# Effects of STS Dose and Duration of Exposure on the Post Harvest Physiology of Lisianthus *(Eustoma grandiflorum)* Cut Flowers

**By: Winnie Wanjiku M.**

A22/0102/2007.

Department of Plant Science and Crop protection,

As a requirement in the completion of the degree of Bsc. Agriculture,

University of Nairobi

**SUPERVISORS**:

- Dr. M. J. Hutchinson
- Mr. N. N. Musembi

# **Introduction**
## Importance of Floriculture

- leading foreign exchange earner
- generating employment
- increasing per capita income of households
- improving national nutritional standards

# Problem statement

- short vase life triggered by ethylene

# justification

- long vase life of cut flowers is valued highly by consumers
- Vase life is cut short by ethylene
- STS is an ethylene action inhibitor

# objectives

**General objective**

- To investigate the effects of STS on the post harvest physiology of cut Lisianthus cut flowers

**Specific objective**

- To investigate the effects of STS  Dose and Duration of exposure on the post harvest physiology of cut Lisianthus cut flowers

# Hypothesis

- Ho: No significant difference among the treatment means

- H1:At least one treatment mean is different

# MATERIALS AND METHODS
## Methodology

- **Site**: Crop Physiology Laboratory, UON
- **Expt design:** Randomized Complete Block Design with 3 replicates for each treatment
- The experiment consisted of complete factorial of STS dose (4 levels) by duration of exposure (4 levels)
- Efficacy was evaluated against a placebo and Distilled water control

# Materials

- **Plant materials**: Freshly harvested Eustoma cut shoots harvested when 1 bud is open
- **Vase solutions(treatments)**

I. Silver thiosulphate complex : 4 levels (0, 0.25, 0.5, 0.75 mM)
II. Sodium hypochlorite solution
III. Sucrose
IV. Distilled water

# Dependent variables

Water balance. water balance was measured as follows

- Water balance=water uptake- Transpiration
- water uptake=Change in weight of vase without cut flowers
- Transpiration= Change in weight of vase with cut flowers

# Cont’

- Rate of Leaf yellowing. determined by the number of days to 50% leaf yellowing.
- Loss of pedicel turgor. Determined by number of days to when majority Lisianthus pedicel begin to droop
- Rate of florets opening. determined by the number of days to 50% florets opening

# Data analysis

- ANOVA done using Genstat ®
- Mean Separation done using protected LSD at *P*=0.05

# Results

1

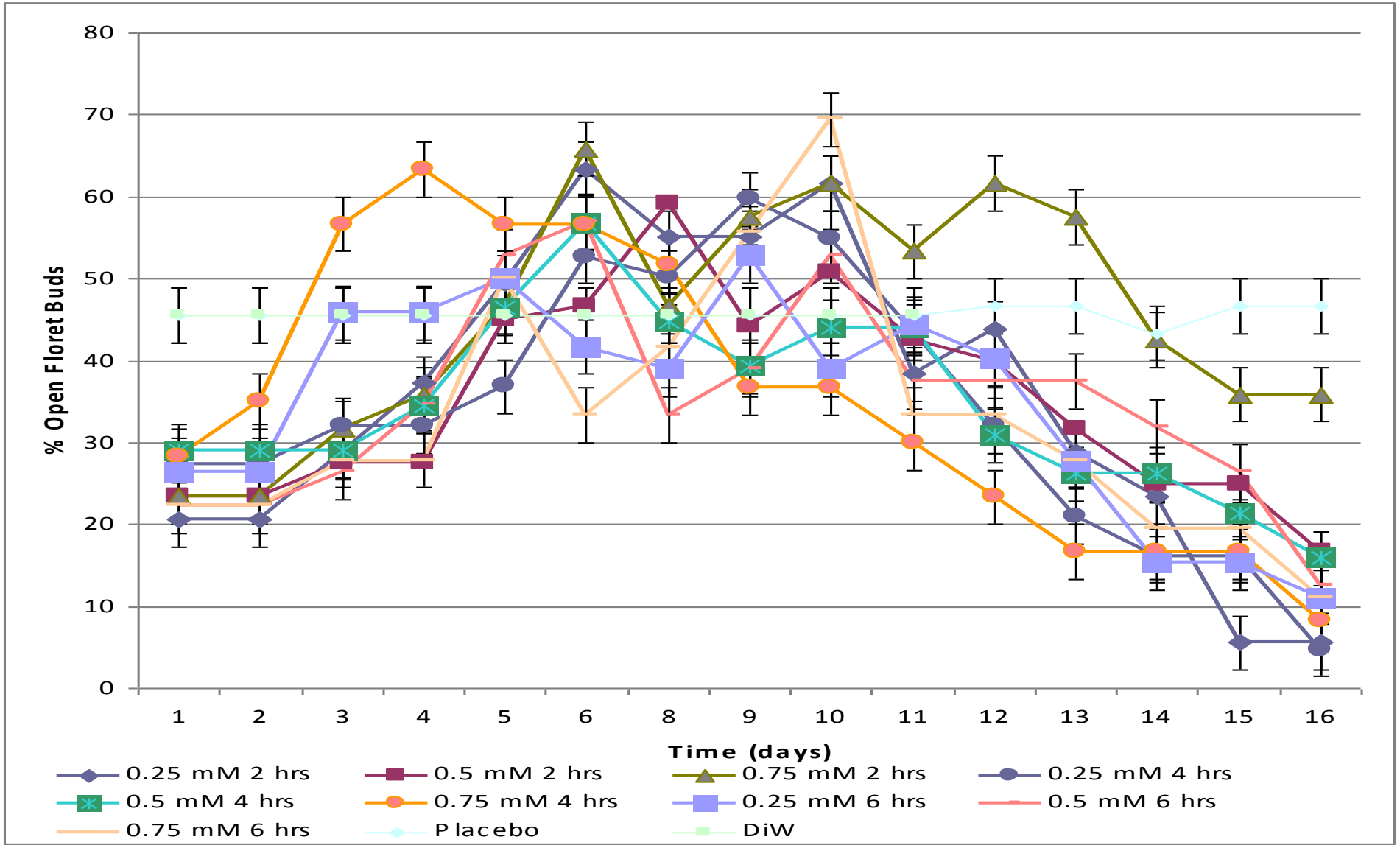
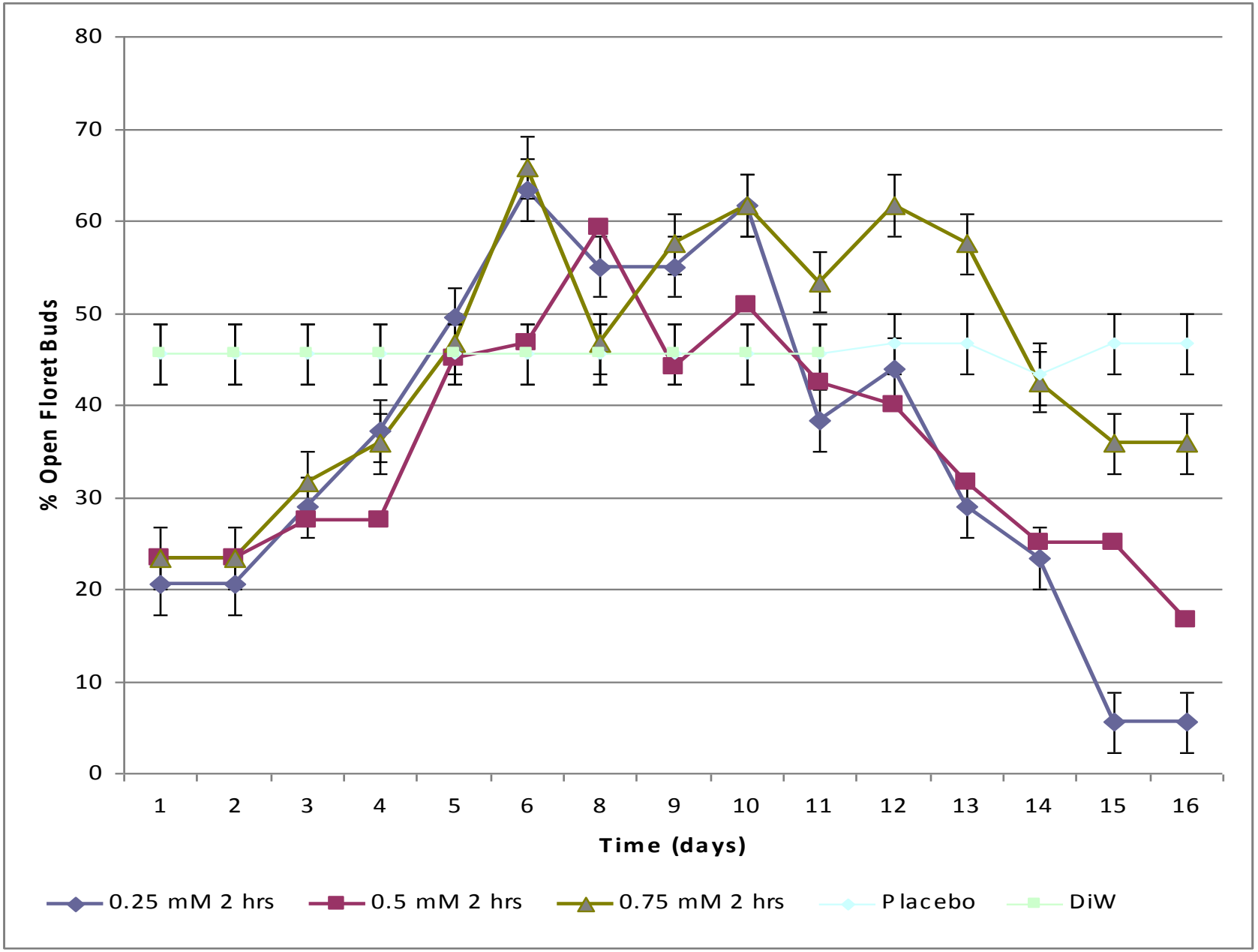
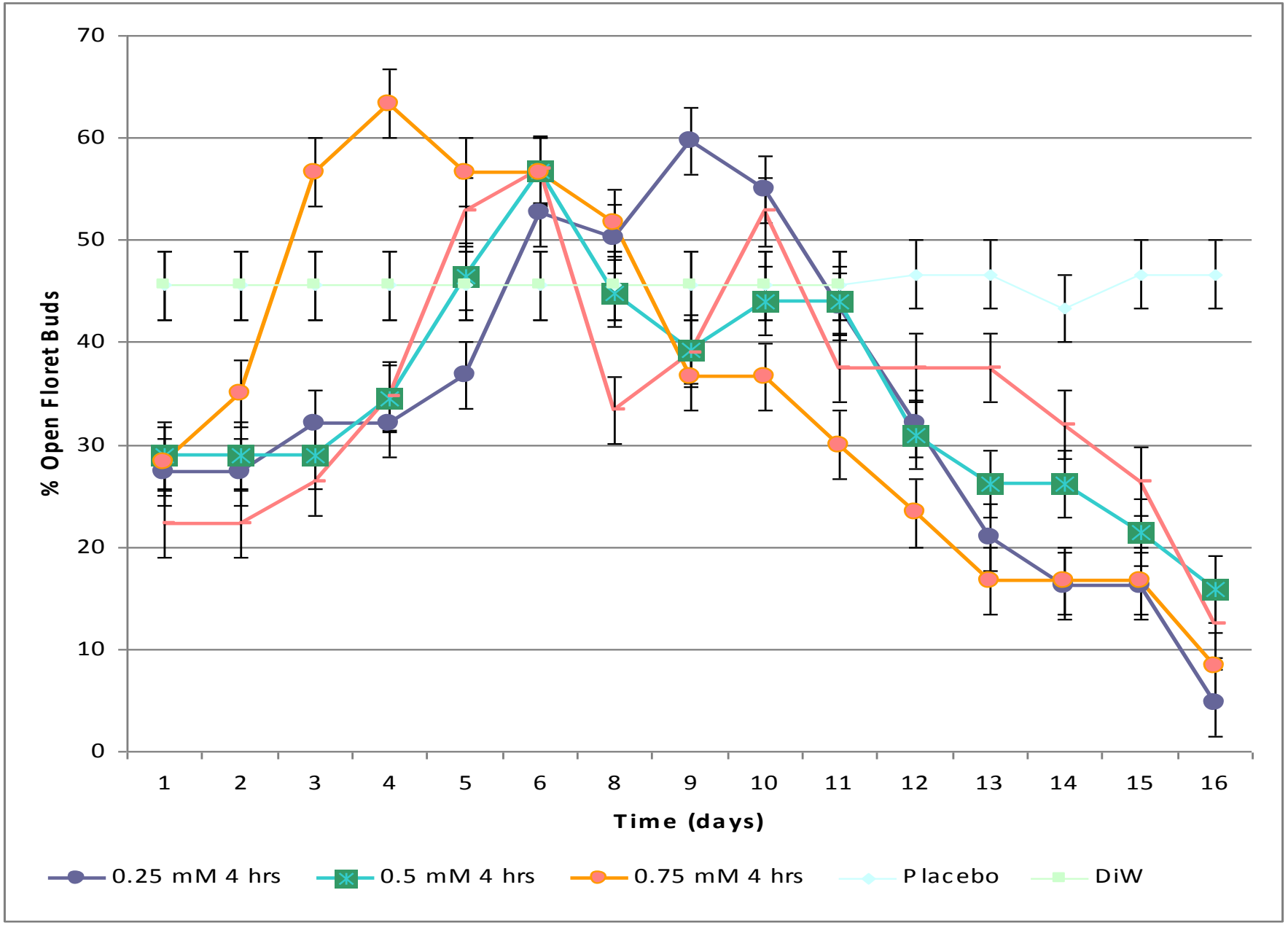



**Fig 1: Interaction effect between STS dose and Duration of exposure of Lisianthus cut flowers on the % floret opening per shoot.**

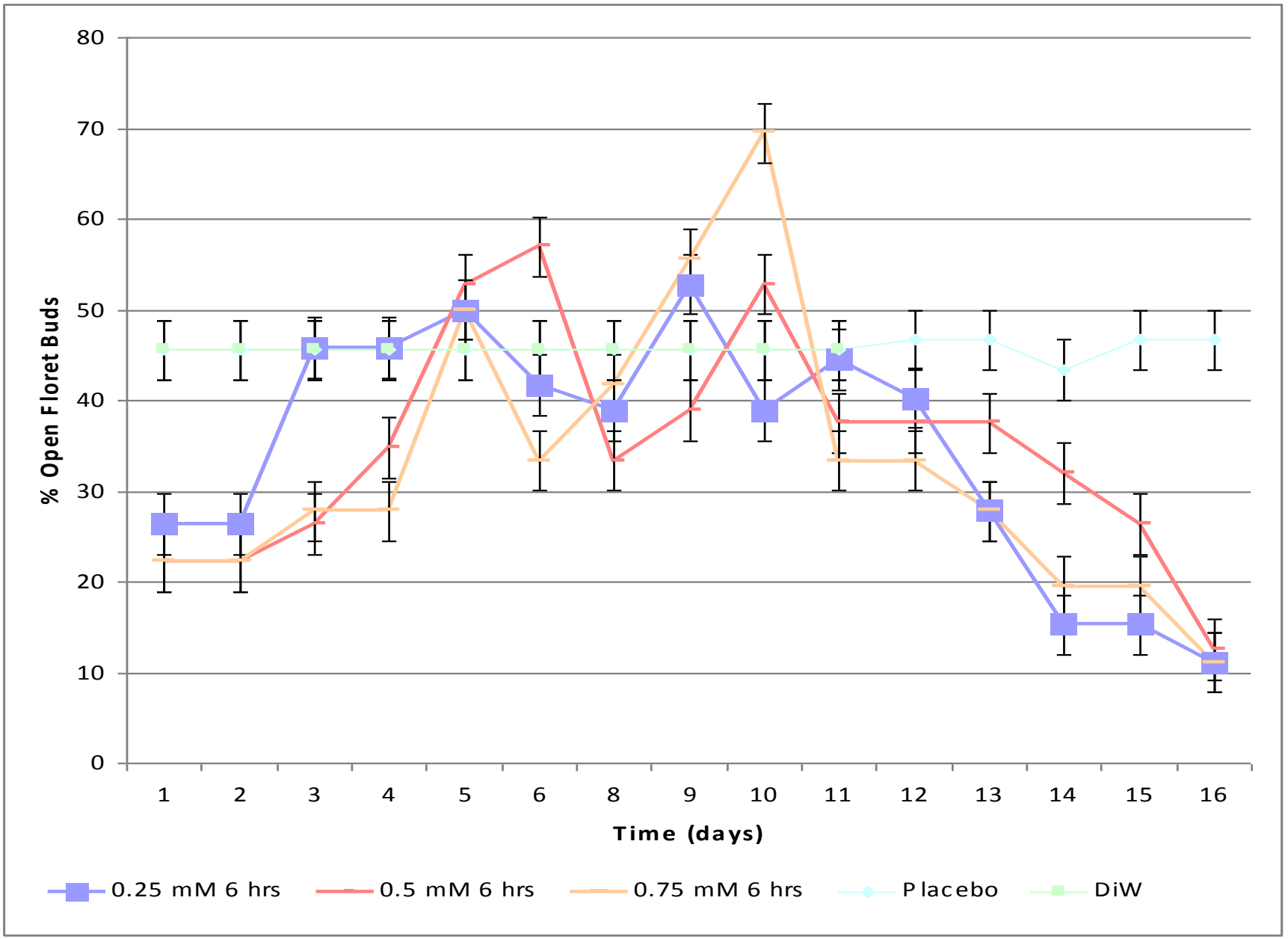
1 (a)


80
70
60
50
40
30
20
10
0
% Open Floret Buds
1
2
3
4
5
6
8
9
10
11
12
13
14
15
16
Time (days)
0.25 mM 2 hrs
0.5 mM 2 hrs
0.75 mM 2 hrs
Placebo
DiW

1 (b)


% Open Floret Buds
70
60
50
40
30
20
10
0
1
2
3
4
5
6
8
9
10
11
12
13
14
15
16
Time (days)
0.25 mM 4 hrs
0.5 mM 4 hrs
0.75 mM 4 hrs
Placebo
DiW

1 (c)


80
70
60
50
40
30
20
10
0
% Open Floret Buds
1
2
3
4
5
6
8
9
10
11
12
13
14
15
16
Time (days)
0.25 mM 6 hrs
0.5 mM 6 hrs
0.75 mM 6 hrs
Placebo
DiW

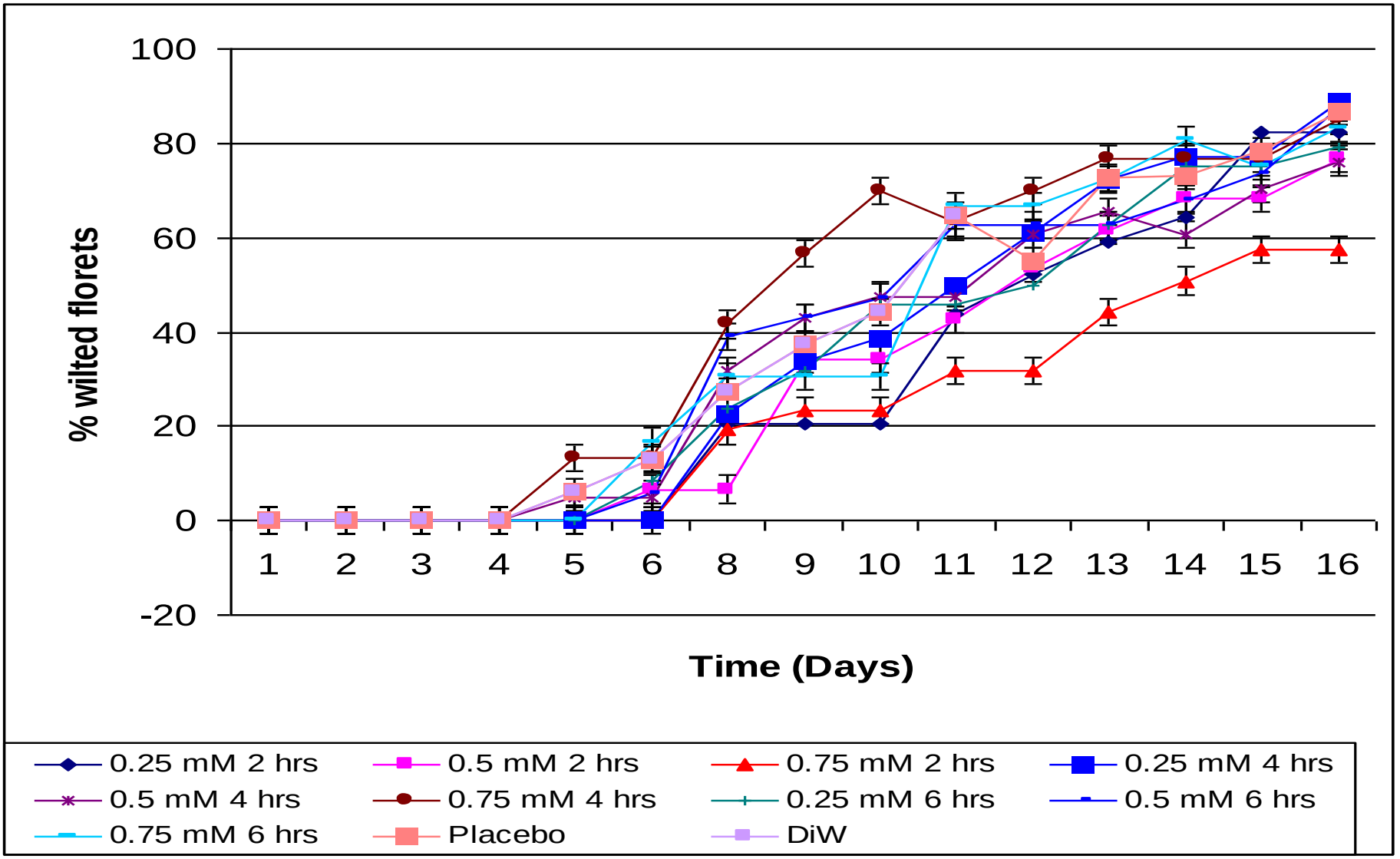
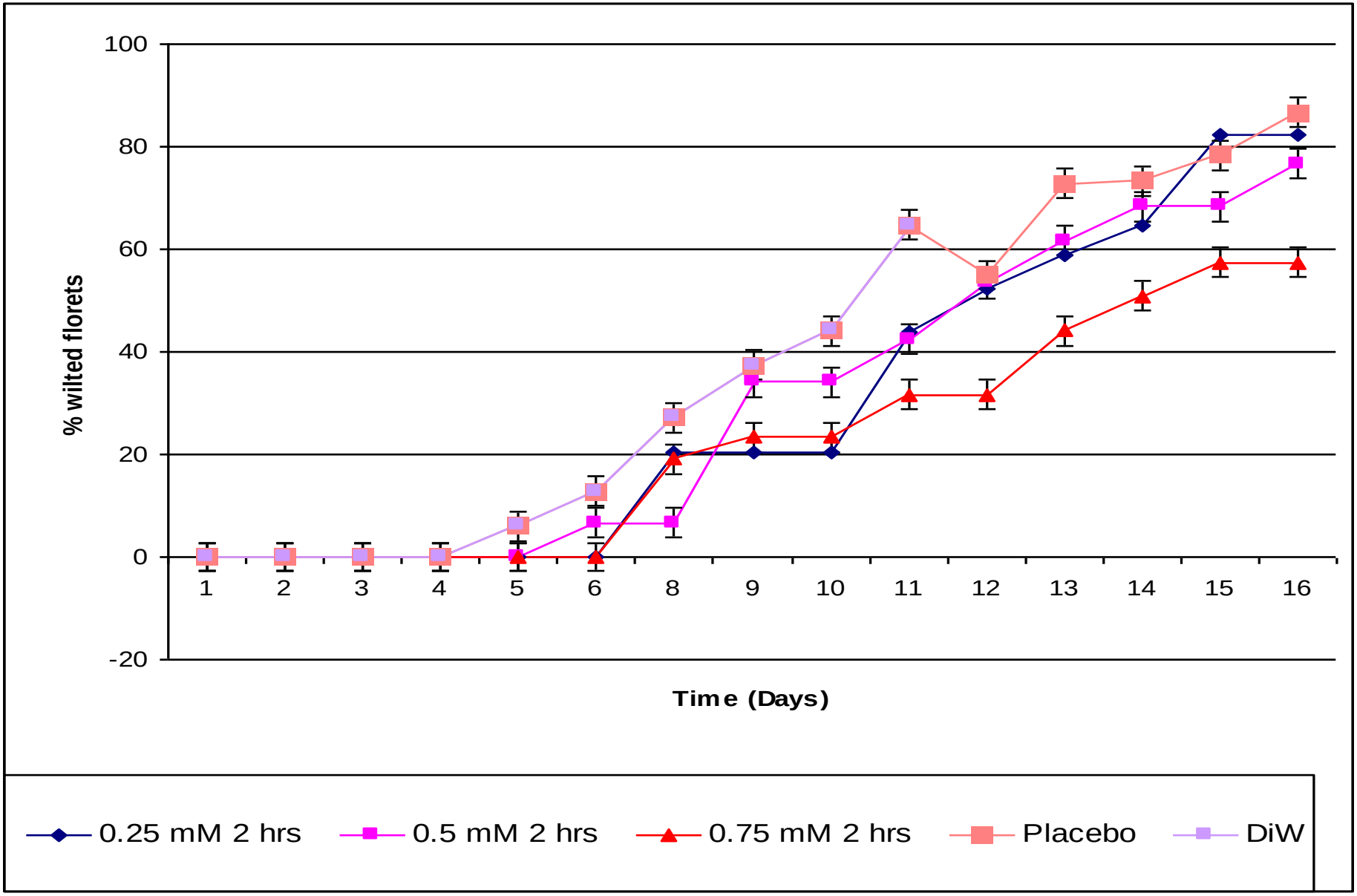
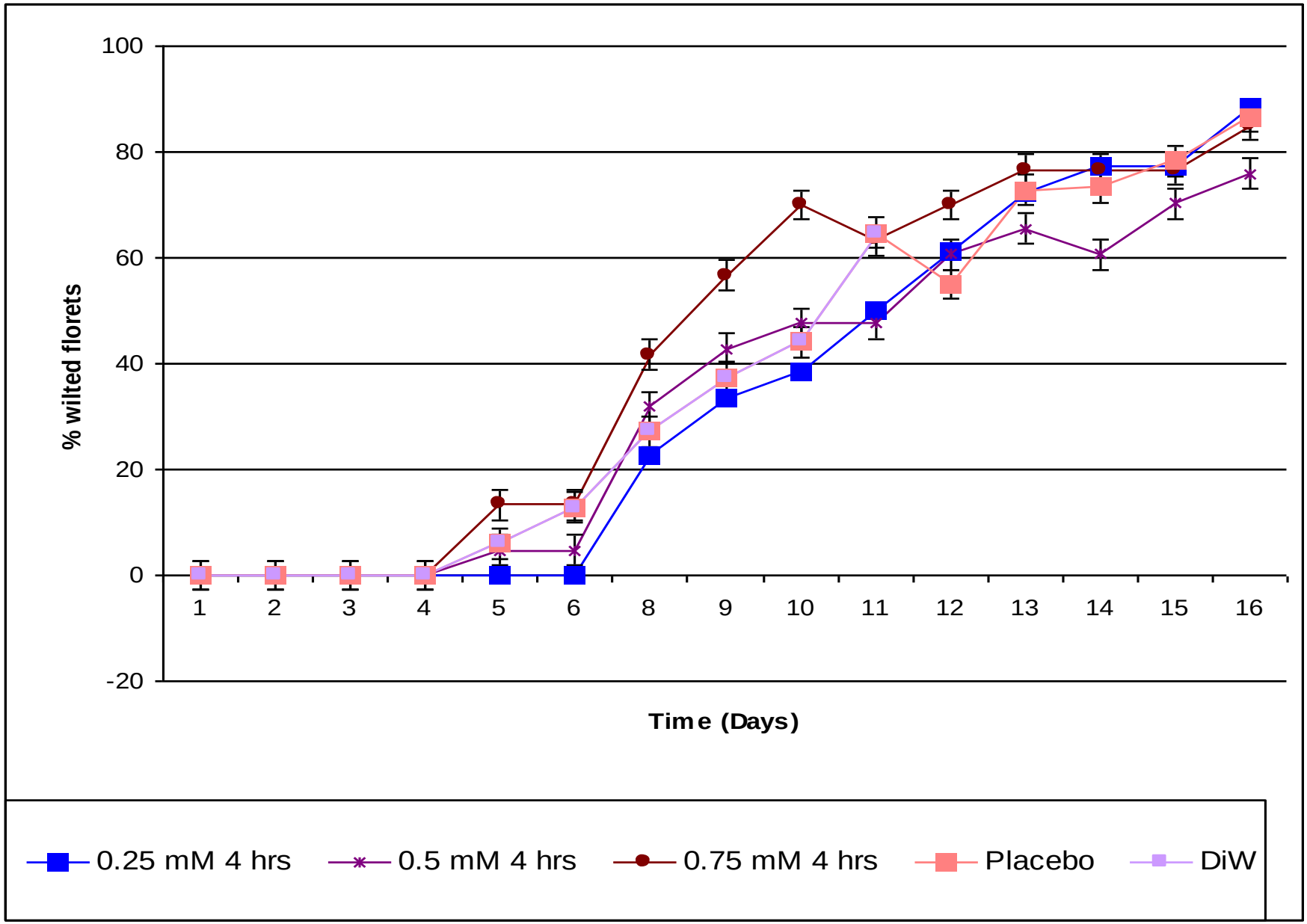



**Fig 2: Interaction effect between STS dose and Duration of exposure of Lisianthus cut flowers on the % senescence of florets per shoot**

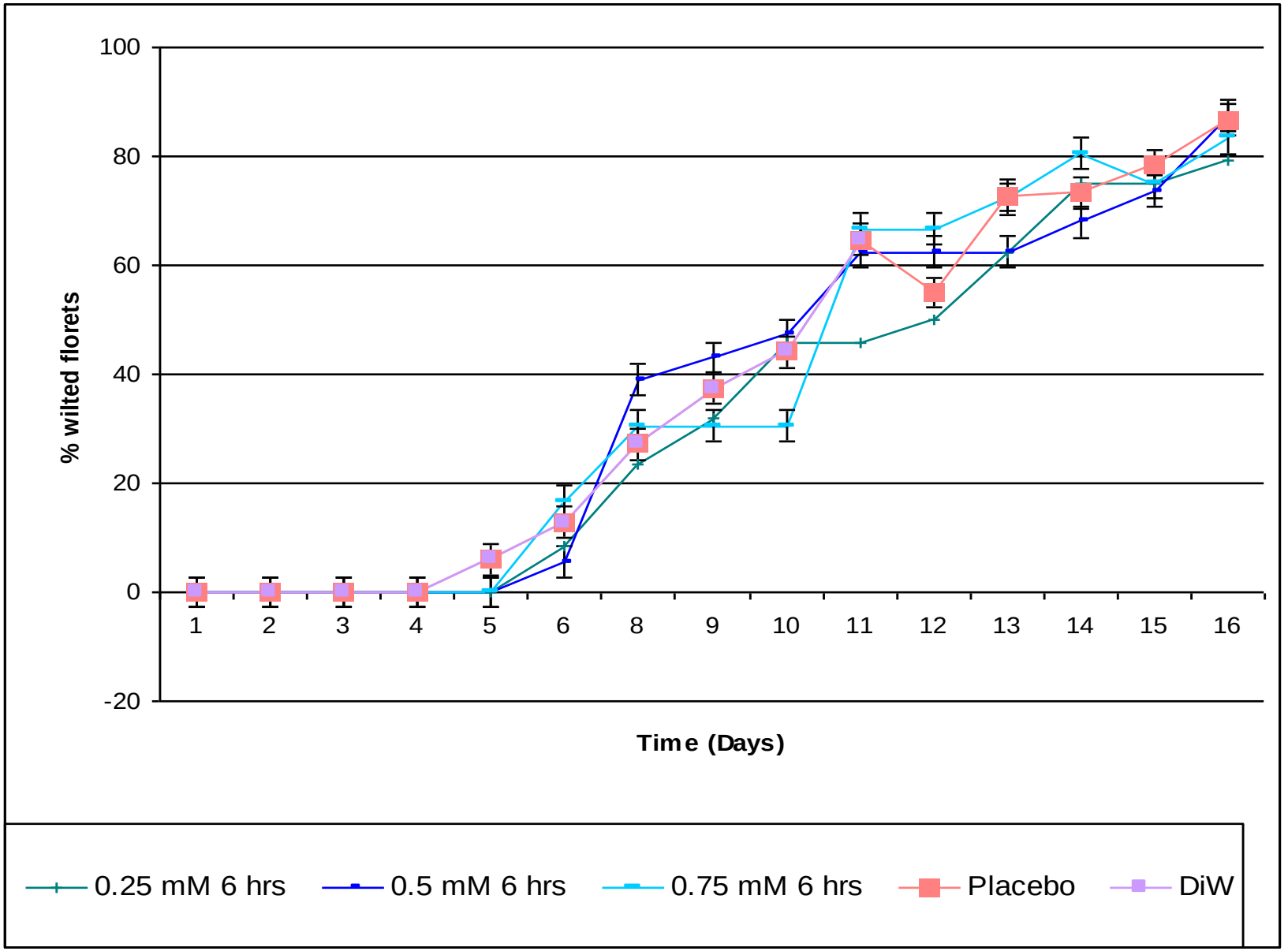
**2 (a)**


100
80
60
40
20
0
-20
% wilted florets
1
2
3
4
5
6
8
9
10
11
12
13
14
15
16
Time (Days)
0.25 mM 2 hrs
0.5 mM 2 hrs
0.75 mM 2 hrs
Placebo
DiW

**2 (b)**


100
80
60
40
20
0
-20
% wilted florets
1
2
3
4
5
6
8
9
10
11
12
13
14
15
16
Time (Days)
0.25 mM 4 hrs
0.5 mM 4 hrs
0.75 mM 4 hrs
Placebo
DiW

**2 (c)**


100
80
60
40
20
0
-20
% wilted florets
1
2
3
4
5
6
8
9
10
11
12
13
14
15
16
Time (Days)
0.25 mM 6 hrs
0.5 mM 6 hrs
0.75 mM 6 hrs
Placebo
DiW

3

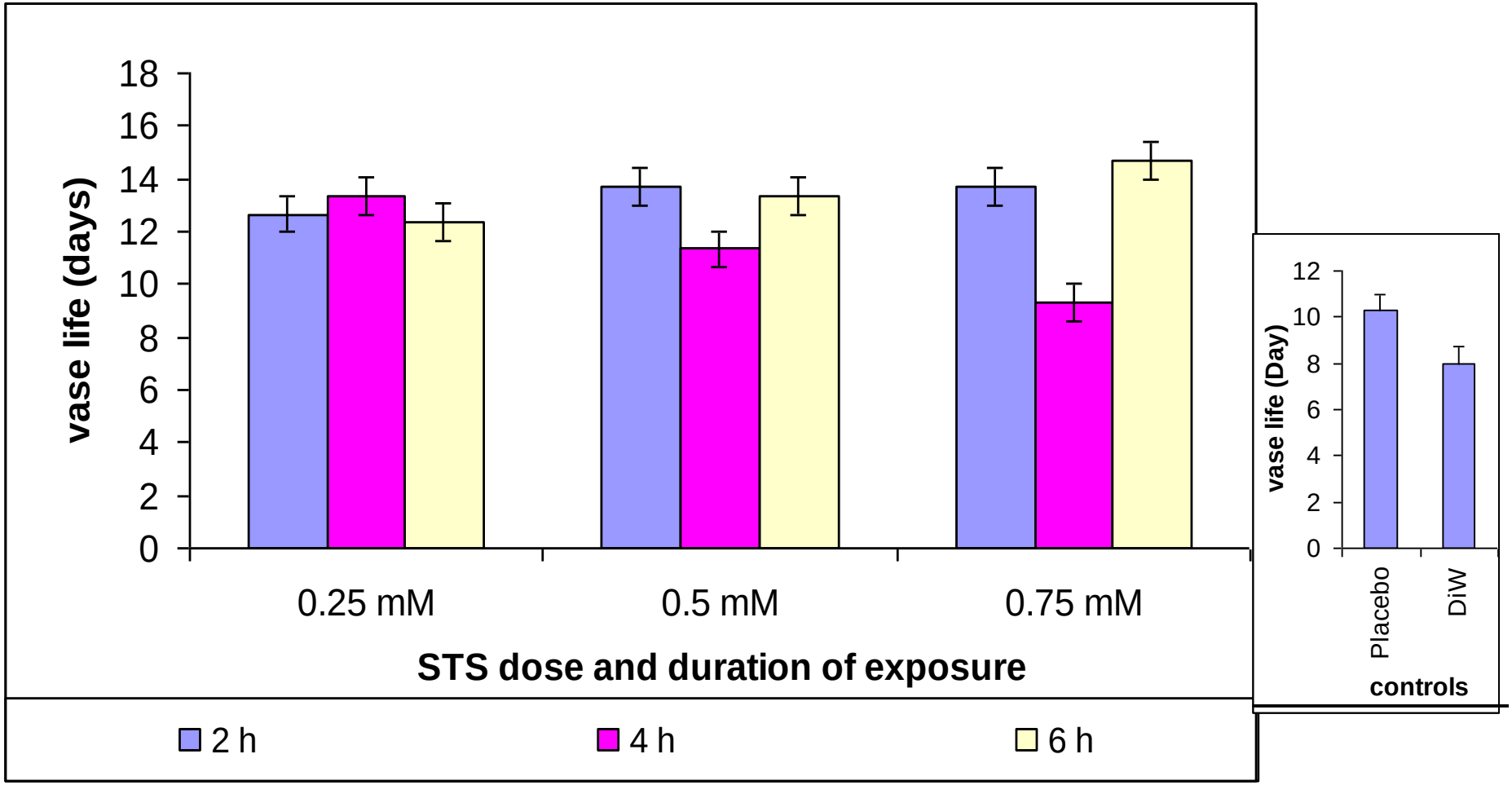



**Fig 3. interaction effect of STS dose with Duration of exposure on vase life of Lisianthus cut flowers**.

Mean separation done by Protected LSD. Y-error bars represent protected LSD

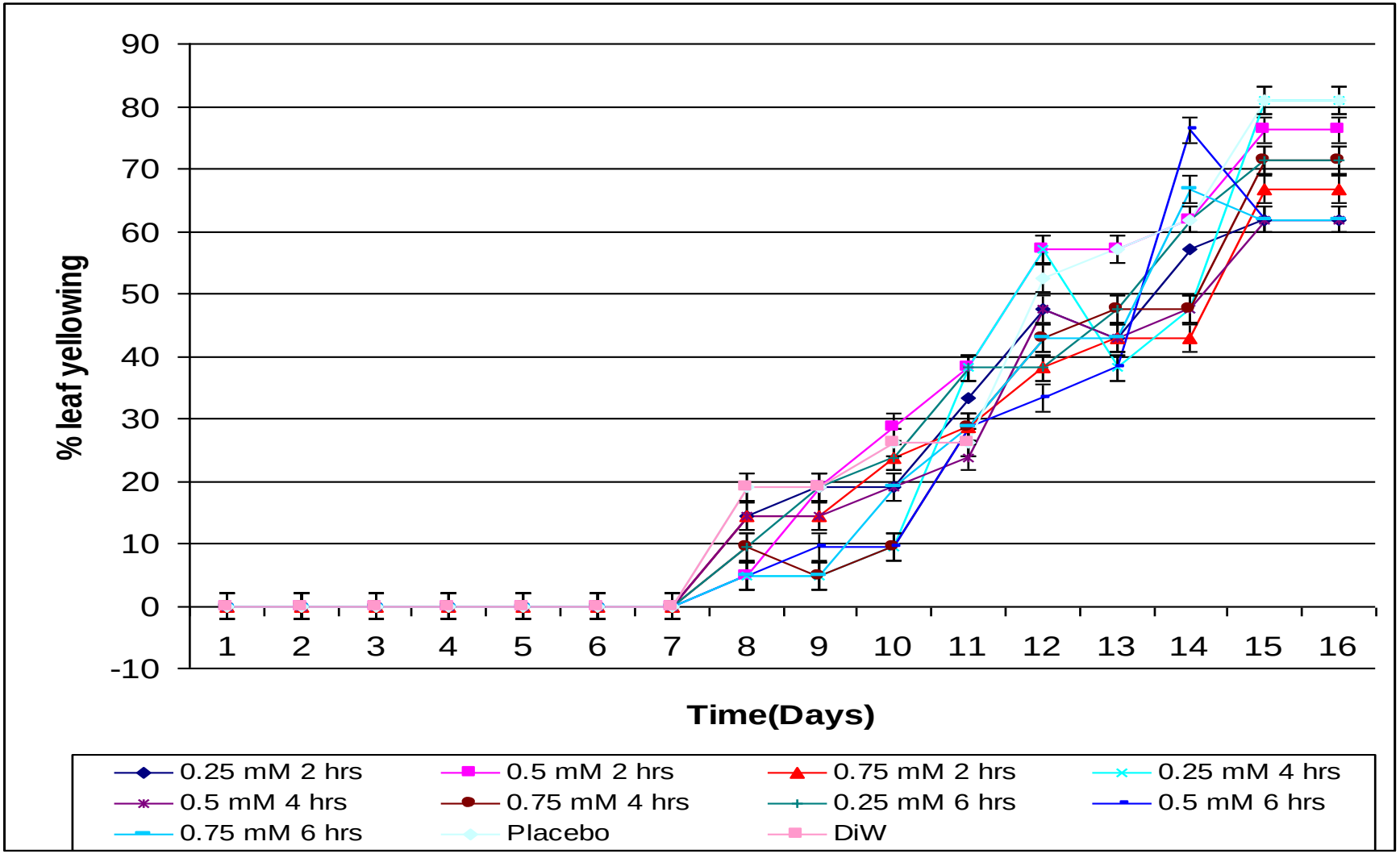
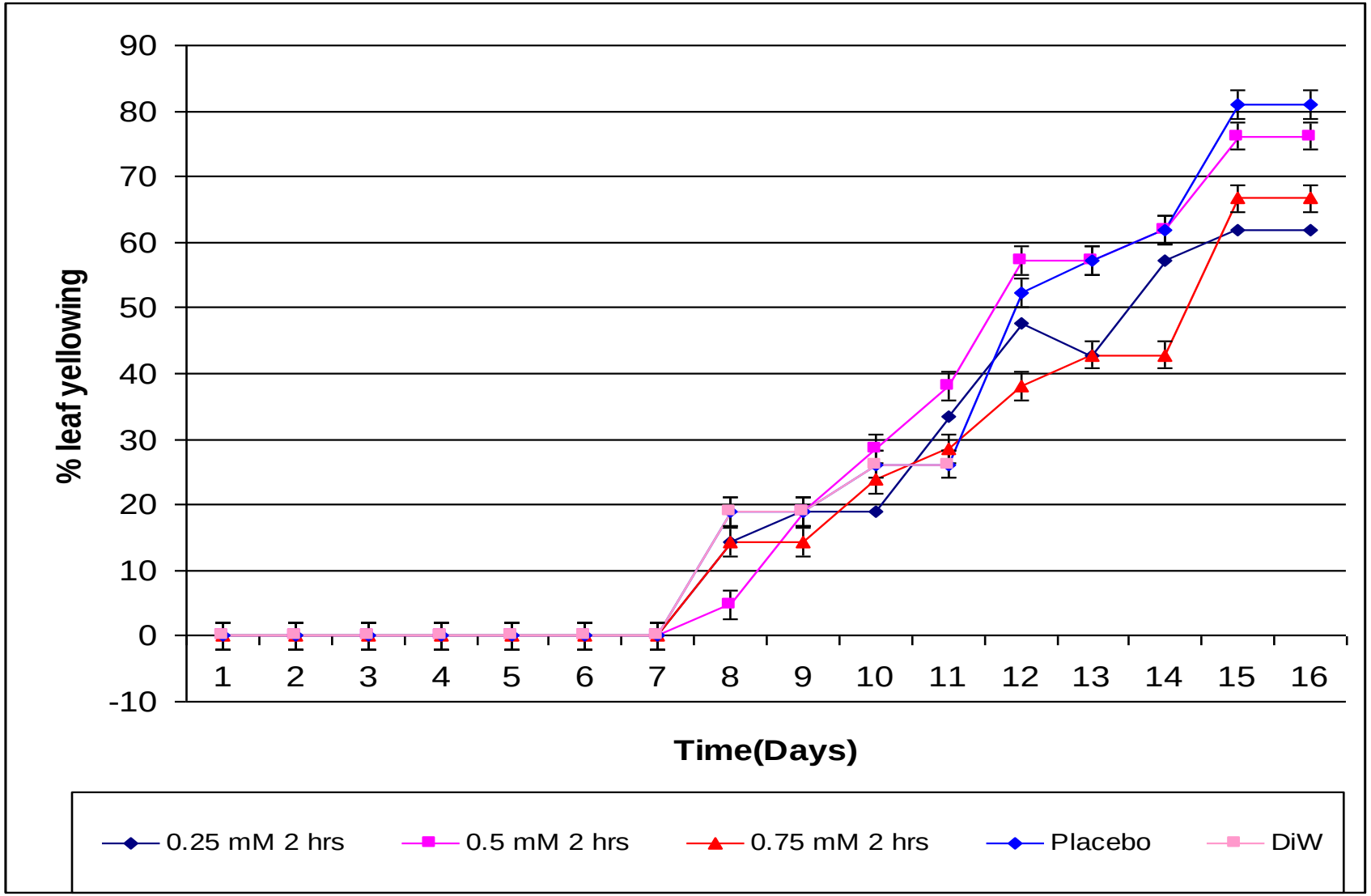
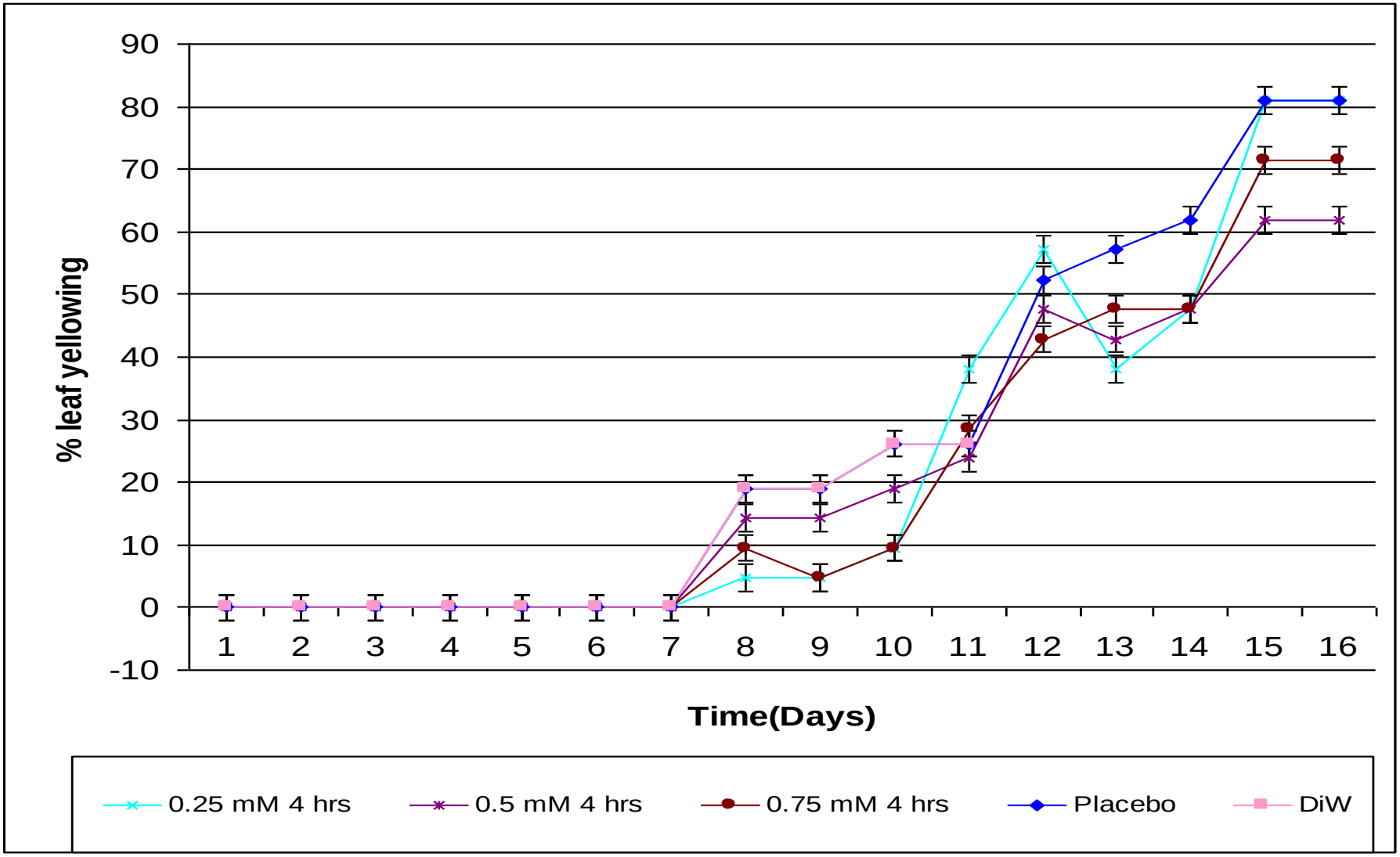



**Fig 4: Interaction effect between STS dose and Duration of exposure of Lisianthus cut flowers on the % leaf yellowing per shoot.**

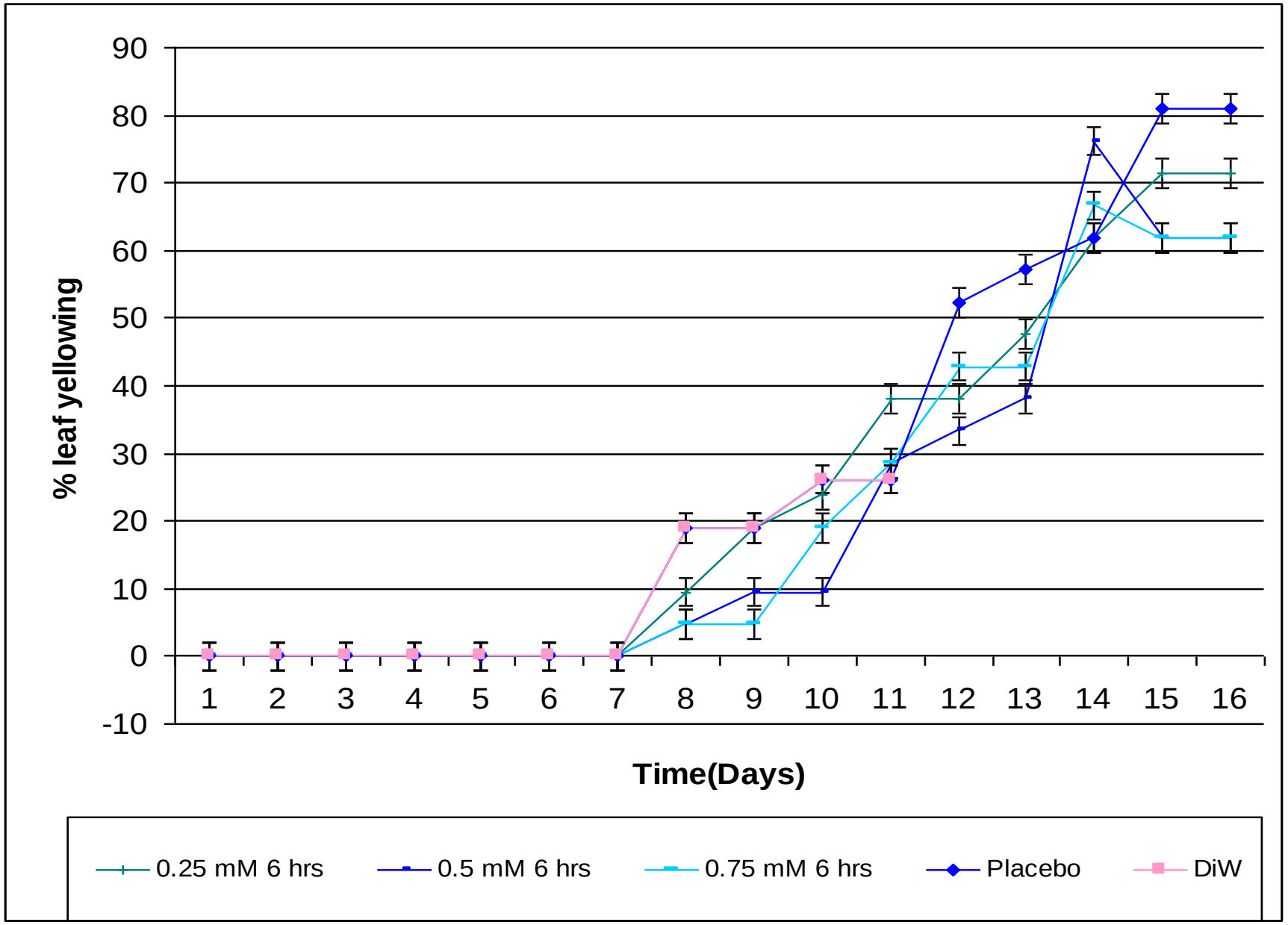
4 (a)


90
80
70
60
50
40
30
20
10
0
-10
% leaf yellowing
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Time(Days)
0.25 mM 2 hrs
0.5 mM 2 hrs
0.75 mM 2 hrs
Placebo
DiW

**4 (b )**


90
80
70
60
50
40
30
20
10
0
-10
% leaf yellowing
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Time(Days)
0.25 mM 4 hrs
0.5 mM 4 hrs
0.75 mM 4 hrs
Placebo
DiW

4 (c)


90
80
70
60
50
40
30
20
10
0
-10
% leaf yellowing
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Time(Days)
0.25 mM 6 hrs
0.5 mM 6 hrs
0.75 mM 6 hrs
Placebo
DiW

5

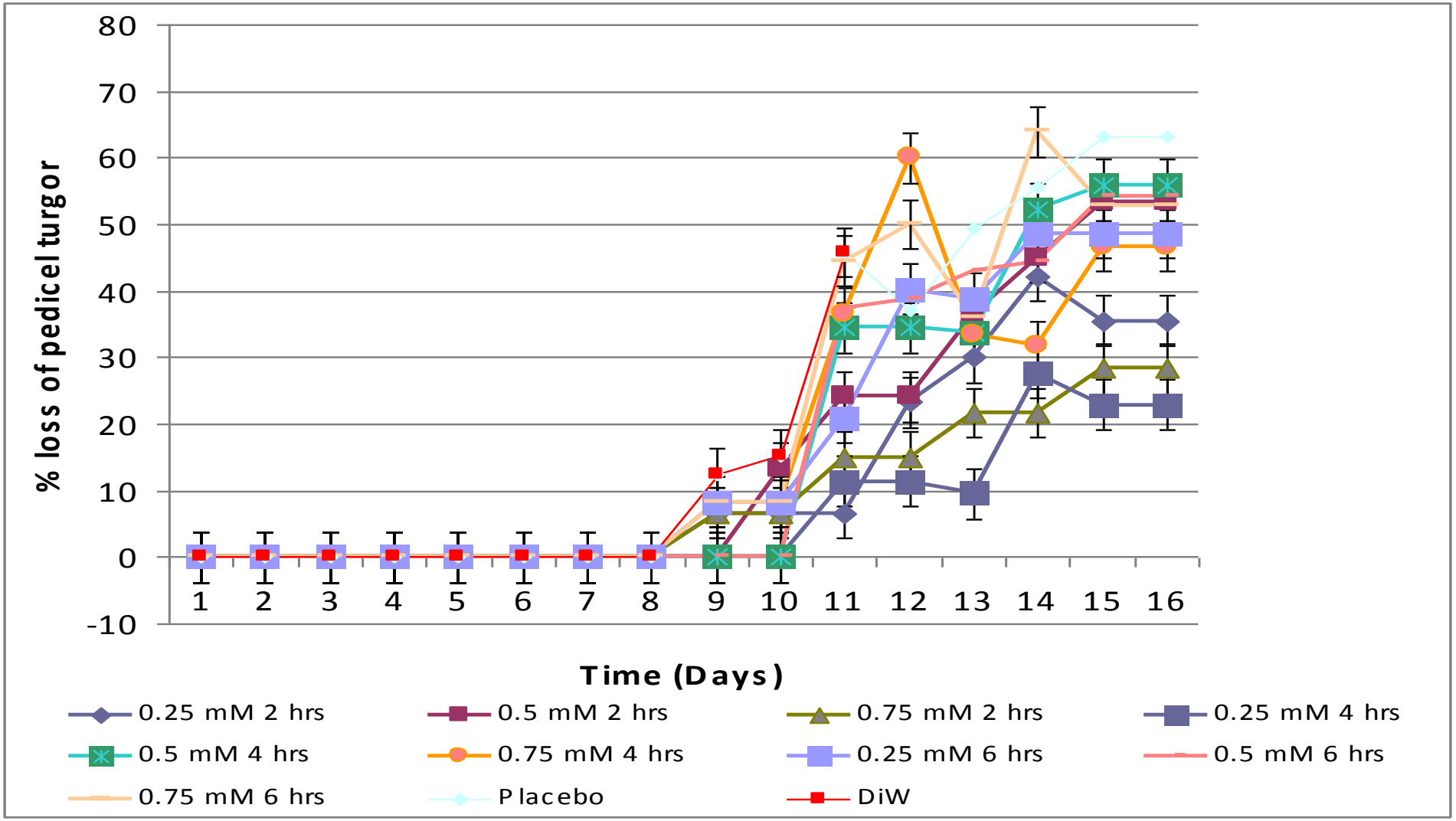
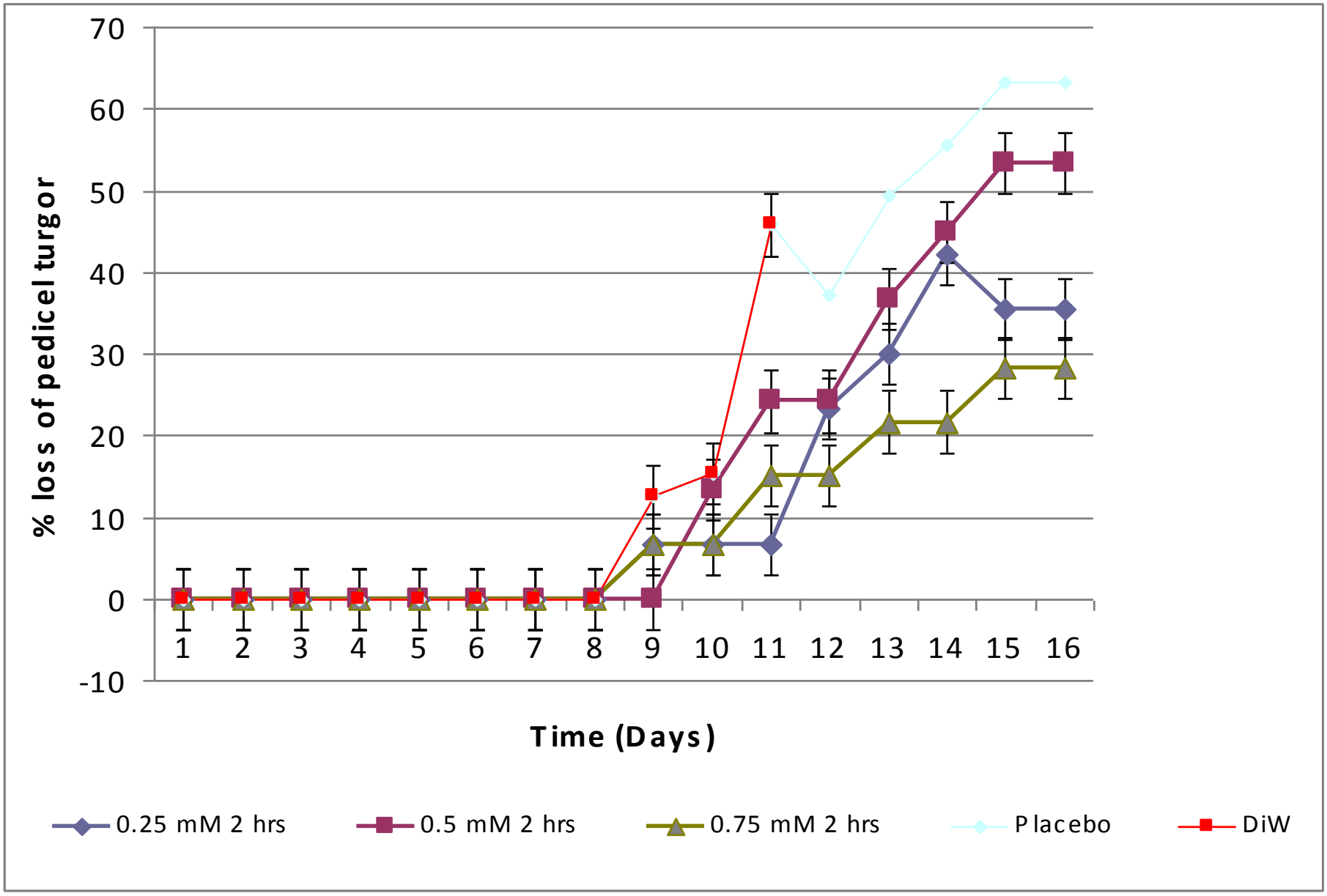
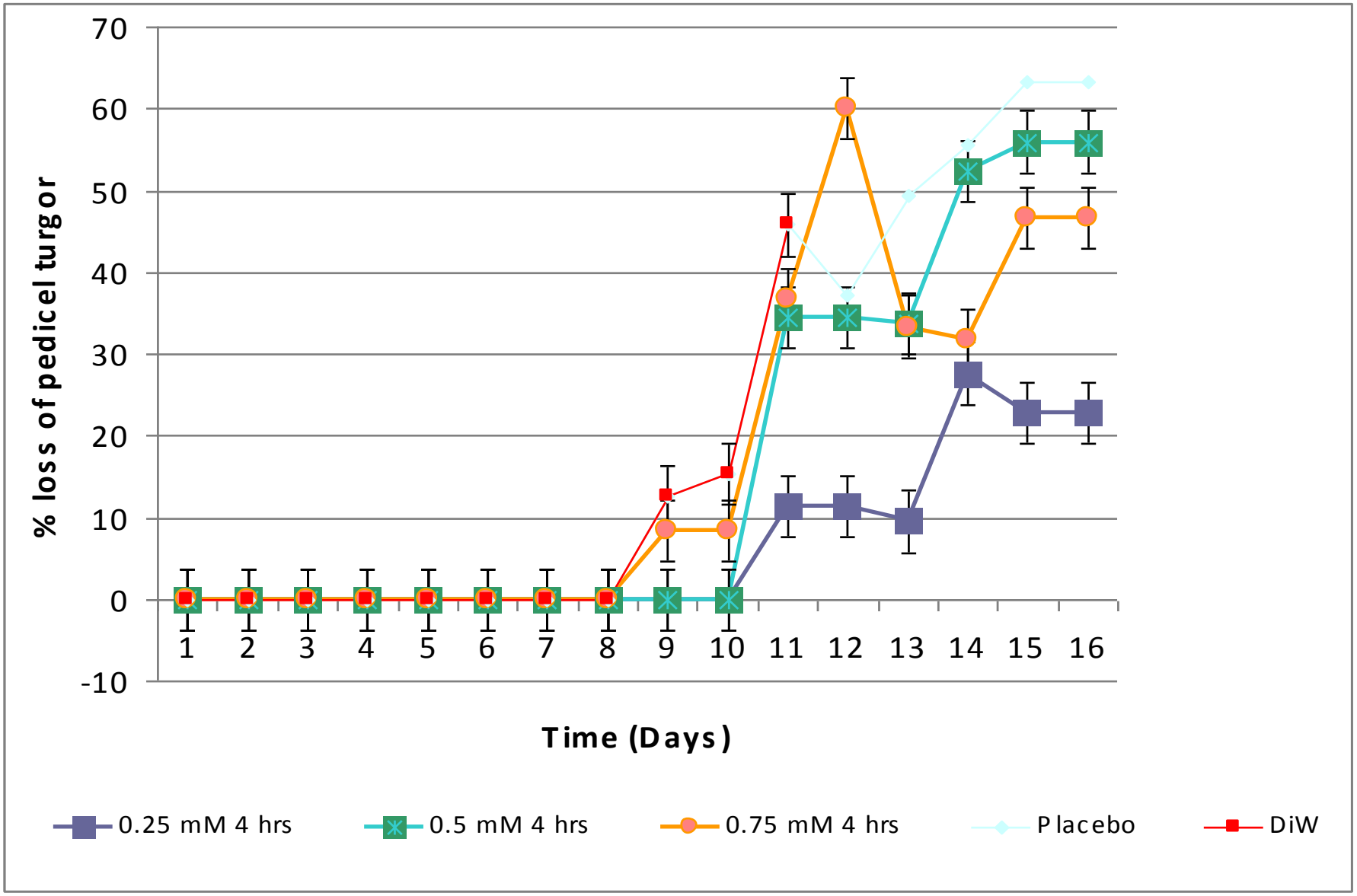



**Fig 5: Interaction effect between STS dose and Duration of exposure of Lisianthus cut flowers on the % loss in pedicel turgor per shoot**

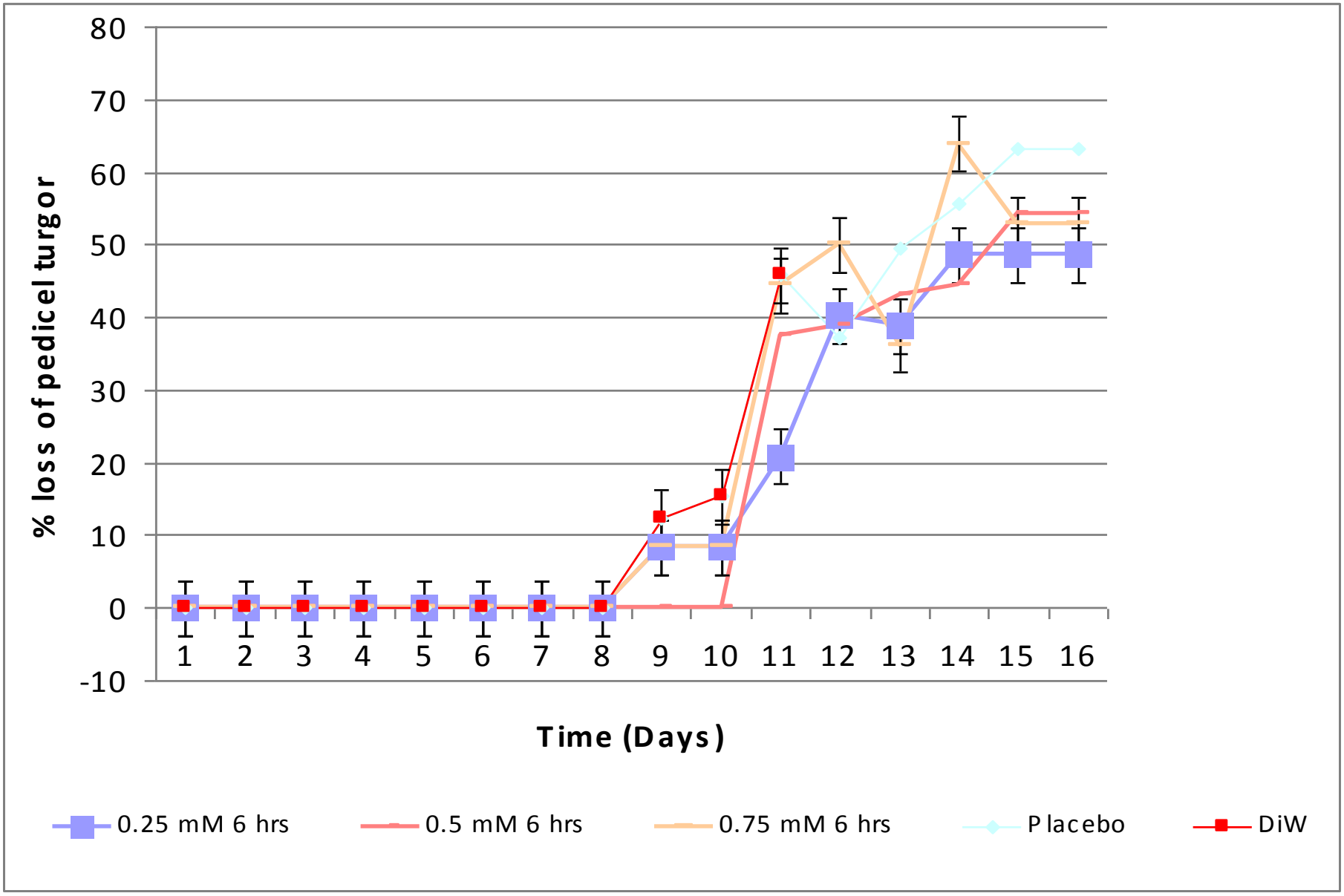
**5 (a)**


70
60
50
40
30
20
10
0
-10
% loss of pedicel turgor
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Time (Days)
0.25 mM 2 hrs
0.5 mM 2 hrs
0.75 mM 2 hrs
Placebo
DiW

5 (b)


70
60
50
40
30
20
10
0
-10
% loss of pedicel turgor
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Time (Days)
0.25 mM 4 hrs
0.5 mM 4 hrs
0.75 mM 4 hrs
Placebo
DiW

5 (c)


80
70
60
50
40
30
20
10
0
-10
% loss of pedicel turgor
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Time (Days)
0.25 mM 6 hrs
0.5 mM 6 hrs
0.75 mM 6 hrs
Placebo
DiW

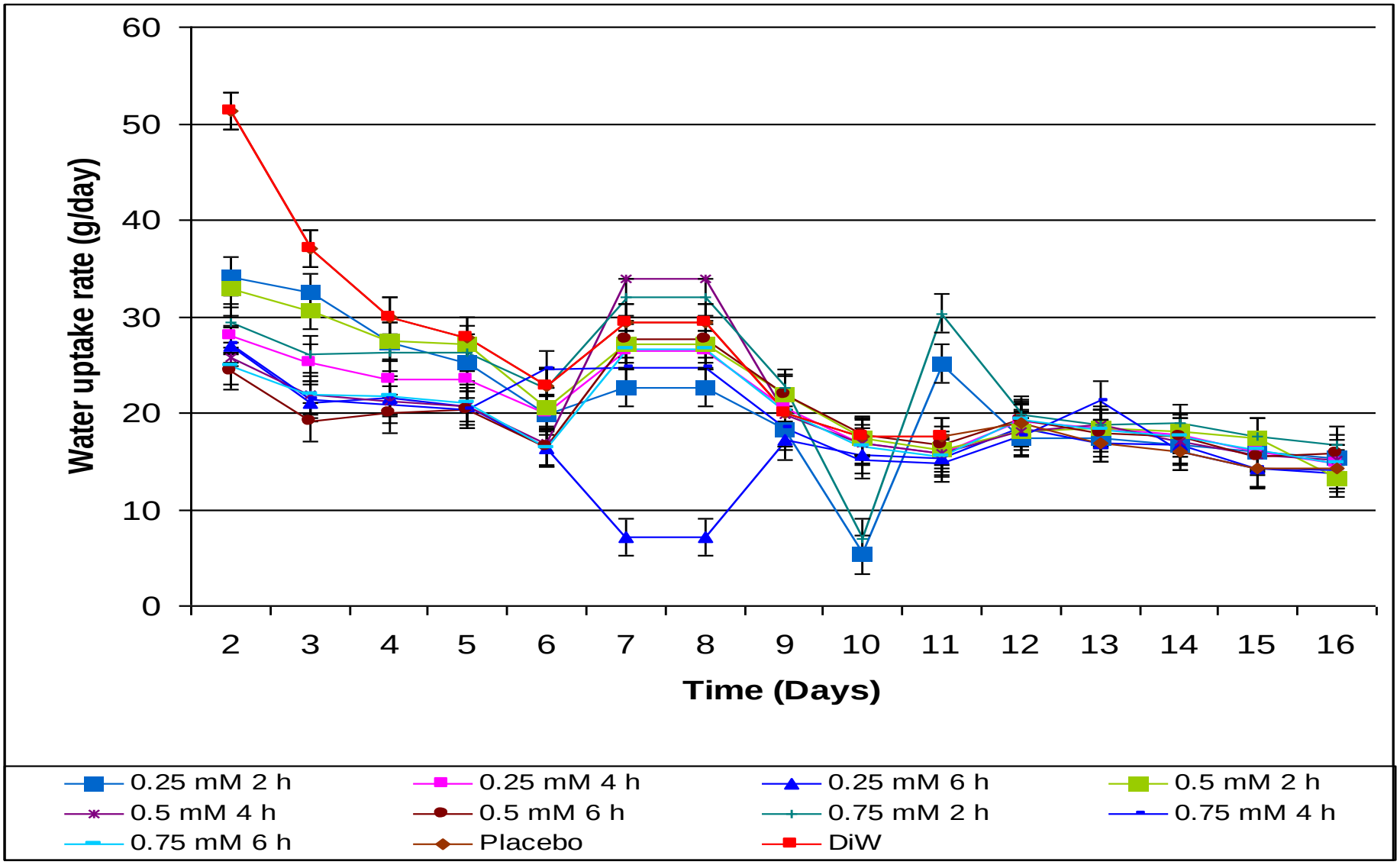
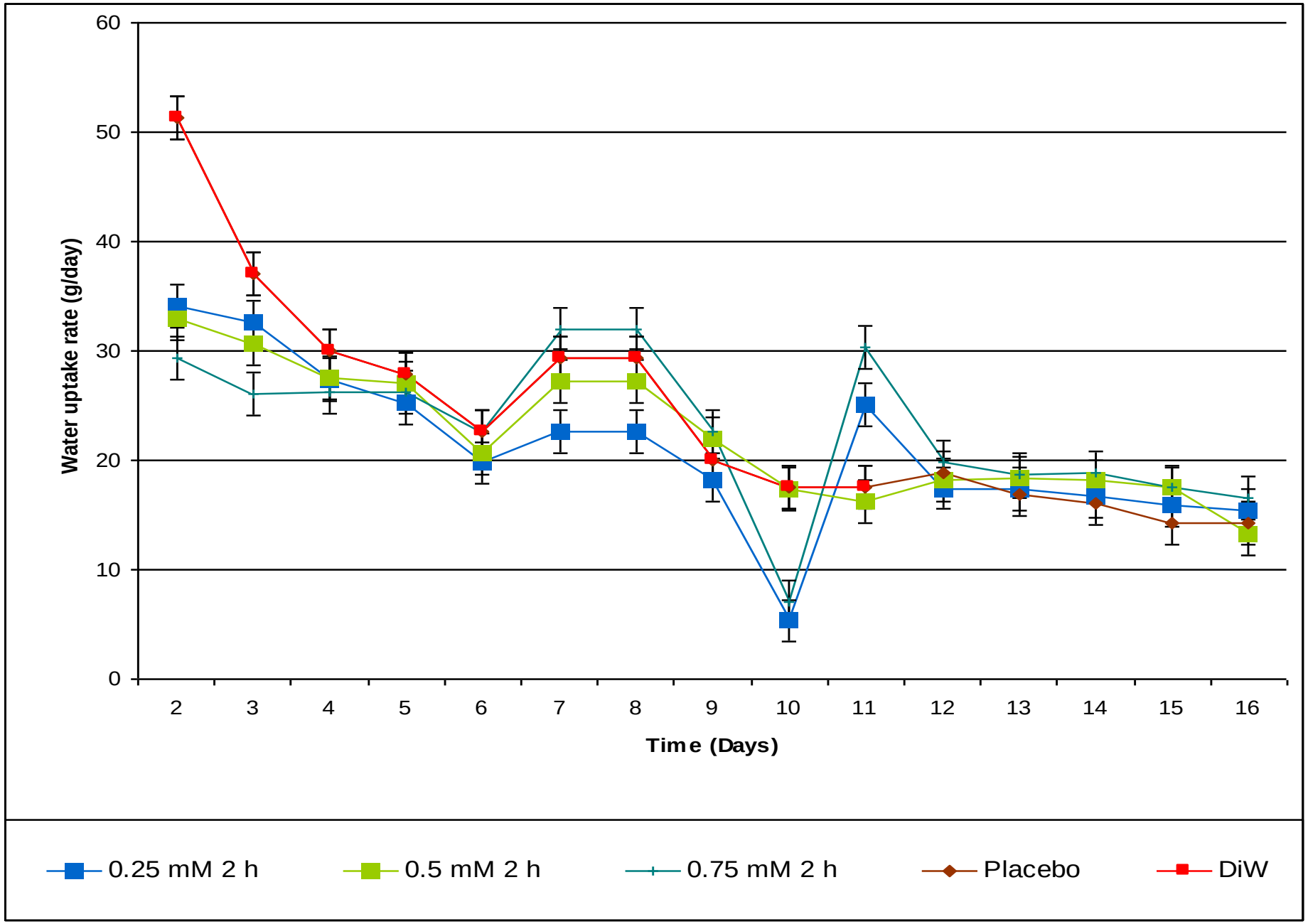
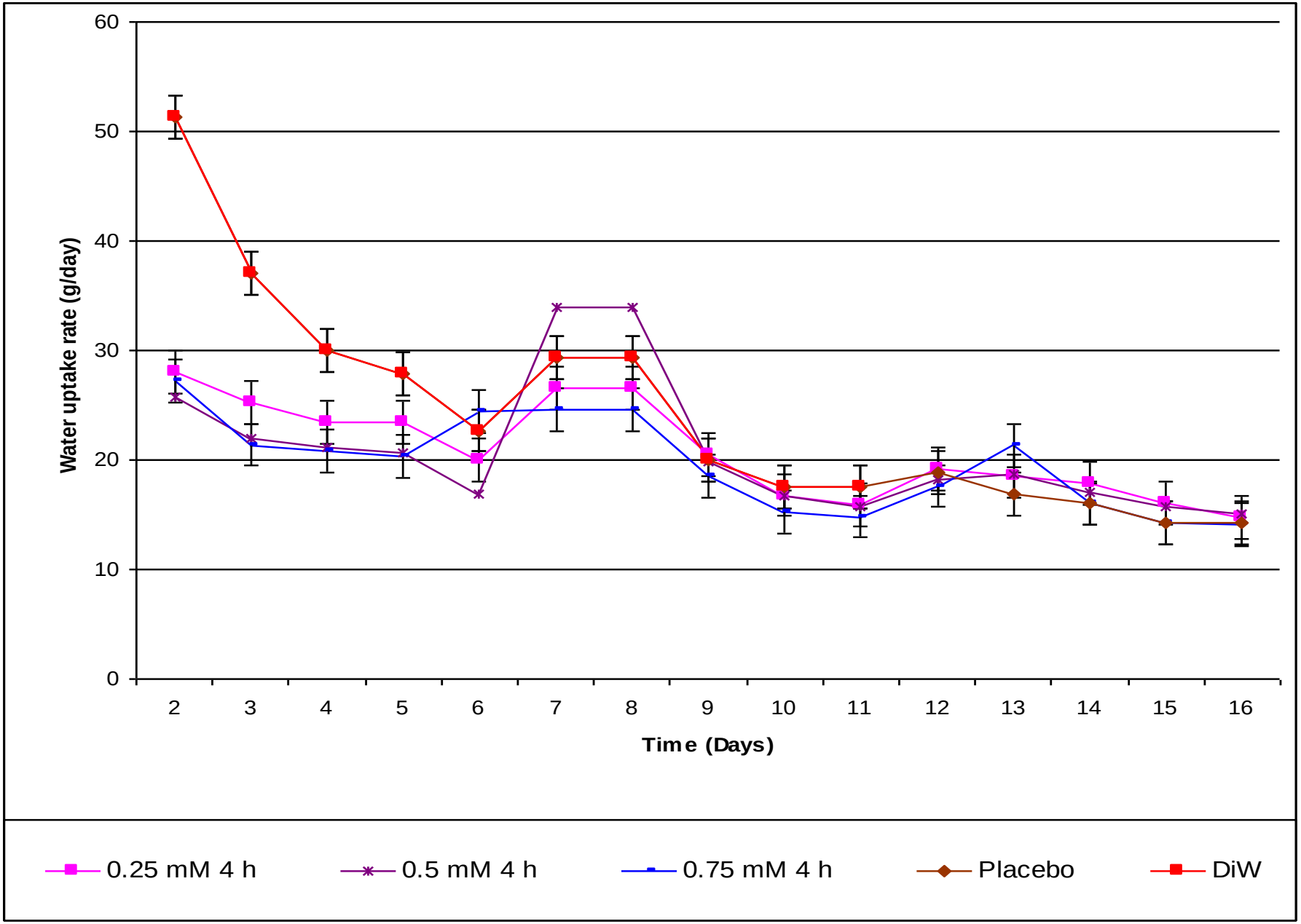



**Fig 6: interaction effect of STS dose with Duration of exposure on water uptake rate of Lisianthus cut flowers**

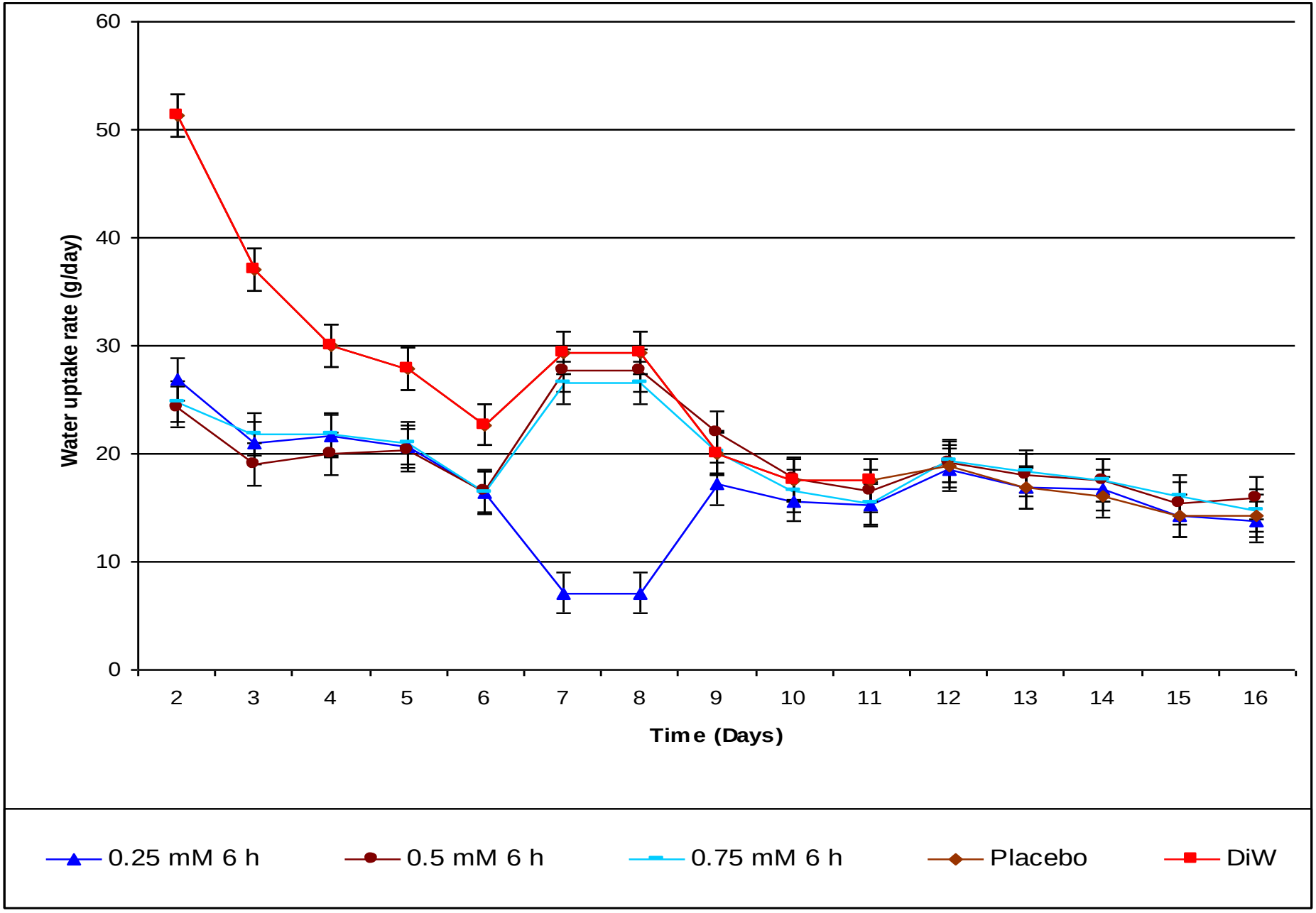
6 (a)


60
50
40
30
20
10
0
Water uptake rate (g/day)
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Time (Days)
0.25 mM 2 h
0.5 mM 2 h
0.75 mM 2 h
Placebo
DiW

6 (b)


60
50
40
30
20
10
0
Water uptake rate (g/day)
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Time (Days)
0.25 mM 4 h
0.5 mM 4 h
0.75 mM 4 h
Placebo
DiW

6 (c)


Water uptake rate (g/day)
60
50
40
30
20
10
0
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Time (Days)
0.25 mM 6 h
0.5 mM 6 h
0.75 mM 6 h
Placebo
DiW

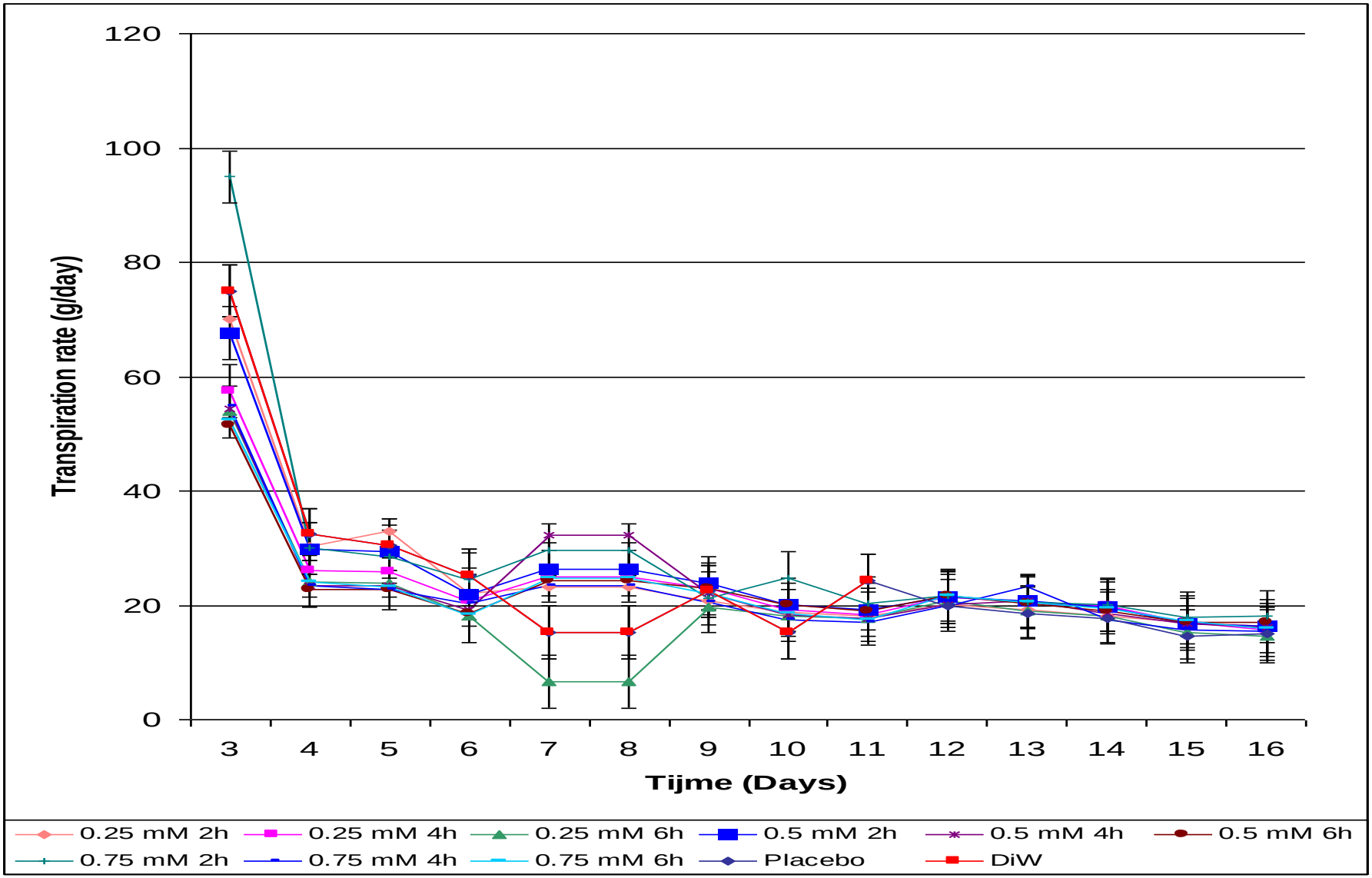
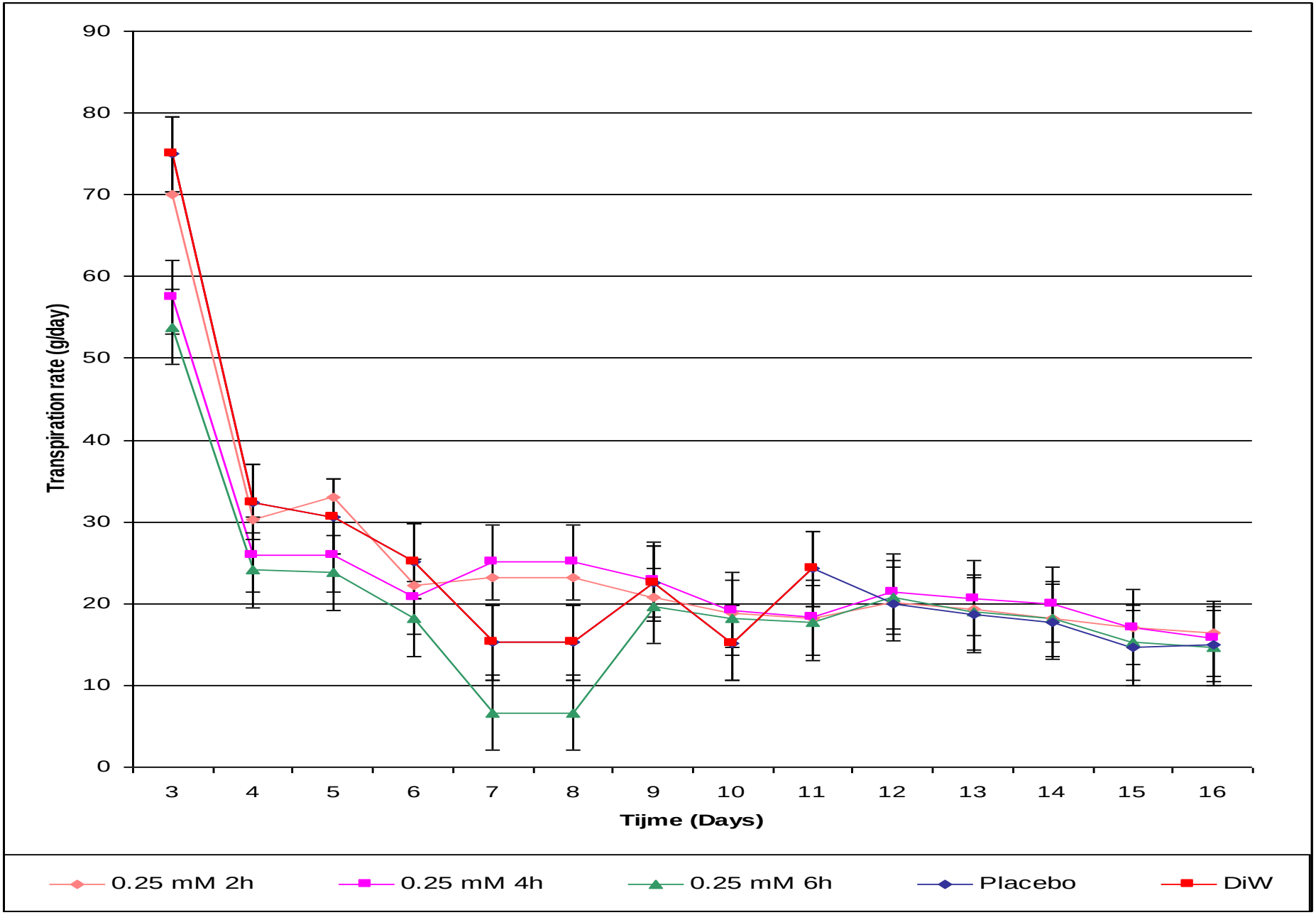
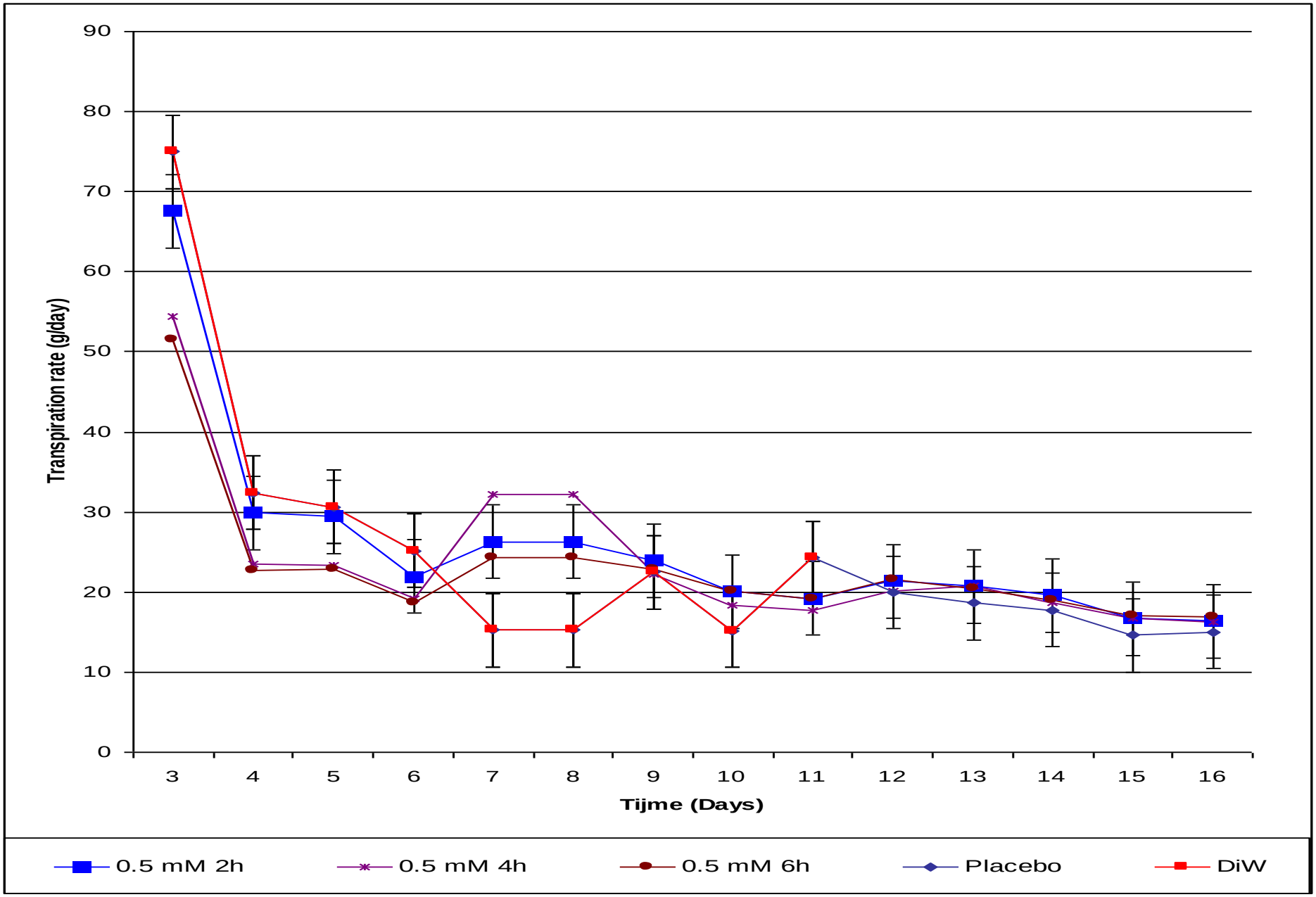



**Fig 7: interaction effect of STS dose with Duration of exposure on transpiration rate of Lisianthus cut flowers**

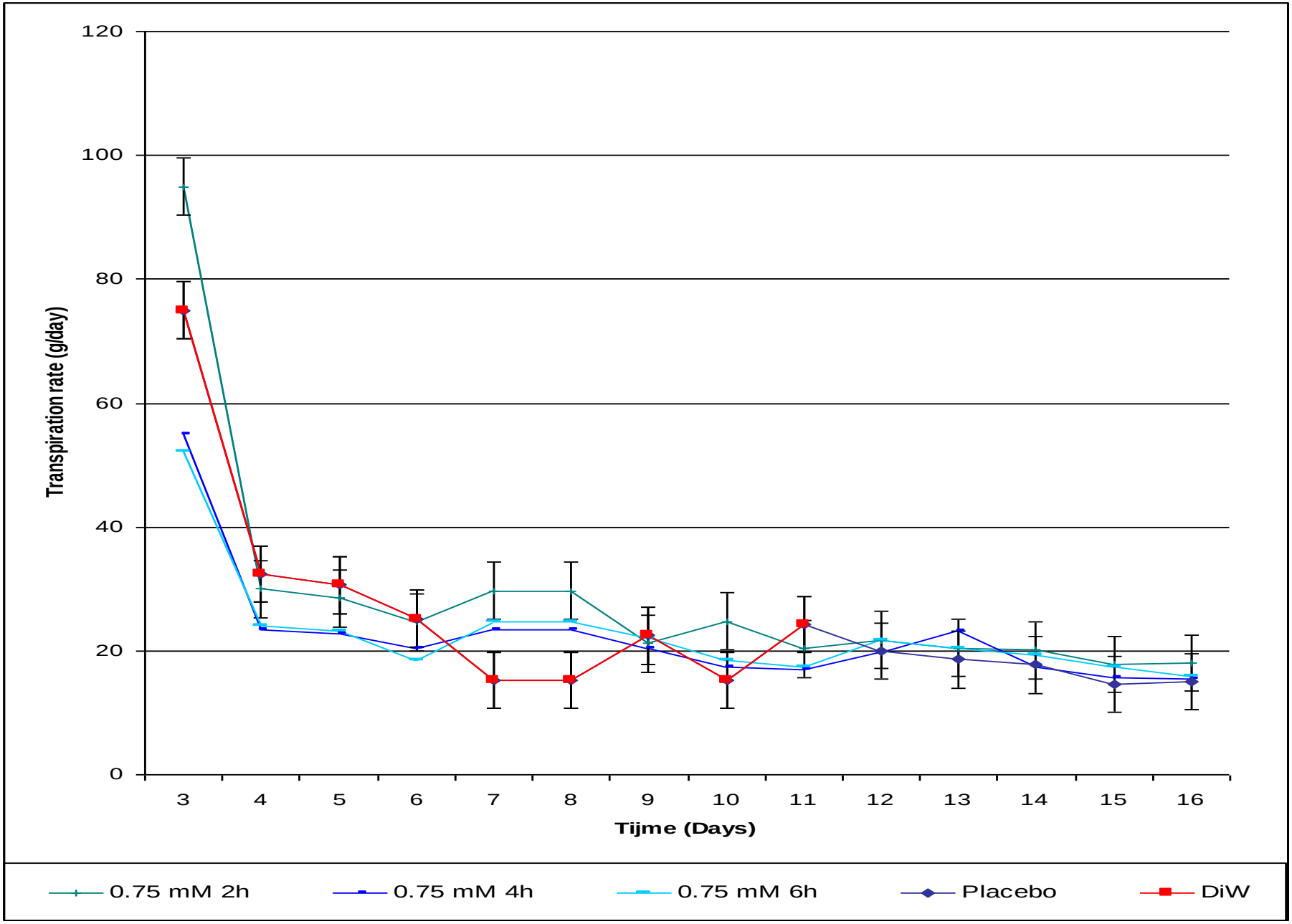
7 (a)


Transpiration rate (g/day)
90
80
70
60
50
40
30
20
10
0
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Tijme (Days)
0.25 mM 2h
0.25 mM 4h
0.25 mM 6h
Placebo
DiW

7 (b)


90
80
70
60
50
40
30
20
10
0
Transpiration rate (g/day)
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Tijme (Days)
0.5 mM 2h
0.5 mM 4h
0.5 mM 6h
Placebo
DiW

7 (c)


120
100
80
60
40
20
0
Transpiration rate (g/day)
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Tijme (Days)
0.75 mM 2h
0.75 mM 4h
0.75 mM 6h
Placebo
DiW

# Conclusion

- Data obtained in this study reveals that Lisianthus cut flowers are highly ethylene sensitive.
- STS doses ranging 0.25-0.75 mM were found to be effective in countering the adverse effects of ethylene; However, the higher doses (0.5 and 0.75 mM) required either short duration of exposure or sufficiently high duration to be effective

# Cont’

- The low efficacy of high STS doses given moderate duration of exposure (4 h) could be attributed to endogenous hormonal interactions triggered by the increasing blocking of ethylene action; hormonal crosstalk (Musembi 2008)

- Efficacy of the placebo compared to the distilled water could be attributed to the biocidal effect of NaOCl and energy source from Sucrose
- Distilled water showed greater losses since florets died on day 10
- STS  dose of 0.75 mM at 6 h duration of exposure recorded the highest vase life

# Recommendation

It is therefore recommended that :

i. STS dose of 0.75 mM for 2 or 6 hrs;the later being more reliable be used meanwhile to pre treat Lisianthus cut flowers against the adverse effects of ethylene as other effective and environment friendly technologies are identified

ii. Registration of other anti-ethylene treatments e.g. 1-MCP to facilitate trials in Kenya