Study on the Growth of Jujube under Different Rotation Irrigation Methods

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Abstract

Hebei plain is rich in brackish water, with the average amount of brackish water reaching 2.135 billion m³for many years, accounting for 12.4% of the total groundwater resources in the province. The utilization amount reached 1.552 billion m³, accounting for 11.4% of the available water resources in the whole province. It is mainly distributed in the eastern HeiLongGang region and coastal counties and cities. Reasonable exploitation of brackish water has great development potential. In view of the current situation that Hebei province is short of water in northern China and the distribution of brackish water in the province is large, and the irrational use of freshwater resources in agricultural irrigation, etc. a related experimental study on the influence degree of saline water on the growth site of Jujuba seedlings was carried out to reduce the amount of fresh water irrigation during the cultivation of Jujuba and achieve efficient utilization of saline water. To solve the problem of adverse impact on the ecological environment caused by the exploitation of a large amount of irrigation fresh water.

Keywords

Jujube; Alternate irrigation; Plant height; Stem diameter; Leaf area.

1. Research background and significance

Water shortage is one of the major issues facing China's agricultural production. At the same time, Hebei Province is one of China's water shortage areas. The planting area and output of jujube are among the highest in the country, and the planting area has reached 5.5 million mu. Greatly promoted the development of local agriculture. The use of inferior water, especially brackish water, is receiving more and more attention. There are many classification standards for brackish water in foreign countries. China generally believes that brackish water refers to water resources with a salinity of 2~5g/L. Most groundwater and surface runoff in surface salinized areas will Form salt water, brackish water. China's brackish water resources are close to 20 billion m3, and the proportion of surface and shallow groundwater is high [1]. Agricultural water demand is large and utilization rate is low. The water utilization rate of traditional agricultural irrigation mode is only 30%~ 40% [2]. Therefore, brackish water has great potential in agricultural irrigation, and the irrigation and utilization of brackish water is also of great significance to China's agricultural development. Therefore, research on the use of brackish water for round irrigation is of great significance.

2. Experimental design

The test was conducted in the test area on the south side of the Agricultural Water Hall of Hebei Agricultural University (East Campus). The seedlings with similar growth degree were selected for experiment, and two control groups were set: 1. total light (CK1) and 2 whole salty (CK2). A total of 6 kinds of brackish alternate irrigation methods are set: 1. brackish (BFF), 2. brackish (FBF), 3. faint salty (FFB), 4. brackish (BBF), 5. salty and salty (BFB), 6. Light salty (FBB). A total of 8 treatments, each treatment of 3 groups of repetition, eight treatments according to the same watering cycle salt water irrigation times can be divided into I (CK2), II (CK1), III (BBF, BFB, FBNB,) IV (BFF, FBF, FFB) four gradients. The salinity of salt water was 150 mmol/L (8.7 g/L). The test area is provided with a shelter to prevent rainfall.

Tab.2-1 Saline and fresh water irrigation schemes for each treatment group

Treatment	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
CK1	F	F	F	F	F	F	F	F	F
CK2	B	B	B	B	B	B	B	B	B
BFF	B	F	F	B	F	F	B	F	F
FBF	F	B	F	F	B	F	F	B	F
FFB	F	F	B	F	F	B	F	F	B
BBF	B	B	F	B	B	F	B	B	F
BFB	B	F	B	B	F	B	B	F	B
FBB	F	B	B	F	B	B	F	B	B

3. Results and analysis

3.1 Measurement and recording

(1) Plant height measurement: In the measurement process, the plant height was measured with a ruler, and the horizontal distance from the root of the plant to the surface of the soil to the top of the natural plant height of the plant was the height of the plant height (unit: cm).

(2) Measurement of stem diameter: The root of the plant was measured by a digital vernier caliper, the plant was perpendicular to the vernier caliper placed at the root of the seedling and the length of the cross section of the plant was measured, and then the vernier caliper was rotated 90° along the plane to be measured again, taking the maximum value. The stem of the plant is thick (unit: mm).

(3) Leaf area measurement: The leaf area was measured by the grid method, and the leaf area was calculated by multiplying the product of the leaf length and the leaf width by the leaf area conversion coefficient.

In this experiment, the leaves of the plants were completely withered and yellowed as the standard for determining the death of the plants. Such leaves were not recorded in the current leaf area, and the plants were cut off from the dead plants. In the subsequent measurements, the number 0 represents the leaf area of the plants. Stem thick, plant height.

3.2 Influence of irrigation concentration on leaf area of jujube plants

The leaf growth status of plants is compatible with their own growth environment. From the figure, the leaf area of different groups is increasing in the first three cycles, the growth of CK1 group is the most obvious, and the growth rate of CK2 group is decreasing. After the third cycle, the growth of the CK2 group with the highest salt content ceased to occur.

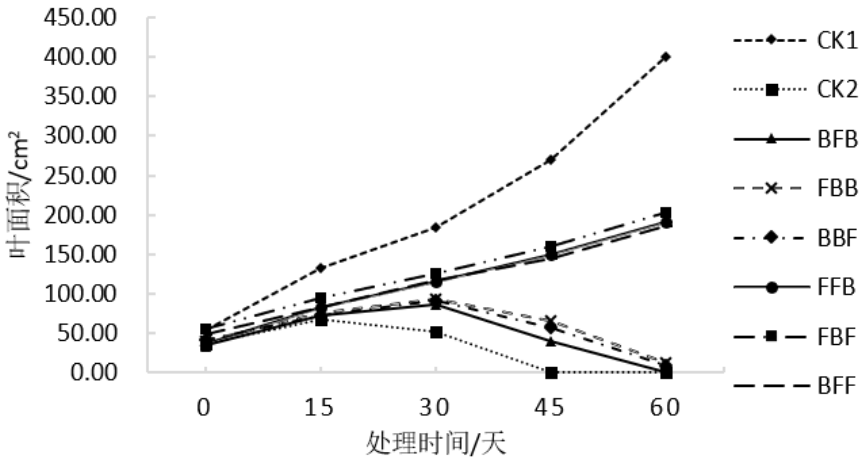

Figure 3-1: Average leaf area of each group

3.3 Irrigation concentration on the stem diameter of jujube plants

There is a layer formed between the xylem and the phloem of the plant. The cells forming the layer can be continuously split to form new xylem cells and phloem cells, so that the stems grow thicker. In the following figure, the plants with the highest salt content are constantly showing death. From the growth line of the eight stems in the figure, it can be seen that the two trend lines of the CK1 group and the CK2 group are very different. BFB, FBB, and BBF The trend of the line is similar, and the trend lines of the III gradient FFB, FBF, and BFF can roughly coincide. Because the salt water irrigation times of different gradients are different, it can be concluded that the higher the salt accumulation, the more obvious the inhibitory effect of salt in the soil on the cell division of the formation layer. The expression form is the normal growth of the stem of the CK1 group and the growth rate of the CK2 plant. As the cumulative amount of salt increases, it continues to slow down until death.

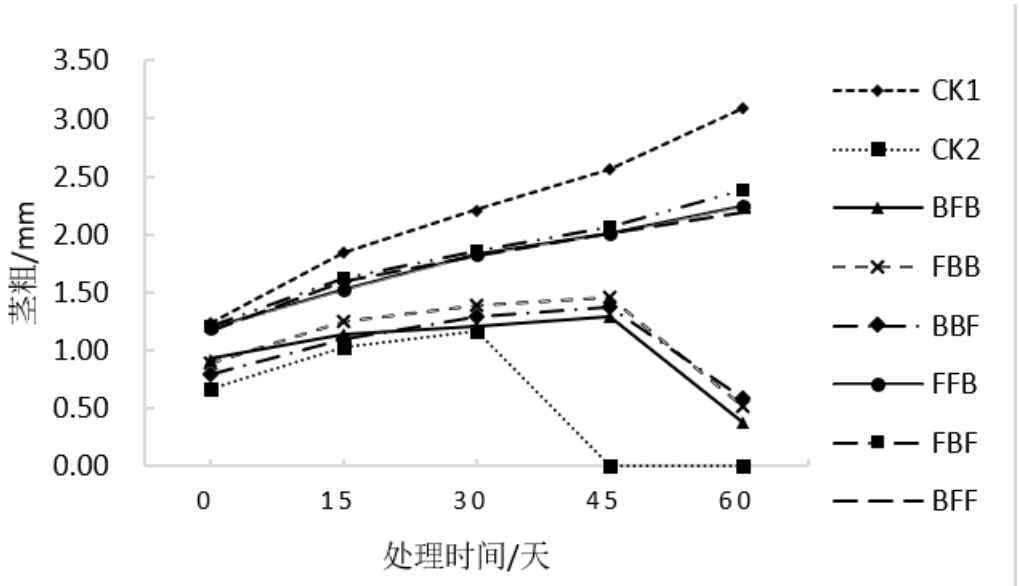

Figure 3-1: Average stem diameter of each group

3.4 Effect of Irrigation Concentration on Plant Height of Jujube Plants

As shown in the figure, as the growth cycle continues to increase, the cumulative amount of salt in the different treatment groups also has a large gap. It can be seen from the figure that the average plant height of the CK1 group is the highest, and the average plant height of each treatment group is The cumulative amount of salt is decreasing and increasing. Comparing the data of CK1 and CK2, the growth of each plant in CK1 group was good, and the increase of plant height was higher than that of CK2 group in the same cycle interval. The CK2 group gradually stopped developing and died after the third measurement. The II gradient group stopped growing after the fourth cycle and began to die a lot. The III gradient plants grew better than the I and II gradient plants to ensure normal growth, but The growth rate is lower than that of the IV gradient plants.

4. Conclusion and discussion

When the soil salinity is higher than the concentration threshold of suitable plant growth, it will trigger changes and reactions in plant functions [3]. In the experiment, different groups of jujube seedlings were treated with different methods of brackish water alternately. The plant height, stem diameter and leaf area of the jujube plants were measured in the same interval measurement period. In the four gradients of salt accumulation, under the I gradient Plant growth was severely inhibited and all died after the third measurement. A large number of deaths occurred in the growth of plants under the gradient of II. The gradients of the control III and IV can be concluded as follows: the higher the salt accumulation under different alternate irrigation methods, the more obvious the inhibition of plant

growth, and the high concentration of salt can cause the plant to die. In the process of watering, a small amount or no irrigation of salt water can ensure the survival and growth of the plants. Therefore, under the premise of ensuring the normal growth of the plants during irrigation, salt water irrigation can be used in an appropriate amount to increase the utilization rate of salt water resources. Save fresh water resources.

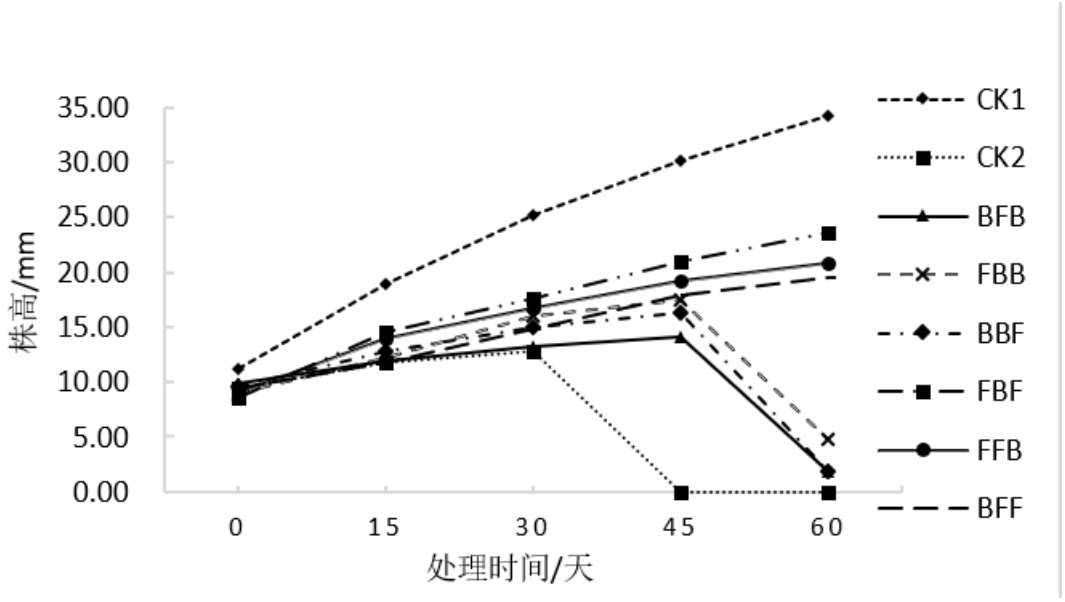

Figure 3-1: Average plant height of each group

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