

# Study on the effect of DA-6 on the maturity and fruit quality of 'Aikansui' pear

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**Abstract.** The effect of DA-6 treatments with different concentrations on the maturity and fruit quality of 'Aikansui' pear was studied. The results showed that the effect of treatment at 35 mg · L<sup>-1</sup> was the best, followed by 30 mg · L<sup>-1</sup>. The treatment of 35 mg · L<sup>-1</sup> could increase the sugar content of the fruit, reduce the content of titratable acid, and advance the maturity of the fruit to the greatest extent. The 30 mg · L<sup>-1</sup> treatment had the most significant effect on the increase of fruit weight and the Vc content.

## 1. Introduction

DA-6 (N, N - diethyl aminoethyl hexanote) is a new type of cytokinin plant growth regulator, which can increase crop yield and improve crop quality [1-2]. DA-6 can be naturally degraded in nature, which is non-toxic, harmless, pollution-free and low residual [3]. It is a highly safe plant growth regulator. Therefore, it has broad application prospect and market value [4]. 'Aikansui' is a widely cultivated pear variety in Sichuan, with brown peel and milky yellow flesh. It has fine and brittle texture, strong and sweet flavor, slightly fragrant, and high quality [5].

In recent years, there have been some reports on the application of DA-6 in fruit trees. Spraying DA-6 can increase the fruit weight and soluble total sugar content of pineapple and longan, and can improve their storage resistance and preservation effect [2,6]. However, there are few reports on DA-6 in pear fruits. This experiment explored the effects of different concentrations of DA-6 on the fruit maturity and fruit quality of 'Aikansui'. It provides theoretical and practical basis for promoting fruit maturity, improving fruit quality, and increasing the economic value of 'Aikansui' cultivation.

## 2. Materials and methods

### 2.1. Test Materials

The tested pear variety was 'Aikansui' with high density V-type cultivation, and the planting density was 660 plants / mu.

Six-year-old 'Aikansui' plants with basically the same growth were selected as test materials. The tested DA-6 is produced by Shanghai tianxiuca Biotechnology Co., Ltd.

### 2.2. Test Site Overview

The experiment was carried out in the pear garden of Chongzhou base of Sichuan Agricultural University, where the average annual rainfall was 1775mm, the frost-free period was 285 days, the average temperature was 16.2°C, and the average annual sunshine duration was 1050h. The soil texture was loam, pH was around 6.8, and the management level was medium.

### 2.3. The main content of the experiment

Pear trees with the same crown growth and no pests were selected. And three trees were selected as a plot, three replicates were set. The method of foliar spraying was adopted. DA-6 was sprayed to the leaves at a concentration of 10 mg · L<sup>-1</sup>, 15 mg · L<sup>-1</sup>, 20 mg · L<sup>-1</sup>, 25 mg · L<sup>-1</sup>, 30 mg · L<sup>-1</sup>, and 35 mg · L<sup>-1</sup> after flower fading 82 days. Clean water was applied as a control. All treatments were sprayed again after 7 days.

### 2.4. Analytical method

Determination of intrinsic quality of pears such as soluble solids and reducing sugars under different treatment concentrations is based on Xiong's method [7].

Determination of pear fruit appearance quality with different treatment concentrations

Determination of single fruit weight: the single fruit weight was determined by electronic balance, and the average value was obtained after three repetitions (the same below).

Determination of fruit shape index: the vernier caliper was used to measure the transverse and longitudinal diameter of fruit and calculate the fruit shape index.

### 2.5. Data processing

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EXCEL2016 and SPSS 23.0 were used for data processing and analysis.

### 3.1. Effects of different treatments on the maturity of 'Aikansui' pear

## 3. Results and analysis

Table 1. Effect of different DA-6 treatments on maturity of 'Aikansui' pear .

Treatments	Mature
CK	7/13
10mg/L	7/13
15mg/L	7/12
20mg/L	7/12
25mg/L	7/11
30mg/L	7/10
35mg/L	7/9

As can be seen from the table 1, compared with the control group, except for 10 mg ·L<sup>-1</sup> treatment, pear fruit ripening stage could be advanced by other concentration treatments. Moreover, with the increase of treatment concentrations, pear fruit ripening stage could be advanced earlier. This indicates that in a certain range,

the higher the concentration of DA-6 was, the better the pear ripening stage would be.

### 3.2. Effects of different treatments on the external quality of 'Aikansui' pear

Table 2. Effects of different DA-6 treatments on the fruit external quality of 'Aikansui' pear.

Treatments	Single fruit weight	Shape index
10mg/L	93.75 c	0.82 a
15mg/L	102.5 b	0.83 a
20mg/L	90.00 c	0.88 a
25mg/L	103.75 b	0.87 a
30mg/L	117.50 a	0.85 a
35mg/L	91.33 c	0.86 a
CK	90.00 c	0.79 a

Note: different lowercase letters indicate significant difference (P<0.05). The same as below.

As can be seen from the table 2, different treatment concentrations have different degrees of promotion on the single fruit weight of pear fruits. Among them, the single fruit weight increase of the pear fruit treated with 30 mg ·L<sup>-1</sup> has the largest increase of 27.50 g. The fruit shape index of 'Aikansui' pear fruit has little difference,

and there was no significant difference between the treatments, which indicated that the effect of different concentrations on the fruit shape index was not obvious.

### 3.3. Effects of different treatments on the internal quality of fruit of 'Aikansui' pear

Table 3. Effects of different DA-6 treatments on the internal quality of fruit of 'Aikansui' pear

Concentration	Total soluble solid/%	Reducing sugar content g/100ml	Invert sugar content g/100ml	Acid content g/100ml	VC content g/100ml	Sugar/acid
10mg/L	12.17 a	7.97 bc	7.88 a	0.13 bc	2.06 ab	120.52 abc
15mg/L	12.23 a	7.63 c	6.75 b	0.12 c	2.16 a	99.13 c
20mg/L	12.47 a	8.20 bc	6.09 b	0.14 abc	2.26 a	101.16 c
25mg/L	12.40 a	8.52 ab	5.84 c	0.15 ab	2.16 a	125.56 a
30mg/L	12.10 a	9.13 a	8.26 a	0.16 a	2.26 a	108.68 abc
35mg/L	11.90 a	9.31 a	6.41 c	0.13 bc	2.06 ab	120.92 ab
CK	12.13 a	7.57 c	8.02 a	0.15 ab	1.75 b	104.87 ab

As can be seen from the table 3, different treatment concentrations of DA-6 could significantly increase the content of reducing sugar and Vc in 'Aikansui' pear among which 30 mg ·L<sup>-1</sup> has the most significant treatment effect. In addition to 15 mg ·L<sup>-1</sup>, 20 mg ·L<sup>-1</sup>, the concentration could improve the pear fruit sugar acid ratio. Treatment of 30mg/L and 35mg/L could increase the sugar content of fruit, but the titratable acid content of 30mg/L was the highest, while the sugar acid content was lower than that of 35 mg ·L<sup>-1</sup>.

#### 4. Discussion and summary

From the perspective of 'Aikansui' fruit ripening stage, DA-6 could advance the ripening stage of pear fruit, and in a certain range, with the increase of treatment concentration, pear fruit ripening stage was advanced earlier. The mechanism may be to promote cell division and elongation, accelerate growth point growth and differentiation, accelerate vegetative growth, increase flowering and fruit setting rate to promote fruit ripening [8]. Song et al [9]. found that DA-6 had an effect on the early ripening of strawberry fruits, which was consistent with the results of this experiment.

From the comprehensive effect of fruit quality, appropriate concentration treatment could effectively promote the improvement of fruit quality. And the optimal concentration corresponding to different measurement indicators was slightly different, indicating that the different concentration treatment of DA-6 has different regulatory mechanism changes on 'Aikansui', resulting in different changes in some characters. Among them, 35 mg ·L<sup>-1</sup> had the best effect, followed by 30 mg ·L<sup>-1</sup>. The treatment of 30 mg ·L<sup>-1</sup> had the most significant effect on the increase of fruit weight and the maximum Vc content. Sun xiaohui [10] et al., sun guangming [6] et al., and wang zhixia [11] et al., proved that appropriate concentration of DA-6 could improve the fruit quality of spinach, pineapple and peach. This is also consistent with the results of this experiment. Its action mechanism may be through affecting the balance of endogenous hormone system and material metabolism of plants, thus regulating the growth and development of crops, increasing yield and improving quality.

In conclusion, the treatment of 35 mg ·L<sup>-1</sup> could increase the sugar content of the fruit, reduce the titratable acid content, and advance the fruit ripening period to the maximum extent, which is the appropriate DA-6 treatment concentration of 'Aikansui' pear.

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