

EFFECTS OF LIQUID FERTILIZER CONTAINING 5-AMINOLEVULINIC ACID ON THICKENING GROWTH IN TULIP BULBS

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ABSTRACT

The promotive effect of Pentakeep-V (PKV) on thickening growth of tulip bulbs was studied. PKV markedly increased the number of tulip bulbs, especially of commercial bulbs. This effect of PKV was found in both cvs. Ballerina and Leen-van-der-Mark. Thus, this PKV dilution was very useful for the production of commercial bulbs in tulip plants.

INTRODUCTION

Tulip plants are a main crop in winter cropping on drained paddy field, especially in Toyama Prefecture, Japan. The commercial bulbs are used for flower bulbs in gardening and cut flower. However, the thickening growth from seeds to seed bulbs is very slow, approximately 5 to 7 years need to obtain commercial bulbs from original seeds. Therefore, the promotion of thickening growth of tulip seed bulbs using plant growth regulator is very useful for increasing actual income of farmer. In this experiment, we examined whether or not liquid fertilizer containing 5-aminolevulinic acid (5-ALA) and micronutrients (PKV) affects the thickening growth of seed bulb (circumference of bulb, 5 and 6 cm) in tulip plants.

MATERIALS AND METHODS

The cultivars of tulip plants used were Ballerina and Leen-van-der-Mark. Both cultivars were cultivated under field condition. The seed bulbs of 5cm (cv. Ballerina) and 6cm (cv. Leen-van-der-Mark) were transplanted in field on October 23, 2004. At flowering time on May 5, 2005, each testing PKV dilution (5000-fold and 2000-fold) was sprayed three times onto leaves and stem after flower picking. The water solution was also applied to control plants. The spraying volume per 10 are was Ca. 100 liter. These testing solutions contained 0.1% of Approach as a wetting agent. The liquid of PKV used was composed of N 9.5%, MgO 5.7%, MnO 0.3% and B₂O₃ 0.45% as macro-and micro-nutrients, and also DTPA-Fe, ZnSO₄, Na₂MoO₄ and 5-aminolevulinic acid (5-ALA) as

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growth promoters.

At harvesting time on June 20, 2005, the total yield of bulbs and the number in each bulbs size were determined. The bulb size was classified to the circumference (cm) of bulb (>10cm, >9cm, >8cm, >7cm, >6cm, >5cm and <5cm).

RESULTS AND DISCUSSION

The promotive effect of PKV on the yield in each bulb size, in case of cv. Ballerina, is shown in Table 1. As shown in table, the foliar spray of PKV markedly increased the total bulb number per 6 m². The rate increased was 106% for PKV 5000-fold dilution and 120% for PKV 2000-fold one. However, no the promotive effect of PKV on the bulb weight in each bulb size was observed (Table 2).

On the other hand, in case of cv. Leen-van-der-Mark, the promotive effect of PKV on the thickening growth of each bulb size is shown in Table 3. The total bulb number in plants treated with PKV 5000-fold and 2000-fold dilutions were increased by 102% and 111% compared with that of control, respectively. Both the PKV dilutions tested increased the yield of commercial bulbs (>10cm). But PKV treatments had no the promotive effect on the bulb weight in each bulb size (Table 4). Thus, high yielding for commercial bulbs was found in tulip plants treated with PKV 2000-fold dilution.

Yoshida et al. (2) have been reported that at low concentration 5-ALA has promotive effect on growth of welsh onion, garlic and rakkyo. Yoshida et al. (3) also found that 5-ALA in the presence of microelements increased the fresh and dry yield of Komatsuna, *Brassica campestris* var. *perviridis* under alkaline soil conditions. Hotta et al. (1) have reported that the foliar application of 5-ALA at low concentration (0.18 to 1.6 mM) increased fixation in light and decreased release of CO₂ in darkness.

From our results and these findings, we wish to emphasize that PKV (5-ALA in the presence of macro-and micro-nutrients) and 5-ALA alone behave as a stimulant for the thickening growth of tulip bulbs, especially for high yielding of commercial bulbs in tulip plants.

LITERATURE CITED

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Table 1. Effect of PKV on the yield in each bulb size

Treatment	Total bulb number (No./6m ²)	Bulb size(No./6m ²)					
		>9cm	>8cm	>7cm	>6cm	>5cm	<5cm
Control(Water)	1471(100)	4(0.3)	51(3.5)	108(7.3)	539(36.6)	541(36.7)	228(15.6)
PKV 5000-fold dilution	1560(100)	5(0.3)	66(4.2)	91(5.8)	580(37.2)	349(22.4)	469(30.1)
PKV 2000-fold dilution	1760(100)	2(0.1)	86(4.9)	95(5.4)	525(29.8)	426(24.2)	626(35.6)

Cultivar :Ballerina ,planting seed-bulb size:5cm

Table 2. Effect of PKV on the weight in each bulb size

Treatment	Bulb weight(g)					
	>9cm	>8cm	>7cm	>6cm	>5cm	<5cm
Control(Water)	13.13	10.00	7.87	5.25	2.99	1.67
PKV 5000-fold dilution	12.11	10.30	8.79	4.97	3.01	1.11
PKV 2000-fold dilution	12.15	9.30	8.00	5.28	2.96	1.52

Cultivar :Ballerina ,planting seed-bulb size:5cm

Table 3. Effect of PKV on the yield in each bulb size

Treatment	Total bulb number (No./6m ²)	Bulb size(No./6m ²)					
		>10cm	>9cm	>8cm	>7cm	>6cm	<6cm
Control(Water)	745(100)	44(5.9)	127(17.1)	222(29.9)	51(6.8)	40(5.3)	260(35.0)
PKV 5000-fold dilution	763(100)	61(8.0)	50(6.5)	207(27.2)	50(6.6)	27(3.5)	368(48.2)
PKV 2000-fold dilution	827(100)	59(7.1)	153(18.5)	221(26.7)	76(9.2)	44(5.4)	274(33.1)

Cultivar :Leen-van-der-Mark planting seed-bulb size:6cm

Table 4. Effect of PKV on the weight in each bulb size

Treatment	Bulb weight(g)					
	>10cm	>9cm	>8cm	>7cm	>6cm	<6cm
Control(Water)	18.67	13.94	10.75	8.61	6.67	1.83
PKV 5000-fold dilution	18.67	13.60	10.63	9.00	7.41	1.85
PKV 2000-fold dilution	18.78	13.80	10.86	8.95	7.27	1.90

Cultivar :Leen-van-der-Mark planting seed-bulb size:6cm