

Extension of Vase Life of Cut Flower in Tree Peony and Herbaceous Peonies Using STS and Other Chemical Compounds.

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STS および種々の薬剤によるボタン、シャクヤク切花の花持ち延長
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Extension of vase life of cut flowers in tree peony and herbaceous peonies using STS and other chemical compounds, was investigated.

STS or AOA treatment delayed petal-drooping for few days in tree peony and herbaceous peonies.

Uniconazol treatment slightly extended vase life of cut flowers in tree peony. Twenty mg/l uniconazol treatment delayed opening of petals in 'Taiyoh'. In herbaceous peony, uniconazol treatment did not extend vase life of the cut flowers.

One mM STS treatment for 30 minutes is the best method in spring forcing for extension of vase life of cut flowers in tree peony and herbaceous peonies.

Introduction

Tree peony and herbaceous peony have been cultivated long for garden landscape plants. Yatsuka-cho in Shimane prefecture is noted as the biggest tree peony-producing area in Japan. One million and five hundred thousand plants are produced every year and one hundred eighty thousand plants are shipped to USA and Europe. However, sale of nursery plants has not been increasing for recent years. Consumers are requesting pot or cut flowers rather than nursery plants. Therefore, some of the growers are concentrating on pot or cut flower production of tree and herbaceous peonies from December to April (forcing), because they are dealt at high price in the market (3-5 times as high as nursery plants). A major problem in cut flower production is short vase life after cutting. The vase life of the cut flowers is only 4-5 days in tree peony and 7-9 days in herbaceous peony at the room temperature (about 20 °C) in spring.

Meantime, silver thiosulfate (STS) was explored for extension of vase life of

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various cut flowers.³⁾⁴⁾⁵⁾ For example, this compound extended vase life of cut flowers of carnation two or three times compared with untreated control through inhibition of ethylene production.⁶⁾

The objective of the present study is to extend vase life of cut flowers in tree peony and herbaceous peonies using STS and other chemical compounds.

Materials and Methods

Vase life of cut flowers in tree peony.

Experiment 1. Cultivar difference of vase life in cut flowers with STS treatment.

Flowers of *Paeonia suffruticosa*, 'Hanakiso', 'Yatsukajishi', 'Renkaku', 'Meikouhoh', 'Godaisyu' and 'Kaoh', which had been raised in Shimane Univ. field, were cut when outer petals just appeared from the sepals. Flower stems were cut to 30 cm long in tap water and they were placed in 1/5000 Wagner pot containing 1 mM STS aqueous solution (1 mM AgNO₃ plus 4 mM thiosulfate in 1 liter tap water) or tap water (control) for 30 minutes. After STS treatment, all the flowers were held in 2 liters of tap water for evaluation of vase life.

Experiment 2. Extension of vase life with STS, uniconazol and aminoxyacetic acid (AOA).

Cultivars of tree peony, 'Meikouhoh', 'Taiyoh' and 'Renkaku' raised in Shimane Univ. field, were harvested at the same stage and flower stems were cut by the same method as experiment 1. Flower stems were placed in the pots containing aqueous solution of various concentrations of STS, uniconazol, AOA or tap water (control) for 30 or 60 minutes and then held in tap water.

Vase life of cut flower in herbaceous peony.

Experiment 1. Cultivar difference in vase life of cut flowers with STS treatment.

Flowers of *P. lactiflora* 'Yohkihi', 'Takinoyosooi', 'Harunoyosooi', 'Shiyohchohyoh' and 'Esugata', which had been raised in Shimane Univ. field, were cut when outer petals just appeared from the sepals. Flower stems were cut to 50 cm long in tap water and they were placed in 1/5000 Wagner pot containing 1 mM STS aqueous solution or tap water (control) for 30 minutes. After STS treatment, all the flowers were held in 2 liters of tap water for evaluation of vase life.

Experiment 2. Extension of vase life with STS, uniconazol and their combination treatment.

Cultivars of herbaceous peony 'Hyouten', 'Esugata' and 'Kashyokunoten' raised in Shimane Univ. field, were harvested and the flower stems were cut in tap water as previously described. Flower stems were placed in the pots containing aqueous solution of 1 mM STS, 20 mg/l uniconazol (S-07), 1 mM STS plus 20 mg/l S-07 or tap water (control) for 30 minutes and then held in tap water.

Four or five cut flowers were used each treatment in both tree and herbaceous peonies. The room temperature during the experiments was $20 \pm 2^\circ\text{C}$. All the pots

were placed under continuous light from cool-white fluorescent lamps $46.8 \mu\text{mol m}^{-2} \text{S}^{-1}$. Vase life was determined days from flower cutting to petal-drooping. Days from flower cutting to flower opening were also checked in the experiment 2 in tree peony and experiment 2 in herbaceous peonies.

Results

Vase life of cut flowers in tree peony.

Experiment 1. Cultivar difference in vase life of cut flowers with STS.

For vase life in control, pink cultivars, 'Hanakisoi' and 'Yatsukajishi' were about 4 days, white cultivars, 'Renkaku', 'Meikouhoh' and 'Godaishu' were 5–8 days, and a red double-petal cultivar, 'Kaoh' was 7 days (Table 1). Vase life of all the cultivars was extended about 1.5 days with 1 mM STS treatment except 'Meikouhoh' for which it was extended by 3.5 days.

Table 1. Cultivar difference in vase life of cut flowers with STS.

Cultivars	Treatment	Vase life (total days)
'Hanakisoi'	Control	$3.8 \pm 1.00^*$
	STS 1mM	5.3 ± 0.50
'Yatsukajishi'	Control	4.3 ± 0.60
	STS 1mM	5.3 ± 0.60
'Renkaku'	Control	5.3 ± 0.50
	STS 1mM	7.0 ± 0.80
'Meikouhou'	Control	6.0 ± 0.00
	STS 1mM	9.5 ± 1.00
'Godaishyu'	Control	8.3 ± 0.50
	STS 1mM	9.3 ± 1.00
'Kaoh'	Control	7.0 ± 0.80
	STS 1mM	7.8 ± 1.00

* Mean \pm SD of 5 cut flowers.

Experiment 2: Extension of vase life with uniconazol and AOA.

Uniconazol treatments (5 and 10 mg/l) extended vase life by about 1 day in 'Meikouhoh' and STS (0.75 mM) treatment extended it by 2.4 days (Table 2). Higher concentration of uniconazol (20 mg/l) extended days to flower opening after cutting so that vase life was extended by 1 day in 'Taiyoh'. AOA (0.5 %) extended vase life by 1–1.8 days in 'Renkaku' and 'Taiyoh' (Table 3).

Vase life of cut flower in herbaceous peony.

Experiment 1. Cultivar difference in vase life of cut flowers with STS treatment.

For Chinese cultivars, vase life of 'Yohkihi' and 'Shiyohchohyoh' in control were 6.8 and 4.8 days, respectively and that of these cultivars in STS (1 mM) treatment were 8.3 and 7.3 days respectively (Table 4). For Japanese cultivars, vase life of 'Harunoyosooi' and 'Esugata' in control were about 7 days and that of 'Takinoyosooi' was 4 days. Vase life of these cultivars in STS (1 mM) treatment were 8.8, 8.8 and 4.0 days, respectively.

Table 2. Effect of various concentrations of uniconazol and STS on extension of vase life of cut flower in tree peony.

Cultivars	Treatment	Rate (mg/ℓ)	Days to opening	Vase life (total days)
'Meikouhoh'	Control		1.0±1.0*	6.0±1.58
	0.75mM STS		1.0±1.0	8.4±0.89
	Uniconazol	5	1.2±1.1	7.4±0.89
		10	1.0±1.0	7.2±0.84
'Taiyoh'	Control		1.6±0.55	5.0±1.00
	1mM STS		1.4±0.55	6.0±0.00
	Uniconazol	10	1.6±0.55	5.6±0.55
		20	2.3±0.50	5.8±0.50

* Mean±SD of 5 cut flowers.

Table 3. Effect of STS and AOA on extension of vase life of cut flowers in tree peony.

	Treatment	Days to opening	Vase life (total days)
'Renkaku'	Control	0.5±0.58*	7.0±0.00
	0.75mM STS	0.5±0.58	7.8±0.96
	0.5% AOA	0.8±0.50	8.0±0.00
'Taiyoh'	Control	0.5±0.58	5.0±0.71
	1.00mM STS	0.5±0.58	5.4±1.34
	0.5% AOA	0.8±0.50	6.8±1.10

* Mean±SD of 5 cut flowers.

Experiment 2. Extension of vase life with STS, uniconazol and their combination treatment.

All chemical solutions did not influence days to opening (Table 5). One mM STS extended vase life by 1 day. Twenty mg/l uniconazol treatment did not extend vase life. One mM STS plus 20 mg/l uniconazol combination treatment extended it by 0.4-1.5 days.

Discussion

Extension of vase life of cut flowers in tree peony and herbaceous peonies is important to increase their commercial value.

For tree peony, vase life of white cultivars were a few days longer than pink and red cultivars whether or not chemical treatment. This result was also observed in herbaceous peony. Color of petals faded before drooping of the petals in pink and red flowers. Thus, actual appreciable period of pink and red cultivars was shorter than the evaluated vase life. It is generally known that the cause of petal drooping is due to ethylene production from senescent petals. In our experiment, a supplement with ethephon into holding water shortened vase life of cut flowers in tree peony by 2 days (data not shown). Meantime, it was reported that STS and AOA extended the vase life of other cut flowers through inhibition of ethylene production. Also in our

Table 4. Cultivar difference in vase life of cut flowers with STS.

Cultivars	Treatment	Days to opening	Vase life (total days)
'Yohkihi'	Control	1.3±0.50*	6.8±0.50
	STS	1.0±0.00	8.3±0.50
'Shiyoh chouyoh'	Control	2.0±0.00	4.8±0.96
	STS	2.0±0.00	7.3±0.95
'Haruno yosooi'	Control	2.3±0.00	7.0±0.00
	STS	2.0±0.00	8.8±0.50
'Esugata'	Control	3.0±0.00	7.6±0.55
	STS	2.8±0.45	8.8±0.45
'Takino yosooi'	Control	1.0±0.00	4.0±0.00
	STS	1.0±0.00	4.0±0.00

* Mean±SD of 5 cut flowers.

Table 5. Effect of STS, uniconazol and both combination on vase life of cut flowers in herbaceous peony.

Cultivar	Treatment	Days to opening	Vase life (total days)
'Kashyokuno ten'	Control	2.3±0.50*	6.5±0.58
	STS	2.0±0.00	7.5±0.58
	STS+uniconazol	2.0±0.00	7.5±0.58
	uniconazol	2.0±0.00	7.7±0.58
'Hyouten'	Control	2.6±1.15	11.0±2.00
	STS	3.6±1.51	12.2±0.44
	STS+uniconazol	2.8±1.09	12.5±0.58
	uniconazol	2.6±0.55	9.0±2.73
'Esugata'	Control	3.0±0.00	7.6±0.55
	STS	2.8±0.45	8.8±0.45
	STS+uniconazol	2.4±0.55	8.0±0.00
	uniconazol	2.7±0.52	7.2±0.84

* Mean±SD of 5 cut flowers.

experiment, STS or AOA treatment delayed petal-drooping for a few days in tree peony and herbaceous peonies.

For growth retardant treatment, chloromequat (25 to 50 ppm) improved the keeping qualities of gladiolus. Chloromequat (50 ppm) combined with 8-hydroxyquinoline sulfate and sucrose was reported to increase the vase life of tulips, sweet peas, stocks, snapdragons, carnations. Daminozide (50 ppm) combined with 8-hydroxyquinoline citrate (200 ppm) and sucrose (3%) increased the vase life of cut flowers by 1 day in tree peony. In our experiment, uniconazol, another growth retardant, was tested whether or not extend vase life of cut flowers in tree peony and herbaceous peonies. In tree peony, uniconazol treatment slightly extended vase life of cut flowers but the effect was less than STS. Twenty mg/l uniconazol treatment delayed opening of petals in 'Taiyoh'. Therefore, treatment of this chemical may become a good method for keeping cut flowers unopen during a long distance transportation. In herbaceous peony, uniconazol treatment did not extend vase life of the cut flowers. Only STS treatment extended vase life slightly.

In conclusion, 1 mM STS treatment for 30 minutes is the best method (in spring forcing) for extension of vase life of cut flowers in tree peony and herbaceous peonies.

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摘 要

STS または種々の薬剤によるボタンとジャクヤクの花持ちについて検討した。
ボタン、ジャクヤクにおいて STS または AOA 処理では対照区に比べ花卉の脱落が1-3日遅延した。
ウニコナゾール処理ではボタンの花持ちをやや延長し、20ppm 処理では‘太陽’の開花までの日数を延
した。またジャクヤクでは花持ち効果は認められなかった。
以上の結果、ボタン、ジャクヤクの切花の花持ち延長には STS 1mM 30分間処理が最適と思われる。