Scholars Journal of Agriculture and Veterinary Sciences **e-ISSN 2348–1854**
Sch J Agric Vet Sci 2017; 4(3):123-125 **p-ISSN 2348–8883**

(An International Publisher for Academic and Scientific Resources) DOI: 10.36347/sjavs.2017.v04i03.007

Effects of Foliar Spraying with Methyl Jasmonate on Bulb Development of Lily

Fang Liu[1]*, Zhiqiang Wang[2], Yunyan Sheng[1], Yanli Jing[1], Yanhong Wang[1], Hua Lian[1], Yazhong Jin[1]
[1]College of Agriculture, Heilongjiang Bayi Agricultural University, Daqing 163319, India
[2]College of information and technology, Heilongjiang Bayi Agricultural University, Daqing 163319, India

***Corresponding Author**
Name: Fang Liu
Email: 48419306@qq.com

Abstract: Experiment with bulbs of *lilium* asiatic hybrids Prato and *Lilium pumilumu*. Effects on the perimeter and fresh weight of bulbs and carbohydrate contents of lily bulb treated with methyl jasmonate were studied. It made clear that the perimeter and fresh weight increased significantly by spraying 5 mg/L MJ, The starch content and the soluble sugar content and the soluble protein content of lily bulb also increased by spraying 5 mg/LMJ. The perimeter and fresh weight and carbohydrates in bulbs were reaching maximum by prayting 0.5 mg/L MJ. Bulb development is closely related to the accumulation of carbohydrates. The accumulation of carbohydrate is benefit for development of lily bulb development.
Keywords: *Lilium*; Bulb development; Methyl jasmonate; Foliar spraying

INTRODUCTION

Lily (*Lilium*) is an important bulb flower, It is one of the bigest fresh cut flowers in the world. The bulb development is an important problem in the lily cultivation. Methyl jasmonic acid is a new kind of plant growth regulating substances, It can promote blooming of wheat (*Triticum aestivum*L.) and rice (*Oryza sativa* subsp. Indica), adjust the flowering time, and it can improve the flowering period to be centralized and glume opening rate [1], accelerate the bulb development of garlic (*Allium sativum*L.) [2], improve the quality of bulbs [3], etc. The promoting effects of jasmonic acid on the tuber formation of potato, yam, jerusalem artichoke in vitro and the root formation of sweet potato and the bulb formation of garlic, onion were significant. There are few reports about MJ effecting the growing bulbs in field for lilies. In view of this, this experiment aims to study the effects of foliar spraying with methyl jasmonate on diameter and fresh weight of bulbs and carbohydrate contents of lily bulb. To further study the development mechanism of lily bulbs. In order to provide the reference for shortening the lily field growth cycle and good quality and high yield cultivation.

MATERIAL AND METHODS

Test material is Asian lily Prato and *Lilium pumilumu*. Bulb perimeter 1~ 3cm specifications, The experiment was from in May 2016 to October 2016 at experimental field in Heilongjiang Bayi Agricultural University. Select alone head lily bulbs with no diseases and pests and other injury, soaked for 30 min with 50% carbendazim wettable powder 500 times liquid before planting. Planted the bulbs On May 5, Planting spacing is 15 cm. Planting depth is 6 ~ 7cm. In the lily bulbs expansion development period, on July 18, spraying MJ on the leaf of lily, once every 3 days, a total of spraying 3 times. MJ concentration was set at 0.05 mg/L, 0.5 mg/L, 5 mg/L, 50 mg/L, a total of four levels, control (CK) for water treatment. Using randomized block design, each processing repeat 3 times. Random sampling respectively in September 2. Determined the bulb perimiter and fresh weight and the content of carbohydrates in bulbs. The soluble protein content was determined by coomassie brilliant blue G-250 method, The soluble starch and soluble sugar content were determined by anthrone colorimetry method.

RESULTS

Effects of foliar spraying MJ on the perimeter and fresh weight of lily bulb

Table 1 shows that the effects of foliar spraying MJ on the bulb perimeter and fresh weight of Prato and *Lilium pumilumu*. The late bulb sampling found that the perimeter and fresh weight of bulb of lily were improved compared with the control. With the increase of MJ concentration, the bulb perimeter and fresh weight of lily increased firstly and then decreased. In this experimental concentration range, the perimeter and fresh weight of *Lilium pumilumu* increased obviously most with 5 mg/L MJ processing, the differences are very significant than control. Bulb diameter enlarged 12.89% than that of control, Bulb fresh weight increased 10.54% than that of control, The perimeter and fresh weight of Prato with 0.5 mg/L MJ processing had significant differences between control, Bulb perimeter increased 10.39% than that of control, the fresh weight of bulbs increased 10.81% than that of the control.

Table-1: Effects of foliar spraying MJ on the perimeter and fresh weight of lily bulb

MJ concentration （mg/L）	fresh weight (g)		perimeter (cm)	
	Lilium pumilumu	Prato	*Lilium pumilumu*	Prato
CK	8.92±0.34b	8.76±0.49b	6.83±0.1b	7.12±0.24c
0.05	9.25±0.27b	8.94±0.33ab	7.38±0.16a	7.63±0.33ab
0.5	9.36±0.5b	9.53±0.19a	7.45±0.23a	7.86±0.37a
5.0	10.07±0.34a	9.26±0.34ab	7.55±0.34a	7.61±0.14ab
50	9.12±0.39b	9.18±0.34ab	7.16±0.14ab	7.35±0.1bc

Note: Small letters in the same column refer to significant at 5% level, and the same letters show no significant difference. the same below

Effects of foliar spraying MJ on the carbohydrate content of lily bulb

Table2 shows that the effects of foliar spraying MJ on the bulb carbohydrate content of Prato and *Lilium pumilumu*. From the point of the test results, MJ treatment concentration and lily varieties had differences, the degree of the change of soluble sugar content is also different. The soluble sugar content with 4 kind of MJ treatment in two lilies were higher than control, With the increase of treatment concentration, the soluble sugar content increased first and then ecreased. The soluble sugar content of 5mg/LMJ treatment in *Lilium pumilumu* and 0.5 mg/L MJ treatment of Prato bulb were highest, increased by 6.53% and 10.15% than the control.

The starch accumulated in two kinds of lily in the late stage of bulb expansion, the starch content in the bulb increased with MJ treatment in. With the increase of MJ concentration, the starch content increased and then decreased. The starch content of *Lilium pumilumu* bulb with MJ treatment were higher than that of the control, and the starch content of 5 mg/L MJ treatment increased by 29.2%. The starch content of Prato with 50 mg/L MJ treatment was slightly lower than that of CK, and the content of starch in the bulb of 0.5mg/LMJ treatment was the highest, which increased 20.06% than the control.

In the later stage of bulb expansion, the content of protein in MJ treated bulb increased and then decreased with the increase of MJ concentration. The soluble protein content of 50 mg/L MJ in the bulb were lowest, the soluble protein content of 5 mg/L MJ treatment in bulb of *Lilium pumilumu* was highest, the protein content increased 18.47% than the control. The soluble protein content of 0.5 mg/L MJ treatment in Prato bulb increased by 18.6% compared with the control. There were no significant differences in the contents of soluble sugar, starch and protein in MJ treated bulbs.

Table 2: Effects of foliar spraying MJ on the carbohydrate content of lily bulb mg/g FW

Species	MJ concentration （mg/L）	Soluble sugar	Soluble Starch	Soluble protein
Lilium pumilumu	CK	68.12±1.77a	18.22±2.03a	11.26±0.8a
	0.05	68.38±3.83a	18.45±1.43a	12.12±1.23a
	0.5	71.36±3.45a	22.36±3.58a	12.46±1.9a
	5.0	72.57±3.81a	23.54±2.89a	13.34±0.64a
	50	70.28±2.28a	20.32±4.01a	10.84±1.58a
Prato	CK	72.23±5.2a	21.34±2.58a	12.53±2.46a
	0.05	75.47±2.41a	23.28±5.47a	13.44±0.29a
	0.5	79.56±3.42a	25.62±2.74a	14.86±2.11a
	5.0	75.89±3.75a	22.84±2.61a	13.22±2.08a
	50	73.43±5.2a	22.31±2.56a	12.43±2.47a

DISCUSSION

Effects of foliar spraying MJ on the growth and development of lily bulbs

The weight and the perimeter are the important appearance standards to measure the quality of lily bulbs. The results of this study show that effects of foliar spraying different concentrations MJ on the bulb fresh weight and circumference were different because of different kinds of Lily. Foliar spraying MJ of appropriate concentration in lily bulb expansion stage, which can improve the circumference of lily bulb. However, the effects of different MJ treatments on the diameter of the two varieties were different. The circumference of bulb spraying with high concentration of MJ did not significantly increase. In the range of this experiment, in the bulb expansion late period, the bulb perimeter of 5 mg/L MJ increased obviously. 0.5 mg/L MJ Prato bulb perimeter increased obviously.

According to the fresh weight of the bulb, the effect of MJ spraying on the fresh weight of two lily were also different. the effect of 5 mg/L MJ on bulb growth and development of *Lilium pumilumu* was most obvious, the effect of 0.5 mg/L MJ on bulb growth and development of Prato was most obvious. The effect of foliar spraying MJ on the bulb perimeter and fresh weight of lily was the same, but the effects were different for two lilies.

Effects of foliar spraying MJ on the carbohydrates of lily bulbs

Carbohydrate change is one of the significant indexes during the bulb development. The soluble protein, soluble sugar and starch content may be a direct response to various metabolic activities. This experiments showed that carbohydrates in *Lilium pumilum* and Prato bulbs accumulated by foliar spraying MJ of suitable concentration. The effect of 5 mg/L MJ treatment on bulb growth and development of *Lilium pumilumu* was best. Soluble sugar and starch and protein content in bulbs of 5 mg/L MJ treatment increased compared with the control. the effect of 0.5 mg/L MJ treatment on bulb growth and development of Prato was best. Soluble sugar and starch and protein content in bulbs of 0.5 mg/L MJ treatment increased compared with the control. Foliar spraying MJ can promote starch accumulation of the lily bulb. The soluble sugar and starch contents of bulbs in *Lilium pumilum* with 5 mg/L MJ increased greatly compared with the control, and the soluble sugar and starch contents of bulbs in Prato with 0.5 mg/L MJ increased greatly compared with the control.

Mita Shibao kaa [4-5] found that in bulb formation process, the direction of microtubule arrangement of cell wall was irregular, and the number was slowly reduced. Due to lack of support of cell microtubule transverse arrangement of cell wall, cell skeleton relaxation, leads to increased cell volume [6]. In this study, bulb perimeter, fresh weight and carbohydrates content have increased greatly. This is consistent with Hao Ruijie's [7], Li Chunxiang's researches [3]. MJ maybe increased cellular accumulation of sugar, promote microtubule and microfilament to be thickening and promote cell to be swelling [8], which affects bulb expansion. The interference to microtubules by MJ may be induced bulb expansion [9].

ACKNOWLEDGEMENT

Fund project: Cultivating subject support plan of Heilongjiang Bayi Agricultural University (XZR2015-01); The guiding science and technology program of Daqing (zd-2016-105); National science and technology support plan (2014BAD06B01-25); Scientific research of Hei Long Jiang agricultural reclamation bureau (HNK125BZD-04-21).

REFERENCES

1. Yan ZF, Zhou X, Ma CH, Cui SP, Wei JK. Inducing effect of coronatine and methyl jasmonate on the opening of spikelets in wheat, rye, mildew. Sci Agric Sin. 2001;34:334-7.
2. Song P, Xia K, Wu CW, Bao DP, Chen LL, Zhou X, Cao XZ. Differential response of floret opening in male-sterile and male-fertile rices to methyl jasmonate. Acta Botanica Sinica. 2001 May 1;43(5):480-5.
3. Chun-xiang LI, Xie ZH. Effect of Methyl Jasmonate on Bulb Expansion and Endogenous Plant Hormone in Allium statium L. Life Science Research. 2002;2:019.
4. Mita T, Shibaoka H. Changes in microtubules in onion leaf sheath cells during bulb development. Plant Cell Physiol. 1983; 24:109-117
5. Mita T, Shibaoka H. Effects of root excision on swelling of leaf sheath cells and on the arrangement of cortical microtubules in onion seedlings. Plant Cell Physiol. 1981;25: 1521-1529.
6. Sumida S, Ueda M. Effect of O-ethyl O-(3-methy-6-nitrophenyl) N-sec- butyl-phosphorothioamidate (S-2846), an experimental herbicide, on mitosis in Alium cepa. Plant Cell Physiol. 1976;17:1351-1354
7. Jie HR. Studies on the components in different size of Lilium bulb. Shaanxi journal of agricultural sciences. 2005; (3): 15-17
8. Kiyoshi T, Kaien F, Yosho K. Expansion of potato cells in response to jasmonic acid. Plant Science. 1994;100 (1): 3-8.
9. Ravnikar M, Ze1 J, Plaper I. Jasmonic acid stimulates shoot and bulb formation of garlicin vitro. Plant Growth Regul. 1993;12: 73-77.