Breeding and Cultivation Technique of Ditian 6

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Abstract Ditian 6 is super sweet corn hybrid. Its parents are inbred line 201-2 and 769 respectively. It was certificated by Variety Certification Committee of Shanxi Province in 2013. Ditian 6 participated in regional trials of Shanxi Province in 2010 and 2011. The average fresh ear yield is 14257.5 kg/ha. Its growth period is 81 d, belonging to the early variety. It has obvious advantages if it is early cultivated. The kernel is yellow, and the quality reaches a high level. In the early or late market, it has significant economic benefits. The variety has strong resistance to disease and adversity, with wide adaptability, high and stable yield. It can be planted in the areas where accumulated temperature is above 2300℃.

Key words Ditian 6, Breeding, Planting pattern, Cultivation techniques, Seed breeding, Early cultivation

1 Introduction

Sweet corn, originating from America, is a subspecies of corn, grown and eaten by people 100 years ago. Sweet corn has high sugar content, fragrant flavor and good taste, and can be cooked in the form of fresh ear. It can also be used for making soup, cooking dishes or processing vacuum ear, frozen ear or grain drinks. Sweet corn is rich in sucrose, dextrose, maltose, fructose, dietary fiber, trace elements and vitamins as well as 18 kinds of amino acids needed by the body and other nutrients beneficial to humans[1]. In terms of nutritious value, it can be compared with vegetables and fruits, and thus also known as "fruit corn" and "vegetable corn". Sweet corn is also believed to be the cash crop with multiple functions of grain, vegetable, fruit and feed, and it is favored by consumers due to rich amino acids and trace elements needed by the body. Sweet corn is increasingly becoming a new food that can improve diets to enrich people's life[2-3]. In addition, harvesting fresh ear of sweet corn will not occupy farmland for a long time, and it can improve local cropping index, so it is a good crop for increasing farmers' income and adjusting agricultural structure. In Shanxi Province and even entire country, there are few high-quality varieties of sweet corn that can meet various requirements of commercial production currently, and especially the varieties with good appearance and taste are extremely rare[4-7]. Therefore, it is particularly important to breed new varieties of sweet corn with moderate growth period, good appearance and taste and strong resistance and research the supporting technology.

2 Breeding process

2.1 Parental source and characteristics The male parent name of super sweet corn Ditian 6 is 769, which is derived from sweet corn hybrid Hutian going through seven generations of bicyclic system breeding. After inbreeding of Hutian ear, by repeated ear selection and identification, the excellent plants with good appearance, strong disease resistance and long ears are selected each generation for seven generations of successive selfing breeding selection and orientation breeding to breed mid-maturation yellow sweet corn inbred line in 2007. The female parent material name is 201 -2, which is derived from the US super sweet corn hybrid m667210, using the methods above. It is the precocious yellow super sweet corn inbred line bred by Sorghum Institute of Shanxi Academy of Agricultural Sciences in 2006. It has the characteristics of precocity, large ears, good quality and high yield. The seedling leaf sheath of male parent 769 is green, and both the edge of leaf and blade are greenish. The blade is narrow and half upthrusted upward. The plant height is 160 cm; ear axis position is 42 cm; ear length is 15 cm; ear row number is 14; ear thickness is 4.5 cm. The kernel is orange yellow, and plant is semi-compact. The seedling leaf sheath of female parent 201 -2 is green, but the blade is dark green, and the leaf margin is green. The blade is wide and flat. The plant height is 145 cm; ear axis position is 35 cm; ear length is 18 cm; ear row number is 14 -16; ear thickness is 4 cm. The kernel is orange yellow, and plant is loose.

2.2 Hybrid breeding process Male parent 769 and female parent 201-2 were combined to be crossed in the experimental base of Sorghum Institute in 2008. The field planting identification was carried out in 2009. The plants are robust and neat, and the ear axis position is basically the same. For the 200 sweet corn hybrid combinations, the maturity occurs early; the ear is long; the kernel is full; the yield is high. Hybrid advantage is obvious, and the parents have complementary advantages. After being cooked, the ear is bright yellow and fragrant. It has great sweetness, good flavor and few residues, with fine quality. The yield is 8% higher than the control Jinfei, with strong resistance and high seed rate, so it is recognized as the combination of superiority. It took part in

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the Shanxi special regional corn test in 2010 and 2011, and was approved by Variety Certification Committee of Shanxi Province in 2013, with serial number of Jinshenyu 2013026 and name of Ditian 6.

3 Breeding results

3.1 Characteristics The planting, germinating and harvesting of Ditian 6 in Jinzhong will take approximately 78 days, 8 days earlier than the control variety Jinchaotian 1. The sheath of the first leaf of plant seedling is green. Leaf tip is circular, and the plant is semi-compact. The total leaf number of plant is 16; the average height of plant is 185 cm; the average ear axis position is about 48 cm. The tassel spindle and branch angle is moderate, and there are 14 – 16 primary branches. The lateral branches are slightly curved, and the spindle of the highest lateral branch is 25 cm long. The male anther is yellow, the glume is blue-green and the ear is long. The ear axis is white, the average ear length is 21.9 cm and the ear row number is 14 – 16. The average kernel number per row is 37.4 and the kernel is bright yellow.

3.2 Identification of disease resistance The plant of Ditian 6 is robust and grows quickly in the early and middle period. Through the disease resistance identification conducted by Plant Protection Institute of Shanxi Academy of Agricultural Sciences and Agricultural College of Shanxi Agricultural University in 2010 and 2011, it is found that it is moderately resistant to dwarf mosaic virus and rough dwarf disease, and highly susceptible to head smut disease and leaf blight.

3.3 Quality analysis The ear row of Ditian 6 is neat, and the kernel has bright color and good sensory quality. After cooking, it tastes sweet and the total soluble sugar reaches 19.5%. The composite score of ear quality is 90, and the quality reaches National Standard I.

3.4 Yield In the experiment in 2009, the yield of Ditian 6 increased by 8% compared with the control Jinfei. It took part in the regional experiment of fresh corn variety in Shanxi Province in 2010 and 2011. In 2010, the fresh ear yield per mu was 939 kg; in 2011, the yield per mu was increased to 962 kg. The average yield of fresh ear reaches 950 kg, and the yield is high when compared with the same types of corn.

4 High-yielding cultivation techniques

4.1 Plot selection When Ditian 6 is planted, it must be separated from other types of corn for 300 m or more, to prevent pollen of other types of corn onto Ditian 6 lest the quality might be affected. Meanwhile, we should choose flat and fertile plots that can be easily irrigated for planting.

4.2 Fine planting The top soil strength of all super sweet corn is worse than that of ordinary corn, and the seedlings are thin, so during planting, we must carefully choose seeds, remove the rotten and sprouted seeds, make fine soil preparation, control moisture, and prevent compaction. When the 5 cm ground temperature is stable at above 12 ℃, it can be planted. It is stamped after planting in order to ensure full contact between seeds and soil, and the suitable sowing depth is about 3 cm. Growers can adjust sowing date according to actual needs, and stagger the harvest period, so that the collection period can be extended to meet market demand as far as possible and achieve better economic benefits.

4.3 Planting density According to many years of experimental results, the suitable planting density of Ditian 6 is 54000 – 58500 plants/ha in accordance with the soil fertility. Fertile land and convenient irrigation can increase density and income.

4.4 Timely tiller removing When the plant seedlings grow to about 60 cm, it is necessary to timely and thoroughly remove the tillers on the roots in order to prevent nutrient loss caused by excessive tiller growth. If there is tillering afterwards, it must be removed promptly.

4.5 Rational fertilization and timely irrigation Enough base fertilizer should be applied before sowing, and adequate base fertilizer is the basis for good growth. 20000 kg of thoroughly decomposed manure and 1500 kg of NPK can be applied per hectare. Fertilizer for seed bed should be early applied, and at the 5-6 leaf stage of plant, 150 kg of urea and 130 kg of potassium chloride can be applied per hectare based on shallow tillage. During the big horn period, 225 – 300 kg of urea and 225 kg of potassium chloride can be applied per hectare, and dressing should be buried deep. Jointing and booting stages are the critical period of water demand for sweet corn, and it is necessary to irrigate timely according to the moisture to ensure that the plants have sufficient moisture absorption. Sweet corn needs more water than ordinary corn, and we must not cause plant water shortages, affecting normal growth of plants.

4.6 Pest and disease control The major pest for Ditian 6 is corn borer[8] which chomps blades, ears and kernel, seriously affecting the corn yield and appearance quality, so it is necessary to pay attention to prevention and control. We can use bassiana granule to control corn borer, and 3 – 5 kg of bassiana granule can be applied per mu during the big horn period. We can also use bassiana powder to be sprayed by motorized sprayer during the big horn, heading and silking stages, and 1 – 2 kg of bassiana powder per mu is used. The main diseases for Ditian 6 are leaf blight and maize head smut. In the early period of leaf blight, we can spray chlorothalonil, carbendazim, propiconazol and ketotriazole to control, and it is sprayed 2 – 3 times every 5 – 8 days. We can use the seed coating agent containing tebuconazole to prevent maize head smut[9]. Using seed coating agent for coating can effectively prevent disease, improve the germination rate, and ensure high yield.

4.7 Timely harvest The harvest period of super sweet corn is the period from the time when fruit is full and can be eaten to the time when the fruits begin to be dehydrated, quality declines and harvest is not available. Timely harvest has a great impact on the quality and market commodity prices. To make corn ear full and bright, the time when the filament becomes dark brown is the suit-

(To page 77)

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(From page 67)

able harvesting period, and harvest time is usually the 22nd d after pollination.

5 Conclusions and discussions

Ditian 6 has high sweetness, good flavor, few residues and full kernel, and its quality is at the upper level. It is an ideal healthy food favored by urban and rural people. This variety has large ear, long husk, moderate stalk, good density tolerance, and high-level ear-bearing rate. Ditian 6 is an early-maturing variety with short growth period, and growers can adjust sowing date according to actual needs. Based on excellent and appropriate cultivation measures, the suitable regions can carry out double cropping or interplanting to increase multiple cropping index and greatly improve economic efficiency. Ditian 6 is super sweet corn, and the top soil strength of Ditian 6 is weaker than that of ordinary corn, so it is necessary to ensure enough fertilizer and moisture during planting and increase the seeding rate, to lay a good foundation for harvest[10].

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