

ORIGINAL ARTICLE

Response of Quality and Quantity Traits of Rose (Cv. 'Angelina') to Kinetin Preharvest Treatment

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ABSTRACT

The aim of this study was to explore the effects of plant growth regulator (kinetin) preharvest treatment on some properties of rose (cv. 'Angelina'). For this purpose, a randomized complete design was carried out in the research greenhouse of Islamic Azad University, Isfahan (Khorasgan) branch. Four concentrations of kinetin including 0, 10, 15 and 20 ppm were used with 3 replications. The plants were sprayed manually on a once every two weeks. Mean temperature of day and night were 28 °C and 18 °C, respectively and relative humidity was fixed in 60 to 70% during the growth period. The some properties of rose such as plant yield, chlorophyll content (a, b and total), anthocyanin content of petal and the total phosphorus, Magnesium, Iron and Zinc were determined. The results showed that foliar application of kinetin significantly affected the most studied traits. Leaf area of rose was far greater in 20 ppm kinetin compared to control. The plant yield and concentration of Fe in 10 and 20 ppm kinetin was significantly higher than that control. Statistical testing showed a significant increase in concentration of P and Zn leaf with increasing kinetin concentration. The application of kinetin caused increases in content of chlorophyll (a, b and total) and anthocyanin. In view of the obtained results, it is suggested that the application of kinetin improved quality and quantity of rose.

Key words: Rose, Kinetin, Preharvet, Yield, plant element

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INTRODUCTION

Plant growth regulators can be defined as either natural or synthetic compounds that are used directly to a plant to alter its growth processes or structure in some beneficial way [6]. Cytokinins are plant hormones that impacts on many developmental processes including apical dominance, leaf senescence, chloroplast development, regulation of cell division and production of anthocyanin [10]. Cytokinins have been known to participate in the regulation of numerous aspects of plant development including initiation of buds, flowering, abscission and yield. Cytokinin is a group of plant hormones that regulate cell division and organogenesis in plant tissues [1]. Kinetin is synthetic cytokinin that led to improvement of plant growth and development even grown under environmental stress [12]. Kinetin is phytohormones involved in different developmental processes. Kinetin can stimulate cell division, leave expansion, and chlorophyll synthesis [15].

The genus Rose (*Rosa* spp.) which belongs to the family Rosaceae and the subfamily Rosoideae, comprises hundreds of species and thousands of cultivars. Roses are, certainly, one of the most economically important genus of aromatic, ornamental and medicinal plants widely distributed all over the world [11],[2]. Millions of rose bushes are cultivated in gardens or pots and billions of rose cut flowers are sold annually around the world.

The positive influences of cytokinin such as kinetin on plant growth were reported by previous studies. reported that the foliar application of kinetin led to significant increase in number of branches and leaves, shoot dry weight and number of produced flowers of Lentil Plant. They found that the application of

kinetin (especially 40 mg L⁻¹) increased the number and weight of pod [13]. Observed that kinetin significantly affected the growth performance, yield and quality characters of sprouting broccoli [9]. stated that fresh weight of rose increased as cytokinin treatments than in the control. However, stem diameter was not affected by cytokinin application [8]. Indicated that spraying kinetin at 2 and 4 mM levels improved growth parameters in tomato. The aim of this work was to study the effects kinetin spraying on quantitative and qualitative traits of rose cut flowers (cv. 'Angelina').

MATERIALS AND METHODS

In order to evaluate the effects of kinetin on some properties of rose (cv. 'Angelina') a greenhouse experiment was conducted in the research greenhouse of Islamic Azad University, Isfahan (Khorasgan) branch. The experimental design was completely randomized, with different concentrations kinetin (0, 10, 15 and 20 ppm) with 3 replications. The stem cuttings were supplied from two-year-old mother stock. These cuttings were grown in a nutrient solution containing hydroponic growing media four month. Thus, the mature plants were sprayed manually using a 500 mL hand sprayer on a once every two weeks during 45 days. Average temperature of day and night were 28 °C and 18 °C, respectively and relative humidity in greenhouse was 60- 70 percent during the growth period. The some properties of rose such as leaf area, plant yield, chlorophyll (a, b and total), anthocyanin, and concentration of P, Mg, Fe, and Zn determined at the after the late-stage of kinetin spray.

Measurement of chlorophyll content:

0.5gm fresh plant material were homogenized in 20 ml of 80% chilled acetone with the help of mortar and pestle in dark. A pinch of MgCO₃ powder added. The extract filtered through Whatman no.1 filter paper. Final volume of the filtrate was made to 100 ml with 80% acetone in conical flask wrapped with black carbon paper. Absorbance readings done at the 645 nm and 663 nm wavelengths respectively with 80% acid used as a blank.

Measurement of anthocyanin:

0.1gr of fresh plant tissue with 10ml of acidified methanol completely pulverized, then extracted, kept in incubator at 25°C for 24 hours. After this time, samples centrifuge 10 minutes with 4000 rpm. Absorbance readings done at the 550 nm wavelength with spectrophotometr.

Measurement of P, Mg, Fe, and Zn:

The concentrations of P (spectrophotometrically method) and Mg, Fe, and Zn (Flame atomic absorption spectrophotometry method) was determined after wet digestion.

Statistical analyses

The effects of kinetin on the quantitative and qualitative traits of rose cut flowers were carried out by one-way analysis of variance (ANOVA). Statistical procedures were performed using the Statistical Analysis System (SAS), version 9.1 (SAS Institute, Cary, NC, USA). Differences between the treatments were determined using Least Significant Difference (LSD) test at $p < 0.05$.

RESULTS AND DISCUSSION

Leaf area:

Statistical analysis showed leaf area was far greater in plants treated with 20 ppm kinetin compared to control. However, there were not significant differences between kinetin 10 ppm and control (Fig. 1). The increase in leaf area may be due to the role of kinetin in increasing cell division.

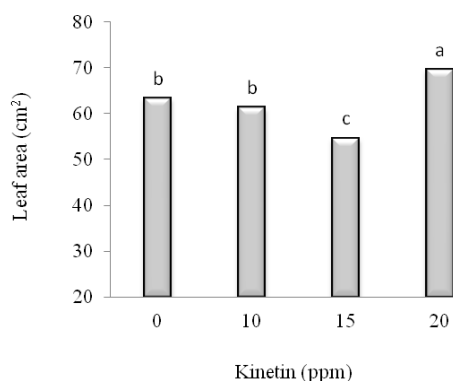


Fig. 1. The effects of kinetin on leaf area of rose (cv. 'Angelina'). Means followed by the same letter are not significantly different at $p < 0.05$ by LSD test (LSD=2.40).

Plant yield:

As shown in Fig. 2, the result indicated that application of kinetin had positive effect of yield of rose. The yield of rose was greater in kinetin treatments compared with control (Fig. 2). The increase in plant yield of rose may be due to the role of kinetin in increasing cell division. Also, another reason for increments in yield may be the role of kinetin in stimulating xylem differentiation consequently more absorption of nutrients and water from the growth media. This result suggested that exogenous treatment of cytokinins help rose plant to promote from shoot growth [9].

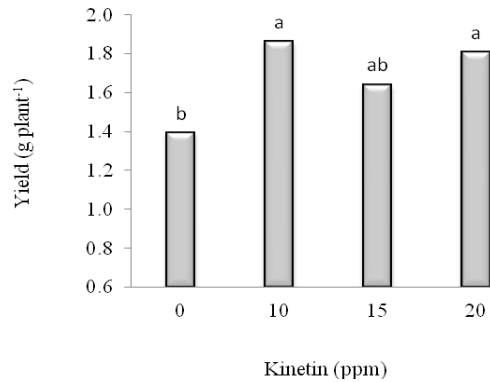


Fig. 2. The effects of kinetin on yield of rose (cv. 'Angelina'). Means followed by the same letter are not significantly different at $p < 0.05$ by LSD test (LSD=0.28).

Content of leaf chlorophyll:

As shown in Fig. 3, Fig. 4 and Fig. 5, leaf chlorophyll content (a, b and total) was affected by application of kinetin. The results indicated that 10, 15 and 20 ppm levels of kinetin increased leaf chlorophyll content compared to control however. Previous studies also suggest that kinetin increase leaf chlorophyll contents. reported that foliar application of kinetin increased chlorophyll content and leaf yield of mulberry and maize, respectively[4],[5]. Increase in the concentration of chlorophyll in the plants treated with kinetin can minimize electrolytic leakage [3].

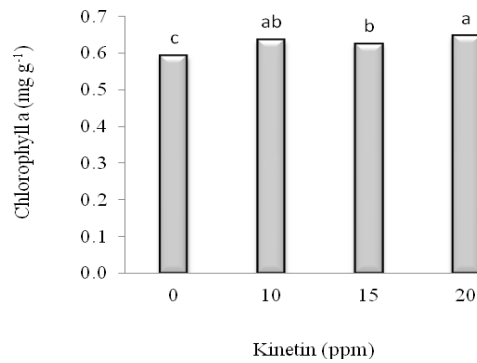


Fig. 3. The effects of kinetin on chlorophyll a of rose (cv. 'Angelina'). Means followed by the same letter are not significantly different at $p < 0.05$ by LSD test (LSD=0.02).

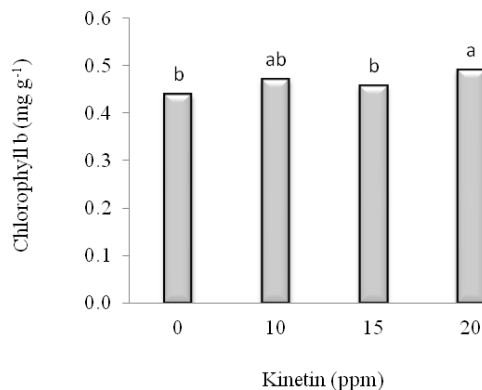


Fig. 4. The effects of kinetin on chlorophyll b of rose (cv. 'Angelina'). Means followed by the same letter are not significantly different at $p < 0.05$ by LSD test (LSD=0.03).

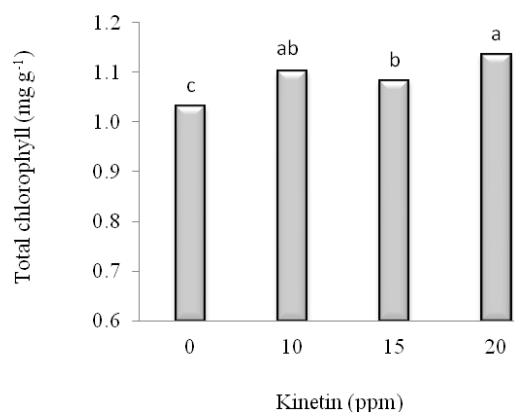


Fig. 5. The effects of kinetin on total chlorophyll of rose (cv. 'Angelina'). Means followed by the same letter are not significantly different at $p < 0.05$ by LSD test (LSD=0.05).

Anthocyanin of petal:

As shown in Fig. 6 the content of anthocyanin of petal was far greater in plants treated with kinetin compared to control.

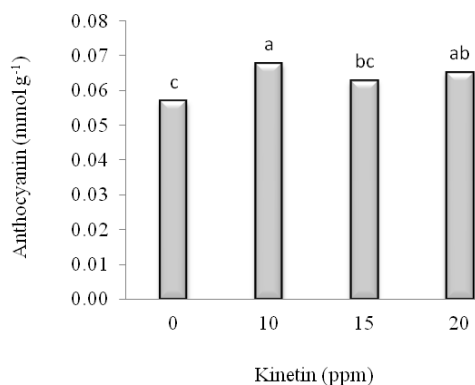


Fig. 6. The effects of kinetin on anthocyanin of petal in rose (cv. 'Angelina'). Means followed by the same letter are not significantly different at $p < 0.05$ by LSD test (LSD=0.006).

P concentration:

As shown in Fig. 7, the P concentration significantly increased with increasing kinetin application. increasing concentration of the foliar application kinetin increased plant height, number of branches, number of leaves, stem diameter, root length as well as fresh and dry weights of all plant organs and also the content of the total carbohydrates, total N, P and K[7].

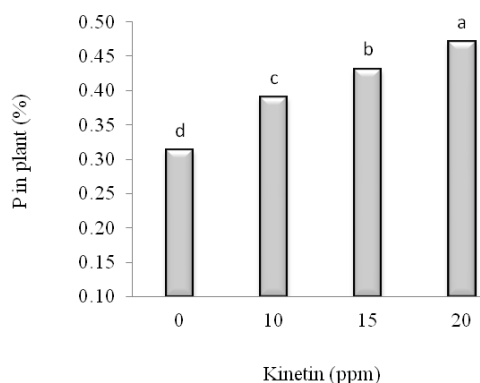


Fig. 7. The effects of kinetin on P concentration of rose (cv. 'Angelina'). Means followed by the same letter are not significantly different at $p < 0.05$ by LSD test (LSD=0.04).

Mg concentration:

The concentration of Mg in leaves was marginally lower in plants treated with kinetin compared to control (Fig. 8). These results are agreed with the past findings of that showed kinetin increased the concentration of K in wheat grain but decreased the concentration of Mg in leaves [14].

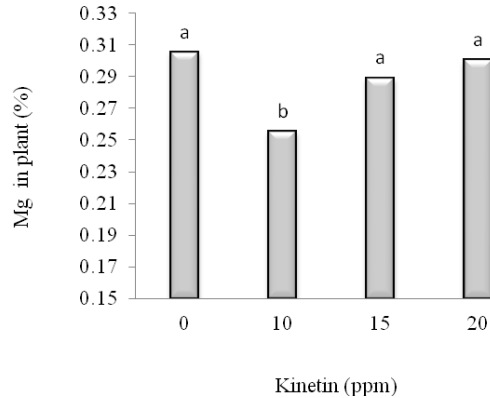


Fig. 8. The effects of kinetin on Mg concentration of rose (cv. 'Angelina'). Means followed by the same letter are not significantly different at $p < 0.05$ by LSD test (LSD=0.02).

Fe and Zn concentration:

As shown in Fig. 9 and 10, the Fe and Zn concentration significantly increased with increasing kinetin application.

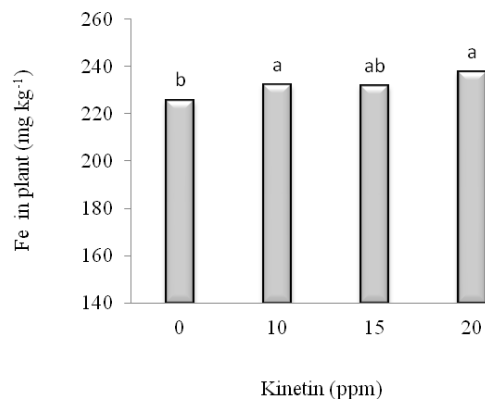


Fig. 9. The effects of kinetin on Fe concentration of rose (cv. 'Angelina'). Means followed by the same letter are not significantly different at $p < 0.05$ by LSD test (LSD=6.43).

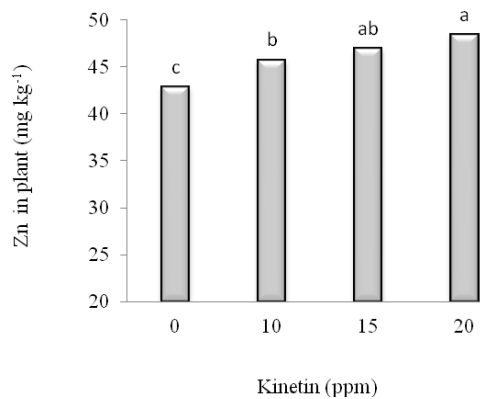


Fig. 10. The effects of kinetin on Zn concentration of rose (cv. 'Angelina'). Means followed by the same letter are not significantly different at $p < 0.05$ by LSD test (LSD=2.34).

CONCLUSIONS

The performance and suitability of Kinetin on quantitative and qualitative traits of rose (cv. 'Angelina') were studied in a greenhouse experiment. Based on the results of this study, utilizing kinetin to increase plant yield, chlorophyll content (a, b and total), anthocyanin, P, Fe and Zn can be useful.

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