

DAMINOZIDE APPLICATION METHOD EFFECT ON GROWTH AND CONTENTS OF OLEANDRIN AND RUTIN OF OLEANDER (*NERIUM OLEANDER* L.)

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Scientific J. Flowers & Ornamental Plants,
4(1):1-6 (2017).

Received:
16/12/2016
Accepted:
16/1/2017

ABSTRACT: This study included one factor with four growth retardant application methods of daminozide at 500 mg.l⁻¹ concentration (without addition, sapling base soaking, drench, and spraying methods) on oleander sapling four months age. The experiment was conducted in a lath-house, Department of Horticulture and Landscaping, College of Agriculture, Tikrit University, during the growing season of 2016. The experiment was designed in a complete randomized design with three replications. The results showed that daminozide applications caused a significant effect in growth characteristics. Drench application gave less plant height 62.87 cm. Spray application resulted in the highest chlorophyll content (10.61 mg.g⁻¹ fresh weight). Highest content of oleandrin was 0.25 mg.g⁻¹ and 47.82 mg.kg⁻¹ of rutin to sapling base soaking treatment.

Key words: Oleander, Daminozide, Rutin, application method.

INTRODUCTION

Oleandrin is a toxic cardiac glycoside compound found in oleander (*Nerium oleander* L.) plant sap. Along with its meandering, it is primarily responsible for the toxicity of the sap of oleander plant. Oleandrin has been used for years in China and Russia for its properties as a cardiac glycoside, for both suicidal and therapeutic purposes as in the treatment of cardiac insufficiency. (Bandara *et al.*, 2010). Rutin is another glycoside between the flavonol quercetin and the disaccharide rutinol. Like quercetin the chemical structures of both are very similar, a difference is existed in the hydroxyl functional group. Both quercetin and rutin were used in many countries as medications for blood vessel protection. They are used as ingredients of numerous multivitamin preparations and herbal remedies, (Chang *et al.*, 2000). The Mediterranean basin to China is the native habitat for oleander plant, the perennial

shrub with height of 2.5-6.0 meters, large flowers of white, pink, red, and purple colors. The shrub is widely used in the street and parks in which it is suitable for planting in large pot, or sowing individually or in groups with other shrubs of large leaves. It is used also as hedges. It prefers sunny and half-shady area. Its soil requirement is light clay soil with good drainage and light irrigation. It prefers organic fertilizers, (Al-Sultan *et al.*, 1991). Plant growth regulators as organic non-nutritional compounds and when low concentrations can promote or inhibit or modify physiological activities of the plant, (Abdul Qadir *et al.*, 1982). Growth retardants are synthetic organic compounds, when added to cause adverse effects of gibberellin as it reduces the rate of stem elongation by inhibiting cell division in the area under the apical meristem, (Dicks, 1979). The plants are varied in response to these constraints by genic, plant variety, and used concentration, (Ruter, 1992), the time

and frequency of treatment, (Miranda and Carelson, 1980), method and type of agricultural media, (Barret, 1982). Daminozide is also known as alar, kylar, B-NINE, DMASA, SADH, or B995. It has been produced in US by the Uniroyal Chemical Company, (Renu and Ranjan, 2013). Ochoa *et al.* (2009) in their studies on oleander seedlings planted in pots of 14 cm size and used paclobutrazole, (cultar 25%) at a rate of 20 mg.liter⁻¹ by adding 45 ml.pot⁻¹, caused a significant decrease of 51, 46, and 37% in the dry weight of shoot, root, and plant height, respectively compared to the control. Due to the lack of studies that focused on the pot production of oleander, this experiment was conducted to study pot production and the contents of oleanderin and rutin in the plant.

MATERIALS AND METHODS

An experiment was carried out in the lath house of the Department of Horticulture and Landscaping, College of Agriculture, Tikrit University on 2015-2016 growing season on oleander sapling that were propagated from semi hard cutting average of 10 cm. The cuttings were planted on 15 November 2015 under misty system in sand. Saplings were planted in pots of 14 cm diameter containing soil and peat moss mixture at 2:1 (v\v). Experiment was conducted with one factor to study the methods of adding growth retardants. Daminozide concentration of 500 mg.l⁻¹ was used in the four methods; First sapling base soak for 30 min before planting, second drench application, third spray application, and the control treatment. Three replications at a rate of four pots as experimental unit. The compound fertilizer (Pro.sol) 20:20:20 pots at a rate of 3 g per pot was added monthly. The measurements of plant height, stem diameter, node length, leaves area, total chlorophyll, and dry weight of shoots and roots were taken on the middle of October. The oleanderin and rutin contents of the leaves were determined by using HPLC (Rajendran, 2011). The data were statistically analyzed using SAS program

and compared between treatments using Duncan's Multiple Range Test at level of 5% probability (SAS, 1996).

RESULTS AND DISCUSSION

The results of the study are shown in Table (1) and Figures (1, 2, and 3).

Table (1) shows that there are some significant effects of daminozide on vegetative growth characteristics. The treatment of sapling base soaking and irrigation water addition caused a significant decrease of the average plant height. The lowest average height was 66.98cm and 62.87 cm for both treatments. The highest average stem diameter was of 7.07 mm for sapling base soaking treatment. The lowest length of internode was recorded for the addition of daminozide with drench application (2.02 cm), and it was low compared with other treatments. The treatments of daminozide caused a reduction in the leaves area compared to 734.80 cm² for the control. Daminozide spraying treatment resulted in the highest total chlorophyll content (10.61 mg.g⁻¹ fresh weight). There was non-significant effect of treatments on fresh weight of the sapling, while sapling base soaking treatment resulted in a significant increase of dry weight.

These results of vegetative growth are in agreement with many physiological findings before related to growth retardants including plant height. The explanation of reduction of internode elongation was due to inhibiting of cell elongation of apical meristem that leads to elongation and resulted in dwarfed plants (David, 1990).

The results of leaf area reduction also could be attributed to the effect on cell elongation inhibition as the leaf stalk is shortened by same physiological inhibition of meristem cells (Chancy, 2005). Abdul Jalel *et al.* (2007) reported that growth retardants caused an increase of the cuticle thickness, epidermis, palisade, and spongy layers in which those caused an increase of chlorophyll contents of the leaves.

Table 1. Effect of damenozide application method on growth of oleander (*Nerium oleander* L.).

Damenozide application method	Plant height (cm)	Stem diameter (ml)	Node length (cm)	Leaves area (cm ²)	Total chlorophyll mg.g ⁻¹ fresh weight	Dray weight canopy (g)	Dray weight Roots (g)
Control	75.16* a	6.85 b	3.08 a	734.80 a	10.13 d	16.24 a	5.73 c
Sapling base soaking	66.98 c	7.07 a	2.53 c	651.84 c	10.48 b	16.42 a	5.97 a
Drench	62.87 c	7.02 ab	2.02 d	591.62 d	10.29 c	16.08 a	5.87 b
Spray	68.80 b	5.95 c	2.73 b	672.27 b	10.61 a	15.86 a	5.17 d

*In a vertical column means having similar letters do not differ significantly according to Duncan's Multiples Range Test at 0.05 level of significance.

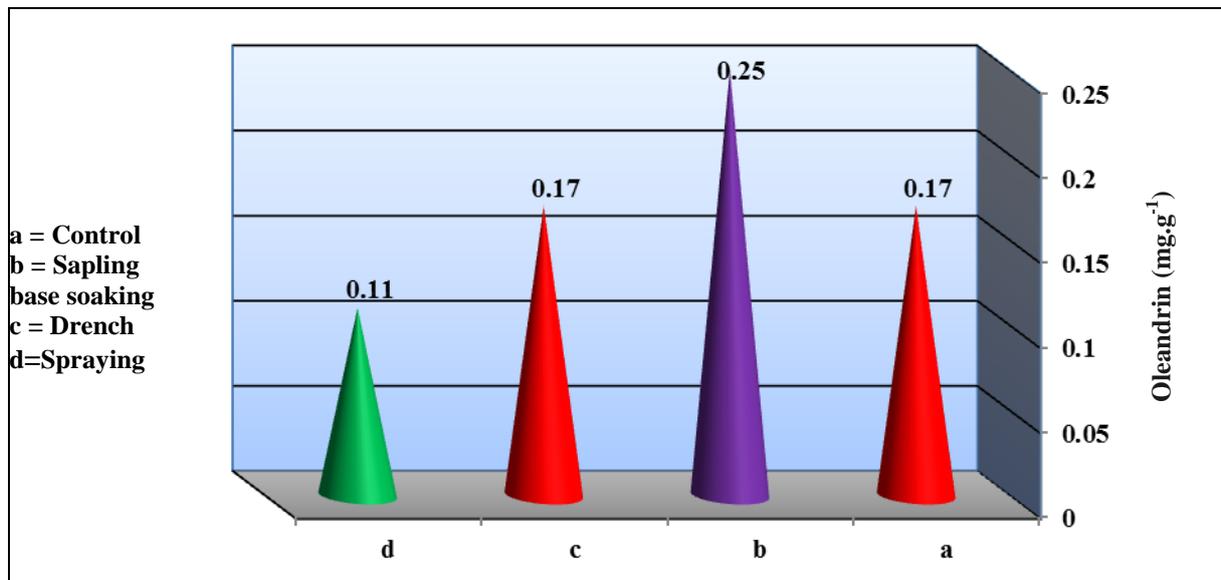


Fig. 1. Effect of dimenozide application method on leaves oleandrin content (mg.g⁻¹).

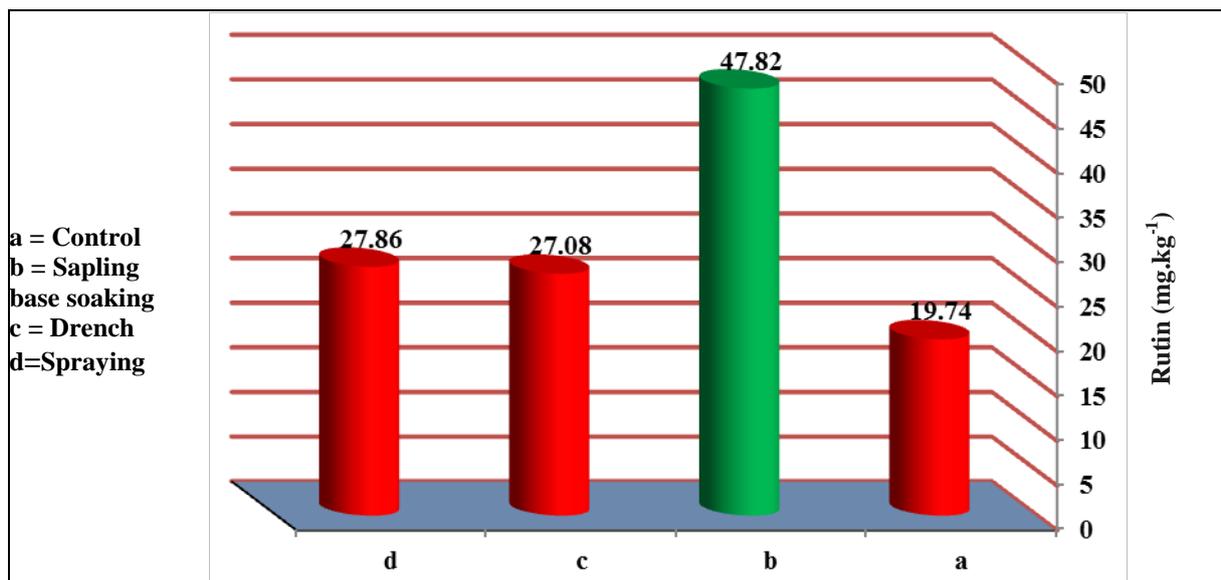


Fig. 2. Effect of dimenozide application method on leaves rutin content (mg.kg⁻¹).

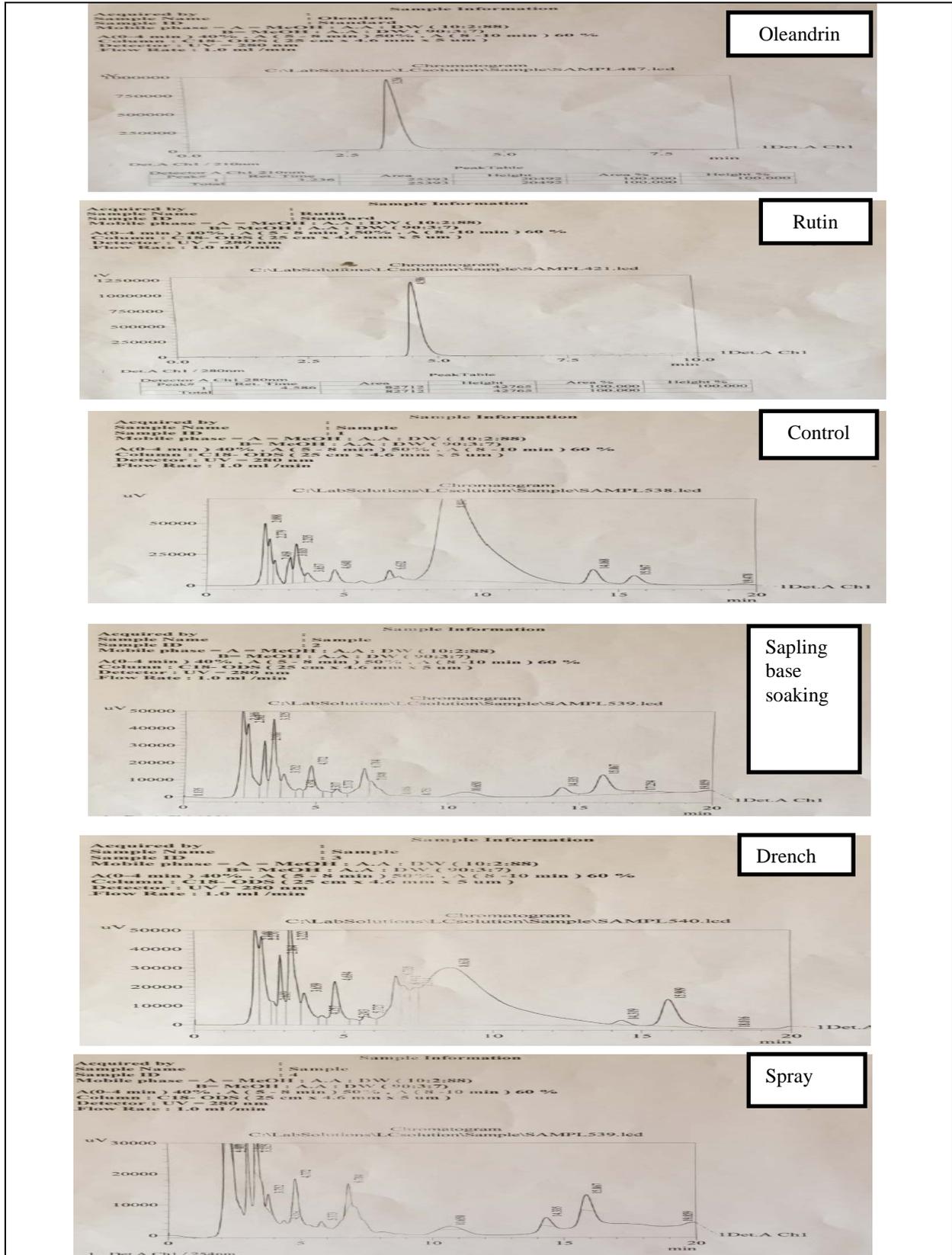


Fig. 3. Chromatographic profile of oleandrin and rutin compounds from leaves of oleander (*Nerium oleander L.*).

That finding was associated increasing of chlorophyll because of nutrients increase in the leaf especially nitrogen and iron.

Figure (1) showed that the sapling base soaking treatment gave the highest oleandrin content of 0.21 mg.g⁻¹ compared to the lowest of 0.16 mg.g⁻¹ for the treatment of daminozide spray treatment. Adding daminozide as drench gave the highest average of rutin content (54.05 mg.kg⁻¹) compared to the lowest (19.08 mg.kg⁻¹) for control and (18.07 mg.kg⁻¹) for spraying treatments as shown in Figure (2). The results of the oleandrin and rutin contents were confirmed by Zhou *et al.* (2009) on growth retardants as they promote the production of secondary compounds production.

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طريقة اضافة Daminozide وتأثيرها في نمو ومحتوى الدفلة *Nerim oleander* L. من مركبي Rutin و Oleandrin

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اجريت دراسة بعامل واحد وبأربعة مستويات من طريقة اضافة معيق النمو daminozide بتركيز ٥٠٠ ملغم لتر^{-١} وباربعة طرق هي (بدون اضافة، غمر قاعدة الشتلة، الإضافة مع ماء الري، الاضافة بالرش) على شتلات الدفلة بعمر اربعة اشهر ونفذت في الصوبية الخشبية التابعة لقسم البستنة وهندسة الحدائق / كلية الزراعة / جامعة تكريت خلال الموسم ٢٠١٦. صممت التجربة بالتصميم العشوائي الكامل CRD وبثلاثة مكررات. بينت النتائج ان المعاملة بمعيق النمو daminozide سبب فروقات معنويه في صفات النمو الخضري وان طريقة الإضافة مع ماء الري اعطت اقل ارتفاع للنبات (٦٢,٨٧ سم). واعطت معاملة الرش اعلى معدل للكوروفيل الكلي (١٠,٦١ ملغم.غم^{-١} وزن طازج)، وبلغ اعلى محتوى لمركب Oleandrin (٠,٢٥ ملغم.غم^{-١}) ولمركب Rutin (٤٧,٨٢ ملغم.كغم^{-١}) لمعاملة غمر قاعدة الشتلة.

