The Effects of Different Soaking Temperature and Time on Seedling Quality of Rice

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Abstract: The yield of rice in Northeast China depends on the quality of rice seedlings, and the quality of rice seedlings is closely related to the temperature and time of rice seed soaking. The optimum combination of temperature and time was found under different soaking temperature and soaking time of Jijing 88 rice varieties. The results showed that the quality of rice seedlings was the best after 8 days soaking at 12℃, which laid a solid foundation for cultivating strong rice seedlings and realizing high-yield cultivation in Northeast China.

1. Materials and Methods

1.1 The Test Materials

The experiment was carried out in the laboratory and rice field of jilin agricultural science and technology university, and the rice variety was jijing 88 (super rice).

1.2 The Test Method

1.2.1 Experimental Treatment

In this experiment, random block experiment method was adopted. Two factors were set in the experiment, which were factor A and factor B, respectively. 12 treatments were performed, and each treatment was repeated for 3 times.

Factor A is the soaking temperature and factor B is the soaking time[2]. Set A different seed soaking temperature factors, equipped with three levels, respectively.They are:A_1=8℃,A_2=12℃,A_3=16℃; Let the seeding time of factor B be set at four levels: B1=6d,B_2=8d,B_3=10d,B_4=12d[3][6].

1.2.2 Seed Selection

Seeds were carefully selected to remove impurities and dented grains, etc. Seeds were selected with brine with a relative density of 1.13:1 and then washed twice with water[7].

1.2.3 Seed Soaking

Seed soaking requires uniform and uniform absorption of moisture[8], dip the first three processing firstA_1B_3,A_2B_3,A_3B_3, two days later the second A_1B_3,A_2B_3,A_3B_3, four days later and then dip the third batch of A_1B_2,A_2B_2,A_3B_2, six days and then dip the fourth batch ofA_1B_1,A_2B_1,A_3B_1, respectively in the three constant temperature box[4][9] with 8℃,12℃,16℃.

1.2.4 Sowing

Sowing method and sowing time: sowing on April 10, seedling cultivation in plates, 150g of wet seeds for each plate.

1.2.5 Sampling

The five-point sampling method was adopted. Five points were taken from each plate, and

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3cm×6cm seedlings were taken from each point. The seedling quality was investigated.

1.2.6 The Content of the Survey

The length of the leaf sheath from the base of the seedling to the longest leaf pillow is measured in centimeters.

Take 10 seedlings randomly at the base width, measure the base of each 10 seedlings, and get the average value.

Dry weight seedlings were dried to constant weight at 105 c, and the dry weight per plant and per seedling g/cm were calculated

White root number, wash away the soil, check the number of white root.

Plant height is the distance from the base of the stem to the top of the leaf in centimeters[5][10].

2. The Results and Analysis

The data of rice seedling quality were obtained and analyzed by mathematical statistics through the two-factor randomized area test data.

2.1 Effects of Different Treatments on the Width of Rice Seedling Base

The seedlings of the test sampling points were measured, the data of the base width of 10 seedlings were measured, the average value was obtained, and the data was analyzed by variance..

2.2 Tables

Tables (refer with: Table 1, Table 2, Table 3, Table 4, Table 5, Table 6, Table 7) .

Table 1 Analysis of the variance of the base width of seedling stems

Source of variation	DF	SS	MS	F
Inter-group	2	0.04	0.02	1.79
Processing combination room	11	0.32	0.03	2.40*
A	2	0.14	0.07	5.87**
B	3	0.13	0.04	3.53*
A×B	6	0.05	0.01	0.67
Error	22	0.27	0.01	

*Represents significance,**Represents extremely significance

It can be seen from the table that the difference between the block repeats is not significant, and the difference between the treatments is significant. During the treatment, the temperature difference of the A factor treatment is extremely significant, while the treatment time of the B factor is significant, and the difference between the two factors is not significant. The LSR comparison analysis of the two factors is as follows:

A comparative analysis of the significance of the influence of A factor on the width of rice stem base under different soaking temperature conditions is shown in Table 2.

Table 2 Significance analysis of factors A at different levels

Levels	Stem width(mm)	Significance of difference	
		F0.05	F0.01
A_2	3.27	a	A
A_3	3.16	b	B
A_1	3.12	c	C

From the significant analysis of the A factor in Table 2, it can be seen that the difference in the three temperature treatments is extremely significant, in which the stem width of A2 is the widest at 12℃, and the stem width of 8℃ treated by A1 is the smallest, indicating that the optimum temperature is around 12℃. Both low temperature and high temperature treatment will affect the quality of the seedlings.

A comparative analysis of the effects of different soaking time of B factors on the width of rice stem base was obtained in Table 3.

Table 3 Significance analysis table of factors B at different levels

Levels	Stem width(mm)	Significance of difference	
		$F_{0.05}$	$F_{0.01}$
B_2	3.24	a	A
B_3	3.22	a	A
B_1	3.17	b	B
B_4	3.09	c	C

As can be seen from Table 3, rice soaking for 8-10 days showed the best stem width, no significant difference, and 8-10 days of soaking was significantly better than 6 days and 12 days of soaking.

2.3 Effects of Different Treatments

on dry weight, total root number, seedling height and first sheath length of rice seedlings

The dry weight of the seedlings, the total number of roots, the height of the seedlings and the length of the first sheath were investigated in the factors related to the quality of rice seedlings, and the reason data were analyzed by variance. The significance was shown in Table 4.

Table 4 Analysis of variance of variance of rice seedling quality in different treatments

Source of variation	Seedling height of F	Seedling dry weight of F	The total number of root of F	Leaf sheath length of F
Inter-group	2.13	0.83	3.07	1.06
Processing combination room	4.71**	2.29*	2.33*	2.45*
A	8.55**	3.61*	0.16	1.15
B	10.19**	5.01**	1.23	7.18**
A×B	0.69	0.48	3.61*	0.52
Error				

*Represents significance,**Represents extremely significance

It can be seen from Table 4 that among the factors affecting the quality of rice seedlings, the difference in the treatment of seedling height was extremely significant, while the difference in the dry weight of the seedlings, the total number of roots and the length of the first sheath length treatment was significant.

The effect of temperature on the seedling height of the influencing factors of seedling quality was extremely significant, and the effect on the dry weight of the ground was significant, but the effect on the total number of roots and the length of the first sheath was not significant.

The soaking time had a significant effect on the seedling height, the above ground dry weight and the length of the first leaf sheath, and the effect on the total number of roots was not significant.

The interaction between temperature and soaking time has significant effects on the total number of roots, but not on other indicators.

Aiming at the significant analysis of the influencing factors of seedling quality in Table 4, the significant differences of different influencing factors were analyzed.

2.4 Significance Analysis of Factor A at Different Levels.

The differences in seedling height and on-ground dry weight of different seed soaking temperature on rice seedling quality were significantly different. It can be seen from Table 5 that A2 treatment at 12℃ affected rice seedling quality the most significant, and seedling quality was the best, while A1 treatment At8℃, the quality of rice seedlings was poor. As can be seen from Table 5, about 12℃is

the most suitable soaking temperature.

Table 5 Significance analysis table of factors A at different levels

Levels	Stem width(cm)	Significance of difference		Levels	Dry weight of seedlings(g)	Significance of difference
		$F_{0.05}$	$F_{0.01}$			$F_{0.05}$
A_2	16.76	a	A	A_2	3.26	a
A_3	16.43	b	B	A_3	3.18	ab
A_1	16.14	c	C	A_1	3.16	b

The soaking temperature only affected the seedling height of the seedlings and the above ground dry weight of the seedlings, especially the effect of seedling height was extremely significant, and the effect on the length and total number of the first sheath was not significant.

2.5 Significance Analysis of Factor B at Different Levels.

Table 6 Significance analysis table of different levels of factor B

Levels	Seedling height (cm)	Significance of difference		Levels	Dry weight of seedlings(g)	Significance of difference		Levels	Leaf sheath length (cm)	Significance of difference	
		$F_{0.05}$	$F_{0.01}$			$F_{0.05}$	$F_{0.01}$			$F_{0.05}$	$F_{0.01}$
B_3	16.88	a	A	B_3	29.70	a	A	B_4	2.63	a	A
B_2	16.67	b	B	B_1	28.70	b	B	B_2	2.62	a	A
B_1	16.14	c	C	B_2	28.60	b	B	B_1	2.57	b	B
B_4	16.09	c	C	B_4	28.20	c	C	B_3	2.44	c	C

The seedling height, the above ground dry weight and the length of the first leaf sheath in different factors of rice seedling influencing the seedling quality of rice had different effects.

It can be seen from Table 6 that the optimum time for rice soaking is 10d, and when it reaches 12d, it will obviously affect the quality of rice seedlings. When soaked for 10 days, the seedling height of rice was the highest, the dry weight of the ground was the heaviest, the length of the first leaf sheath was the shortest, and the quality of the seedling was the best. When the soaking seeds reached 12d, the first sheath length was the longest and the dry weight on the ground was the lowest, indicating a tendency to migrate.

2.6 Significant Analysis of A×B Interaction

After the significant analysis of the influence of the interaction between the A factor and the B factor on the total number of roots in the analysis of variance, the treatments were compared and analyzed as shown in the following table.

Table 7 A × B interaction significance analysis table

dispose	Total number of roots(article)	significance	dispose	Total number of roots(article)	significance
A_2B_2	16.33	a	A_1B_1	14.67	bc
A_1B_3	15.67	ab	A_1B_2	14.67	bc
A_2B_4	15.67	ab	A_1B_4	14.67	bc
A_3B_3	15.67	ab	A_2B_1	14.33	bc
A_3B_1	15.00	b	A_2B_3	14.00	c
A_3B_2	15.00	b	A_3B_4	14.00	c

It can be seen from the table that the highest total number of roots is A_2B_2, that is, under 12℃ conditions, soaking seeds for 8 days, the best for rice seedling quality improvement. The worst is

A_3B_4 and A_2B_3 treatment, that is, soaking seeds for 12 days at 16℃, and soaking seeds at 12℃ for 10 days, the seedling quality is the worst.

From the perspective of seeding temperature and time interaction, rice root development was best when the soaking temperature was close to 100℃.

The soaking temperature of rice reached 12℃ and above, and the time was over 10d, and the quality of seedlings was the worst.

3. Summary

After conducting experiments in the laboratory and nursery greenhouse of Jilin Agricultural Science and Technology College, the following conclusions were drawn: During the soaking process of rice, different treatment temperatures and time have obvious effects on the quality of rice seedlings.

When the rice seeds were treated at8℃,12℃ and 16℃, the difference in the root width and seedling height of the seedlings was significant, and the difference in the dry weight of the seedlings was significant, and the seedling quality was the best at 12℃.

When the treatment time of 6d, 8d, 10d and 12d was used, the effects on the basal width, seedling height, above ground dry weight and first sheath length of rice seedlings were extremely significant, and the seedlings of rice were soaked for 8-10 days. The best quality.

From the analysis of the temperature and time interaction of soaking seeds, when the soaking temperature was12℃, soaking seeds for 8 days, the best quality of rice seedlings was improved.

In summary, the different temperature and time of rice soaking have obvious effects on the quality of rice seedlings. In the process of soaking seeds, the seedling quality of rice soaked for 8-10 days was the highest at 12℃.

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