

## Attempts to Produce Dwarfed *Althaea Rosea* Plants to Beautify Homes in the winter

Said M. Shahin and Hamdy E.B. Moustafa

Botanical Gards Res. Dept., Hort. Res. Inst., ARC, Giza, Egypt.

**Abstract:** This study was conducted at the Experimental Nursery of the ornamental Horticulture Department in the tropical farm at Kom Ombo, Hort. Res. Inst., Aswan, Egypt, during 2016/2017 and 2017/2018 seasons to study the effect of different concentrations of cycocel for the production of *Althaea rosea* plants for house beautification in winter. Significant decrease occurred in most of the vegetative growth characteristics of *Althaea rosea* plants, such as stem height, number of leaves/ plant, number of flowers/plant, main root length as well as the fresh and dry weight of the leaves, stem and roots, when the plants were treated three times (in the first week of March, April and May) with a cycocel at 1000 to 3000 ppm compared to the control. In regard with stem diameter, leaf area and photosynthetic pigments (chlorophyll a. b, total chlorophylls and total carotenoids), they were greatly increased by the application of cycocel at 1000 to 3000 ppm compared to the control. The promotion was associated with increasing concentrations of cycocel. It can be recommended to spray *Althaea rosea* plants three times with cycocel at 3000 ppm in order to control the vegetative growth to suit House beautification in winter where the plants are integrated and the costs of cutting and pruning are reduced.

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### 1. Introduction

*Althaea rosea* trace belongs to Malvaceae or the mallow Family which is a Family of flowering plants containing over 200 genera with close to 2300 species. The largest genera in terms of species include *Hibiscus* (300 species), *Dombeya* (225 species); *Pavonia* (200 species) and *Sida* (200 species) (Bayer, 1999 and Baum *et al.*, 2004)

Where as the genus *Althaea* contains (so species) (Boulos, 1999). *Althaea rosea* (common name, Hollyhock Synonyms *Althaea chinensis* wall and *Althaea Feifolia* Cav.) is an ornamental plants abundant cultivated in gardens of Egypt (Alpna-Johri, 2013).

Genus *Althaea* has been growing from the Mediterranean region to central Asia and is widely distributed in the temperate regions of the world (Boulos, 1999)

There are six species of *Althaea* growing in Egypt. *Althaea rosea* Cav. *Althaea ludwigii* L., *Althaea rufescens* Boiss, *Althaea a caulis* Cav., *Althaea striata* Dc and *Althaea apterocarpa* Del. (Tacholm, 1974)

*Althaea rosea* was imported in Europe from southwestern China during the 15<sup>th</sup> century (Tschirch, 1912 and Shu Kui Shu, 2007)

William Turner, a herbalist of that time, gave it the name Holyoke from which the English name derived ( Alpna – Johri, 2013).

The flowers have a range of colors from white to dark red, including pink, orange and yellow. The plant is easily grown from the seeds. (Bailey, 2008)

The Hollyhock flower is used in Flok medicine for praphylaxis and therapy of diseases of gastraintinal, urinary and respiratory systems and also for reliving fever and thirst. The harb roots and seeds are used to treat cough and lung diseases the root of the plant is described as a substitute for *Althaea officinalis* l. in cough and respiratory problems. Other used include external application in skin inflammations and ulcers (Physician Desk Reference for Herbal Medicine (2000).

The current literature revealed that *Althaea rosea* Cv. is rich in its phenolic compounds and polysaccharides (*Althaea mucilage*).

High-molecular- weight acidic polysaccharides were isolated from the flowers, which consisted mainly of glucuronic acid, glacturonic acid, rhamnase and galactose (Karawya and Afifi, 1982) and Classen and Blaschek, 1998)

Some growth regulators such as cycocel, paclobutrazol, bayleton and daminozide reduce the growth. Today, a variety of organic and chemical compounds that are artificially made and delay plant growth are used in agriculture (particularly in horticulture and ornamentals industry). Some ornamental plants, if have less height are looking more appealing and its transportation is easy.

The effect of plant growth retardants depend on the time and method of application, concentration and

species and varieties type, type of target organ and environmental and physiological conditions (**James et al, 1999 and Latimer et al., 2001**)

Plant growth retardants delay cell division and elongation of shoot and restricting the construction of gibberellins reduces internodes length and vegetative growth (**Magnitsky et al., 2006**)

Some growth retardants, like cycocel could be used as foliar spray at suitable concentration and frequency through out the growing season to reduce the pruning labor Cost and to control the excessive growth of such plants.

## Materials And Methods

This study was carried out during 2016/2017 and 2017/2018 seasons in the Tropical farm at Kom Ombo under directorate of Botanical Garden Aswan ( belongs Hort. Res. Instit ARC) on *Althaea rosea* plants.

The seeds were sown on the first week of October in polyethylene bags 20x15 cm dimensions Each bag was filled with 4 k of compost and sand ( 2:1 by volume). Physical chemical analysis of the compost used in the study were shown in Table (1).

Three weeks after planting, transplants were thinned by leaving one plant/bag.

Table (1): Physical and chemical and analysis of Al-Bostan Compost used in the study.

Character	Content	Character	Content
Weight of m <sup>3</sup> (kg)	560.kg	Ph (1: 10)	7.94
Humidity	33%	EC (1: 10 ds/ m	3.84
Organic carbon	18.68%	Total nitrogen	0.99 %
Ash (%)	67.79%	NH <sub>4</sub> -N (ppm)	699 ppm
Organic matter	32.21%	NO <sub>3</sub> -N (ppm)	0
Weed seeds	0	C/N ratio	1: 18.88
Nematode (pathogenetic)	0	Total phosphorus (%)	0.83%
Nematode (non- pathogenetic)	0	Total potassium (%)	1.02%

The management practices like nitrogen, phosphorus and potassium fertilization, irrigation and weeding were the same for all treatments during entire period of study.

This study included the following six treatments from cycocel concentrations:

- 1- Control (seedlings were sprayed with top water)
- 2- Spraying cycocel at 1000 ppm
- 3- Spraying cycocel at 1500 ppm
- 4- Spraying cycocel at 2000 ppm
- 5- Spraying cycocel at 2500 ppm
- 6- Spraying Cycocel at 3000 ppm

Each treatment was replicated three times, five seedlings per replicate ( 90 seedlings for this experiment). Cycocel was sprayed three times at the first week of March, April and May in both experimental seasons.

Triton B as a wetting agent was added to all solutions at 0.05%. The untreated plants were sprayed with water containing Triton B. Spraying was done till run off. Randomized complete block design was followed (RCBD).

At the termination of each season ( 1<sup>st</sup> week of July) during both seasons the following data were recorded.

- 1- Seedling height (cm)
- 2- Stem diameter (mm)
- 3- Number of leaves / plant
- 4- Leaf area (cm)<sup>2</sup>

- 5- Length of main root (cm)
- 6- Fresh and dry weights of leaves/ plant (g.)
- 7- Fresh and dry weights of stem / plant (g.)
- 8- Fresh and dry weights of roots/ plant (g.)
- 9- Number of flowers/ plant

Concerning the photosynthetic pigments, chlorophyll a, chlorophyll b, total chlorophylls and total carotenoids contents in the fresh leaves, they were determined on the first week of June) for both seasons according to **Fadl and Seri- Eldeen (1978)**.

All the obtained data were tabulated and statistically analyzed according to the method described by **Mead et al, (1993)** and new L.S.D taste at 5% was used to make all comparisons between the means of treatments.

## 3. Results and Discussion

### Vegetative growth characters:

Data in Tables (2 & 3) clearly show that foliar application of cycocel at 1000 to 3000 ppm, significant decreased occurred the most of the vegetative growth characteristics of *Althaea rosea* plants. These results were true during both seasons. In regard with stem diameter and leaf area, they were greatly increased by the use of cycocel at 1000 to 3000 ppm compared to the control. The promotion was associated with increasing concentrations of cycocel.

The minimum stem height ( 71.0, 70.0 cm), number of leaves per plant (14.5, 14.0), number of

flowers per plant ( 12.5, 12.2), main root length ( 21.66, 21.10 cm) fresh weight of leaves / plant (19.8, 19.5 g.), dry weight of leaves/ plant ( 7.0, 7.2 g.), fresh weight of stem / plant (35.2 K 36.0 g), dry weight of stem / plant ( 10.5, 10.9 g.) fresh weight of root / plant (25.8, 26.0 g.) and dry weight of root / plant (11.0, 11.3 g.) during both seasons, respectively, were recorded on the plants that spraying three times with cycocel at 3000 ppm. The maximum stem height ( 146.3, 145.5 cm), number of leaves per plant (30.0, 30.0), number of flowers per plant (27.0, 27.2), main root length (33.5, 32.6 cm), fresh weight of leaves/ plant (40.8, 41.9 g.) dry weight of leaves / plant ( 17.6, 18.1g.), fresh weight of stem / plant ( 50.0, 50.0 g.), dry weight of stem /plant (21.5, 21.8 g.), fresh weight of root/ plant (38.0, 39.0g.) and dry weight of root / plant (17.0, 17.2g.) were revealed on untreated plants. These results were true in the two seasons.

Concerning cycocel, most of the vegetative growth characteristics of *Althaea rosea* were also reduced by the application of all cycocel concentrations in comparison with unsprayed control plant.

The role of cycocel in reducing plant growth obtained in this study was also reported by (Hassan *et al.*, 1986) on *Euphorbia pulcherrimal* Badran *et al.*, (1989) on *Luffa cylindrical*, Mansour *et al.* (1991) and Holcomb and John (1995) on poinsettia; Khalafalla *et al.*, (1996) on *Jasminum grandiflorum.*, Nofal *et al.*, (1998) on geranium; Monoly *et al.*, (2001) on poinsettia; Abdou and Badran (2003) on *Jasminum sambac*; Diab, (2008) on *Clerodendron inerme* and Behzed and Mohammad (2016) on *Euphorbia pulcherrima*.

Table (2): Effect of cycocel concentrations on some growth characters of *Althaea rosa* plants during 2016/ 2017 and 2017/ 2018 seasons.

Treatments	Stem height (cm)		Stem diameter (mm)		Number of leaves/ plant		Number of flowers/ plant		Leaf area (cm) <sup>2</sup>		Main roots length (cm)	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	146.3	145.5	7.50	7.60	30.0	30.0	27.0	27.2	60.0	61.0	33.50	32.60
Spraying cycocel at 1000 ppm	132.0	130.5	8.22	8.30	26.0	25.5	23.0	22.5	71.0	72.0	29.62	28.70
Spraying cycocel at 1500 ppm	116.5	115.2	9.09	9.17	22.5	21.5	19.5	18.5	79.5	80.0	27.33	26.80
Spraying cycocel at 2000 ppm	98.6	97.5	9.98	10.02	18.5	18.0	15.5	15.0	84.0	85.0	25.81	24.91
Spraying cycocel at 2500 ppm	79.5	77.8	10.11	10.16	16.0	15.5	14.0	13.5	88.2	89.0	23.75	23.15
Spraying cycocel at 3000 ppm	71.0	70.0	10.16	10.20	14.5	14.0	12.5	12.2	90.0	91.0	21.66	21.10
New L.S.D. at 5%	2.9	2.8	0.9	0.8	2.3	2.2	2.1	2.0	1.9	1.8	0.8	0.7

Table (3): Effect of cycocel concentrations on Fresh and dry weight of leaves, stem and roots per plant of *Althaea rosa* plants during 2016/ 2017 and 2017/ 2018 seasons.

Treatments	Fresh weight of leaves /plant (g.)		Dry weight of leaves/plant (g.)		Fresh weight of stem/plant (g.)		Dry weight of stem/plant (g.)		Fresh weight of roots/plant (g.)		Dry weight of roots/plant (g.)	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	40.8	41.9	17.6	18.1	50.0	50.0	21.5	21.8	38.0	39.0	17.0	17.2
Spraying cycocel at 1000 ppm	36.2	37.0	14.5	14.9	48.2	48.8	19.0	19.4	34.8	35.0	15.5	15.9
Spraying cycocel at 1500 ppm	28.6	29.8	11.3	11.6	44.5	45.5	16.8	17.0	32.6	33.2	14.2	14.8
Spraying cycocel at 2000 ppm	23.8	23.4	9.9	10.2	41.8	42.2	14.5	14.9	30.0	31.4	13.0	13.6
Spraying cycocel at 2500 ppm	20.5	20.9	8.3	8.5	38.5	39.8	12.4	12.8	27.5	28.2	11.8	12.2
Spraying cycocel at 3000 ppm	19.8	19.5	7.0	7.2	35.2	36.0	10.5	10.9	25.8	26.0	11.0	11.3
New L.S.D. at 5%	1.4	1.3	0.6	0.5	1.4	1.4	0.7	0.6	1.2	1.1	0.4	0.3

**Leaves photosynthetic pigments:**

As shown in Table (4), leaves photosynthetic pigments namely chlorophyll a, chlorophyll b, total chlorophylls and total carotenoids were significantly increased with spraying cycocel at 1000 to 3000 ppm in relative to the check treatment.

Table (4): Effect of cycocel concentrations on some plant pigments of *Althaea rosa* plants during 2016/ 2017 and 2017/ 2018 seasons.

Treatments	Chlorophyll A (mg/1.0 g.F.w.)		Chlorophyll B (mg/1.0g.F.w.)		Total chlorophylls (mg/1.0g.F.w.)		Total carotenoids (mg/1.0g.F.w.)	
	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018	2016/2017	2017/2018
Control	3.01	3.02	1.04	1.05	4.05	4.07	1.21	1.24
Spraying cycocel at 1000 ppm	3.20	3.21	1.11	1.12	4.31	4.33	1.34	1.37
Spraying cycocel at 1500 ppm	3.30	3.31	1.22	1.24	4.52	4.55	1.41	1.44
Spraying cycocel at 2000 ppm	3.50	3.51	1.31	1.33	4.81	4.84	1.45	1.49
Spraying cycocel at 2500 ppm	3.61	3.62	1.40	1.42	5.01	5.04	1.51	1.53
Spraying cycocel at 3000 ppm	3.71	3.72	1.52	1.53	5.23	5.25	1.55	1.56
New L.S.D. at 5%	0.07	0.06	0.04	0.03	0.08	0.07	0.03	0.02

There was a gradual and significant promotion on these photosynthetic pigments with increasing cycocel concentrations. Increasing concentrations from 2500 to 3000 ppm had no significant promotion on these photosynthetic pigments.

The maximum content of chlorophyll a ( 3.71, 3.72 mg/g F.W.), chlorophyll b (1.52, 1.53 mg. / g F.W.), total chlorophylls (5.23, 5.25 mg/g F.W.) and total carotenoids (1.55, 1.56 mg/ g F.W.) during both seasons, respectively were recorded on the plants that received cycocel at 3000 ppm. The minimum content of chlorophyll a (3.01, 3.02 mg/g F.W.), chlorophyll b (1.04, 1.05 mg/g F.W.), total chlorophylls (4.05, 4.07 mg/g F.W.) and total carotenoids (1.21, 1.24 mg/ g. F.W.) during both seasons, respectively were recorded on untreated plants. These results were true in both seasons.

Photosynthetic pigment content reacted differently in response to cycocel. This growth retardant caused a gradual promotion in photosynthetic pigments content in regard to that of unsprayed plants, Such promotion was significant, in both seasons.

The role of cycocel in inducing photosynthetic pigments content was observed on many plants species like *Luffa cylindrica* (Badran *et al.*, 1989) *Jasimmuns Sambac* (Gowda and Gowda 1990) *Poinsettia* (Holcomb and John, 1995), *Shinus terebenthifolius* (Nofal *et al.*, 1998) *Leucaena leucoccephala* ( Badran *et al.*, 1998), *Acacia saligna* (Ahmed and Aly, 1998) *Poinsettia* (Manoly *et al.*, 2001), aguar (Badran *et al.*, 2002), *Clerodendron inerme* (Diab, 2008) and *Euphorbia pulcherrima* (Behzed and Mohammad 2016).

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