield indicators. For ear length, the ear length of treatment 1 was 25.6 cm, which was 5.3 cm longer than the control's ear

length, an increase of 20.7%. For treatment 2, the average ear length was 27.8 cm, which was longer than the average ear length of the control. The average ear length of treatment 3 was 25.7cm, which was 5.4cm higher than the control, and the increase was 21.09%; the average ear length of treatment 4 was 24.9cm, which was 4.6cm higher than the control, and the increase reached 17.96%; the average ear length of treatment 5 was 24.6 cm, which was an increase of 4.3 cm over the average ear length of the control, an increase of 16.79%. It can be seen that the average ear length of treatment 2 is the largest.

For the number of spikes per spike, the number of spikes per treatment 1 was 567.18, which was an increase of 138.84 grains or 24.48% compared with the number of spikes per control. For treatment 2, the average number of spikes per spike was 585.45, which was higher than that of the control. The average spike number increased by 157.12 grains, an increase of 26.83%. The average spike number of treatment 3 was 544.82 grains, an increase of 116.48 grains and 21.38% over the control. The average spike number of treatment 4 was 517.36 grains, which was higher than the control. Increased 89.03 grains, an increase of 17.96%; the average number of spikelets per treatment 5 was 574.32 grains, an increase of 145.99 grains, an increase of 25.41% compared with the average number of spikelets per control. It can be seen that the average number of spikelets per treatment 2 was the largest, followed by treatments such as treatment 5 and treatment 1, and the like.

For ear thickness, the ear thickness of treatment 2 was 5.21 cm, which was 0.62 cm more than the average ear thickness of the control, with an increase of 12.32%. There was a significant difference between the two. The average ear thickness of treatment 5 and treatment 3 ranked second, and the ear thickness was 5.17 cm, which was 0.58 cm more than the average ear thickness of the control, an increase of 11.53%. Compared with the control, there was a significant difference Sexual difference. Treatments 1 and 4 were ranked 3rd and 4th. The average ear thickness was 5.03cm and 5.02cm, which were 8.74% and 8.54% more than the control, respectively.

As for the average yield, the average yield of treatment 2 was still the highest, reaching 11895.4 kg / ha, which was an increase of 2109.8 kg / ha compared with the control, an increase of 17.73%. Followed by treatment 3, its yield reached 11356.7 kg / ha, which was an increase of 1571.1 kg / ha compared with the control, an increase of 13.83%. The average acre yields of corn for treatment 1, treatment 4, and treatment 5 were 11125.8 kg / ha, 10311.8 kg / ha, and 10487.6 kg / ha, respectively, which increased by 1340.2 kg / ha, 526.2 kg / ha, and 702 kg / ha respectively. , Which are 12.04%, 5.10%, and 6.69% more than the control, respectively.

Table 3. Effects of different fertilization ratios on corn yield indicators

Process	Spike length （cm）	Number of ears (grain)	Ear thickness(cm)	Average yield (kg / ha)
Process 1	25.6	567.18	5.03	11125.8
Process 2	27.8	585.45	5.21	11895.4
Process 3	25.7	544.82	5.17	11356.7
Process 4	24.9	517.36	4.59	10311.8
Process 5	24.6	574.32	5.17	10487.6
CK	20.3	428.34	5.02	9785.6

From the analysis of the above data, it can be seen that for five different fertilization ratios, the treatment 2 fertilizer ratio is 410 kg / ha of urea, 209 kg / ha of diammonium phosphate, and 180 kg / ha of potassium chloride. Under the fertilization ratio, the ear length was the longest, reaching 27.8 cm, the ear number was the largest, reaching 585.45, the ear thickness was the largest, reaching 5.21 cm, and the average yield per hectare was the highest, reaching 11895.4 kg, followed by treatment

5, which is 375 kg / ha of urea, 358 kg / ha of diammonium phosphate, and 180 kg / ha of potassium chloride, the yield can also reach 10487.6 kg / ha.

Discussion

In the arid regions of Northwest China, due to the influence of water, the yield of corn is lower than that of North China and Northeast China. Therefore, under the constraints of water and other conditions, how to increase the yield of corn is a subject that needs to be researched. In the case of developing water-saving agriculture, you can write about fertilization, and only in this way can high-yield planting of corn in dry farming areas. The research in this paper found that the effects of five different fertilization ratios on the growth and development of corn have been described in detail. In terms of growth indicators, treatment 2 is 410 kg / ha of urea and 209 kg of diammonium phosphate. Under the fertilization ratio of 180 kg / ha / potassium chloride, the growth indexes such as seedling height, root length, stem thickness, and leaf number of corn were the largest, with a seedling height of 28.5 cm, a root length of 16.3 cm, and a thick stem It reaches 2.2 cm and the number of leaves reaches 12.7 pieces. It can be seen that the above ratio has a significant promotion effect on the growth index of corn compared with the control. In terms of yield and other indicators, the ear length reached 27.8 cm, the number of ears per grain reached 585.45, the thickness of ears reached 5.21 cm, and the average yield per hectare reached 11895.4 kg.

Analyze the reason for the fertilization ratio of treatment 2 to promote the yield of corn, mainly because the nitrogen, phosphorus, and potassium fertilizer application ratio of treatment 2 is more balanced, and the content of phosphorus and potassium fertilizers is relatively high. Phosphate fertilizer can promote the growth of corn roots. In this way, it is more able to adapt to drought conditions. Potassium fertilizer can promote photosynthesis of corn and increase the absorption and conversion of carbon dioxide by crops. This can also help corn adapt to drought conditions.

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