

Effect of essential oils on vase life of cut flowers of *Solidago Canadensis* L. (Golden rod)

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ABSTRACT

The present study was done at Antoniadis Research Branch, Ornamental Plants Research and Landscape Gardening Res. Dept., Hort. Res. inst., ARC, Alexandria, Egypt, during the two successive seasons of 2019 and 2020. The aim of this work was to evaluate the ability to use *Nigella sativa*, *Rosmarinus officinalis* and *Citrus lemon* essential oils (EOs) at 0.0,50,100,200 mg/l as holding solution on reducing bacterial decay and prolonging the vase life of solidago cut spike. The highest significant increase in vase life was obtained after application of Nigella Eo at 200 mg/l which was 15.78days in the first and 16.85 in the second season respectively as the compared to rosemary , lemon oils and control treatments. While the vase life of control treatment was 6.98 and 7.00 days in both seasons respectively. Also, this treatment recorded the highest significant increase in final water uptake, shoot fresh weight/shoot dry weight ratio and chlorophyll a & b content. Moreover, this treatment caused decreased in the loss of flower fresh weight and reduced the number of bacterial colonies in vase solution.

KEYWORDS: Essential oils, solidago (*Solidago canadensis*, L), cut spike, Nigella Eo.

1. INTRODUCTION

Golden rod (*Solidago canadensis* L., fam: Asteraceae) is a weedy plant that is commonly found in its north American region, considered as an ornamental plant (Melville, 1982). It has been recognized for years as a landscape plant. solidago is an excellent cut flower commonly used for vases and bowls of indoor decoration. solidagocut flowers has been dramatically increased over the past three years, it is a new crop among the top 25 most popular cut flowers around the world. This promising crop could be adopted to be produced under natural Egyptian conditions, with minimum environmental control, for export to the European markets during the off seasons in winter and early spring months (Flower council of Holland, 1999).

Cut flowers have a limited shelf life and are traditionally planted near market centers to make the maximum use of flowers possible for the consumers. The distribution problem is that the flowers should now be transported throughout the world wide and the life of the flowers should be termed to provide the cut flower in good quality to the consumers (Zeltzeret *al.*, 2001). The main reason that affect for the vase life of cut flowers is the microbial contamination (Kazemiet *al.*, 2011). The life of the cut flowers in vessels after harvesting is often affected with microbes, physiological occlusion or stem occlusion. It causes the water not

to be absorbed or extracellular enzymes secrete that can damage the vascular tube cell walls (Damunupolaet *al.*, 2010). The use of natural substances which have no side effects on human health and the environment and which are relatively cheap, because most chemicals are toxic and they cause environmental pollution, is very important (Okigbo 2005). Some herbal extracts and essential oil have antimicrobial properties and are used for their impact on prolonging life after harvesting horticultural products. Essential oils (EOs), which have various anti-oxidant, antibacterial or antifungal properties, are organic or natural products from aromatic and medicinal plants (Teissedre and Waterhouse, 2000; Bayatet *al.*, 2013), these can be used these oils as the preservative solutions to control bacterial and fungal pathogens (Hegazi and EL Kot., 2009; Solgiet *al.*, 2009; El-Hanafy, 2007).

Essential oils of *Nigella sativa* (black caraway, also known as black cumin) are an annual flowering plant in the Ranunculaceae family. Thymoquinone is the main constituent of the essential oil of N. sativa seeds, in addition the thymoquinone and its degradation product the thymohydroquinone have been reported to have antibacterial activity (Tembhurneet *al.*, 2014; Nickavaret *al.*, 2003). On carnation cut flowers, a solution containing 100 mg/l black cumin essential oil was found more effective than the control, particularly in terms of vase life and flower fresh

weight losses. (Bazaz and Tehranifar (2011), Fariman and Tehranifar, (2011) Hashemabadi *et al.* (2012) and Shanani, 2012).

Rosmarinus officinalis, L. Lamiaceae family is a rich source of phenolic compounds. In addition to the volatile constituents, EO of rosemary also contain several antioxidant components, pinene and camphor which belong mainly to the classes of phenolic acids, flavonoids, and diterpenoids (Steinegger and Hancel, 1998). The use of a treatment containing 25% rosemary extract and 6% sucrose in the *Dianthus* preservative solution expanded the vase life of flowers to 24 days (Basiriet *al.*, 2011).

Lemon (*Citrus lemon*) (Fam Rutaceae) plant is valuable source of essential oil, which is used in foods and medicines. Lemon oil contains linalool, it is an alcoholic monoterpene and have shown strong bacteriostatic properties (Sue Clarke 2008).

The addition of essential oils to preservative solutions could reduce the microbial density and increase the vase life of flowering spikes (Van Meeteren *et al.*, 2001; Hegazi and El-Kot, 2009). Essential oils lead to an increase in the permeability of bacteria cell due to the incapability of cell membrane to separate the constituents can lead to destabilization of the phospholipid layer of cytoplasmic this damage causes cell inactivation and/or death (Borges *et al* 2013). The mechanism of action of EOs are completely dependent on their chemical ingredients and it was demonstrated that alcohols, aldehydes, terpenes, phenols, ketones, ethers and hydrocarbons in natural essential oil were largely responsible for inhibition of the bacteria. The antimicrobial action of monoterpenes suggest that they can easily diffuse into or penetrate through the damaged cell membrane structures of microorganisms. Therefore, essential oils rich in terpenes have been shown to good possess antibacterial (Mohammad and Hassan 2017). In general, EOs act to inhibit the growth of bacterial cells and also inhibit the production of toxic bacterial (Burt, 2004).

The study was carried out to investigate the effect of using some natural essential oils rosemary, lemon, and nigella of various concentrations as preservative solutions on the vase life of golden rod (*Solidago canadensis*) cut flowers, as well as to improve their quality and extend their shelf-life period.

2. MATERIALS AND PROCESSES

This experiment was carried out in the Laboratory of Antoniadis Research Branch, Ornamental Plants Research and Landscape Gardening Res. Dept., Hort. Res. inst., ARC,

Alexandria, Egypt, over two consecutive seasons in 2019 and 2020.

2.1. Source of the cut flowers

Solidago (*Solidago canadensis*, L) cut spikes were brought from a well-known commercial nursery in Alexandria.

2.2. Cut flowers preparations

Solidago cut spike at the normal commercial harvest stage at 10% of florets are opened according to (Brahmankaret *et al.*, 2005). The uniform flowers were cut in the early morning, wrapped using polyethylene, and then quickly moved to the laboratory under dry condition. The stems were re-cut under water to 50 cm in length, with the 45-degree angle (Khimani *et al.*, 2005) and lower leaves were removed at the end of the third part of stems. The experiment was started on the first of November 2019 and 2020 in the both seasons, respectively.

2.3. Essential oils (EOs) used in the experiment

The EOs used in this experiment was obtained from the National Research Centre (NRC) Dokki, Egypt.

2.4. Post-harvest treatments

The following treatments were applied

Pulsing treatments: The flower spikes were placed in different solutions containing essential oils of rosemary, lemon, nigella (dissolve the oils in the preservative solution, Tween-80 "0.1% v/v" + 10% ethyl alcohol were used) at concentration 0.0, 50, 100 and 200 mg/l for 24 hours. After that, the spikes were transferred to vases containing 500 cm³ tap water (three spikes per vase).

Lab conditions: The spikes were held at the average temperature of (17 to 22 °C), under a 24-h photoperiod with 500-550 Lux from white fluorescent light and the relative humidity was from 65% to 69% in the two seasons.

2.5. Statistical analysis

A randomized complete block design (RCBD) was used for the experimental layout, comprising ten treatments, each with three replicates. Each contains three flower spikes were at a 5% probability level, the L.S.D test was used to compare between the means of the treatment. Snedecor and Cochran's (1989) method of statistical analysis was used to analyse the data.

2.6. Data were recorded as the following

2.6.1. The postharvest characters

2.6.1.1. Vase life (days)

It was calculated as the number of days between the beginning of the treatments and the fading stage of cut flowers. The fading stage was set to 75 percent wilting of the total number of inflorescence spikes.

2.6.1.2. Loss of flower fresh weight percentage (LFFW)

It was determined using the following formula during the fading stage.

$$\text{LFFW (\%)} = \frac{\text{Initial fresh weight} - \text{Final fresh weight}}{\text{Initial fresh weight}} \times 100$$

2.6.1.3. Final water uptake (g):

It was calculated at the end of the experiment as the following formula:

Water uptake (g) = The amount of solution at the beginning of the experiment - the amount of the solution remaining at the end of the experiment.

2.6.1.4. Flower fresh weight / flower dry weight ratio (FW/DW):

To determine the flower dry weight, the flowers were oven-dried at 75°C for 48 hours (FDW.) The fresh weight (g) was then divided by the dry weight (g) as shown below:

$$\text{FW/DW Ratio} = \frac{\text{Fresh weight per flower (g)}}{\text{Dry weight per flower (g)}}$$

2.6.1.5. Relative fresh weight (RFW):

Fresh weight of the flowers was determined just before the immersion of the flowers into the solutions and collected every two days until the vase life of the flowers was terminated. The fresh weight of each flower was expressed relative to the initial weight to represent the water status of the flower as follow:

$$\text{Relative fresh weight (RFW)} = \frac{W_t}{W_0} \times 100$$

Where W_t is the weight of spike (g) at 2, 4, 6 days and W_0 is the initial fresh weight of the same spike (g).

2.6.1.6. Vase solution uptake rate (VSU):

calculated the VSU rate using the formula below:

$$\text{VSU rate} = \frac{(St-1) - St}{\text{IFW of stem}} \times 100$$

Where (St) is the weight of the vase solution (g) on 2,4,6 days, (St-1) is the grams of the vase

solution on the entire past determination day while, and (IFW) is the initial fresh weight (g).

2.6.2. Chemical analysis:

Chlorophyll A and B content (mg/ g fresh weight) was determined in leaves according to Moran, (1982) in the upper part of flowering stems at the end of vase life of control plant and carotenoids (mg / g fresh weight) according to Wellburn (1994) and reducing sugars content (mg/g dry weight) was determined at the end of the experiment in the flower spike according to Miller (1959).

2.6.3. Averages of bacterial counts (C.F.U /ml):

Bacteria were counted according to their number of colonies confirmed by the Laboratory of Bacterial Plant Diseases and Molecular Bacteriology, Faculty of Agricultural, El-Shatby-Alexandria University. Serial dilutions were performed on vase solutions (0.1 mL) spread on general medium (nutrient agar) and incubated for 24 hours at 29 °C. Number of colonies per petri dish was counted accurately. All bacterial counts were repeated three times (Balestraet *al.*, 2005).

3. RESULTS

3.1. Vase life (days)

The application of essential oils (EOs) nigella, rosemary, lemon greatly improved the vase-life of solidago (*Solidago canadensis*, L) cut spikes. By varying the amounts of essential EOs in the preservation solution, the flowers of solidago were enlarged.

The vase life of solidago spikes have been extended at all concentrations used in (Table 1) .In both seasons, obtained data showed that nigella Eos (200 mg/l) had the largest significant impact on the vase-life extension (15.78 and 16.85 d) as compared to the untreated plants (6.98 and 7.00 d), also, there was non-significant differences between rosemary EO concentration of 200 mg/l(13.89 and 13.87 d) and nigella concentrations of 50 mg/l(13.48 and 13.07 d).At all concentration used, applying the different essential oils prolonged the vase life compared with the control. The findings revealed that the lemon EOs treatments had the shortest vase life (9.56 and 9.89 d) As compared to rosemary and lemon oil respectively, in both seasons.

3.2. Loss of flower fresh weight percentage (LFFW%):

Results in Table (1) cleared that the lowest significant decreased in LFFW ratio was obtained after Nigella Eo at 200 mg/l, (18.01 and 19.40%) in both seasons, respectively. On the other hand, the highest increase in LFFW was obtained after

Table 1. Means of vase life (days), loss of flower fresh weight (LFFW) (%), final water uptake (g/plant) and flower fresh weight/flower dry weight ratio (FWR) of *Solidagocanadensis* affected by different concentrations of some essential oils (Eo_s) during 2019 and 2020 seasons.

Treatments	Vase Life (days)		Loss of flower fresh weight (LFFW%)		Final water uptake g/spike		Flower fresh weight/Flower dry weight ratio (FWR)	
	2019	2020	2019	2020	2019	2020	2019	2020
	Control (tap water)	6.98	7.00	40.78	43.28	24.88	24.01	1.82
Rosemary at 50mg/L	11.76	12.56	28.20	28.22	36.86	34.47	2.98	2.95
Rosemary at 100mg/L	12.85	13.07	27.98	24.5	40.87	40.49	3.01	2.99
Rosemary at 200mg/L	13.48	13.78	26.51	23.36	41.85	45.27	3.03	3.23
Lemon at 50mg/L	9.56	9.89	31.29	37.97	39.90	40.49	2.31	2.80
Lemon at 100mg/L	10.78	10.22	31.14	33.55	50.97	41.01	2.89	2.81
Lemon at 200mg/L	11.44	11.67	29.61	30.13	45.59	45.99	2.96	2.82
Nigella at 50mg/L	13.89	13.89	26.51	23.36	35.10	46.55	3.09	3.33
Nigella at 100mg/L	15.34	16.33	25.62	22.21	52.68	55.35	3.21	3.33
Nigella at 200mg/L	15.78	16.85	18.01	19.40	59.56	56.10	3.62	4.21
L.S.D at 0.05	1.22	1.40	6.05	5.21	9.19	11.26	0.87	0.77

application of control followed by lemon EO at 50 mg/l which recorded (31.29 and 37.79%) less than the initial fresh weight in both seasons.

3.3. Final water uptake (g/ spike):

Table (1) indicated that using Nigella Eo at both 100 and 200 mg/l concentrations resulted in the highest increase in final water uptake which recorded (52.68 and 55.35 g) and (59.56 g and 56.10 g) respectively, in both seasons. Moreover, the same Table cleared that the smallest amount of water uptake was obtained after control which was (24.88 g and 24.01 g) in the first and second season, respectively.

3.4. Flower fresh weight / flower dry weight ratio (FW/DW)

Table (1) showed that the maximum flower fresh weight / flower dry weight ratio (3.62 and 4.21) was reported by using 200 mg/l Nigella Eos, followed by

treatment 100 mg/l rosemary EOs, they were recording (3.21 and 3.33) in both seasons, respectively with the same degree of significance. Whereas, the flowers exhibited the lowest FW/DW ratio (2.31 and 2.80) when treated with lemon EO at 50 mg/l in both seasons respectively.

3.5. Vase solution uptake rate (VSU %)

Table (2) showed that there was a significant different after application of different treatments on VSU value after two, four and six days from the experiment start. On the 2nd day the highest significant VSU value was obtained after Nigella Eo at 200 and 100 mg/L, rosmary EO at 200 mg/l and lemon EO at 200 mg/l in both seasons, respectively. On the 4th and 6th days the highest significant increase in VSU was obtained after application of Nigella Eo at 200 mg/l in both seasons.

Table 2. Means of the vase solution uptake (VSU%) of *Solidagocanadensis* affected by different concentrations of some essential oils (EO_s) during the shelf life period, 2019 and 2020 seasons.

Treatments	The shelf life period (days)					
	2019			2020		
	2 nd day	4 th day	6 th day	2 nd day	4 th day	6 th day
Control (tap water)	52.82	22.82	17.88	53.83	17.76	17.76
Rosemary at 50 mg/L	60.64	29.25	22.86	65.94	27.28	27.28
Rosemary at 100 mg/L	62.01	31.00	23.65	67.68	27.82	27.82
Rosemary at 200 mg/L	81.43	41.52	23.57	80.72	32.06	30.18
Lemon at 50mg/L	52.34	24.94	20.60	54.90	21.42	21.42
Lemon at 100mg/L	59.69	31.24	21.23	61.47	23.80	23.80
Lemon at 200mg/L	72.48	35.64	29.90	74.39	26.15	26.15
Nigella at 50mg/L	63.34	34.19	29.17	65.04	30.18	32.06
Nigella at 100mg/L	83.43	43.77	31.73	82.95	33.96	33.96
Nigella at 200mg/L	92.27	52.40	34.02	94.16	34.57	34.57
L.S.D at 0.05%	5.49	5.30	3.53	4.64	4.88	3.27

On contrary, the lowest significant VSU value was obtained after application of control after two, four and six days from the experiment start in both seasons.

3.6. Relative fresh weight (RFW) %

Data in Table (3) cleared that there was a significant difference after application of different treatments on RFW value after two, four and six days from the experiment start. The Table cleared

that application of Nigella Eo at 200 mg/l and rosemary EO at 200 mg/l resulted in the highest RFW value after two, four and six days from the experiment start in the first and second season with the same level of significance. On the other hand, application of tap water (control) recorded the smallest RFW after two, four and six days from the experiment start in both seasons.

Table 3. Means of the relative fresh weight (RFW %) of *Solidago canadensis* affected by different concentrations of some essential oils (EOs) during shelf life period in 2019 and 2020 seasons.

Treatments	The shelf life period (days)					
	2019			2020		
	2 nd day	4 th day	6 th day	2 nd day	4 th day	6 th day
Control (tap water)	107.21	98.31	76.65	105.39	99.36	82.09
Rosemary at 50mg/L	111.05	102.93	81.49	111.77	105.27	90.47
Rosemary at 100mg/L	111.72	104.00	95.27	112.22	111.72	100.62
Rosemary at 200mg/L	113.93	107.01	98.34	114.49	113.73	100.29
Lemon at 50mg/L	105.28	99.04	85.25	102.93	98.90	96.84
Lemon at 100mg/L	110.96	100.02	85.08	108.91	107.78	97.55
Lemon at 200mg/L	112.00	105.78	92.35	112.96	109.12	98.42
Nigella at 50mg/L	109.71	102.97	94.53	111.99	111.05	98.22
Nigella at 100mg/L	111.90	106.21	100.26	113.71	112.00	102.09
Nigella at 200mg/L	115.38	110.94	108.84	115.89	114.25	109.95
L.S.D at 0.05%	7.46	10.95	11.23	9.01	8.09	5.62

3.7. Chemical composition:

3.7.1. Chlorophyll a, chlorophyll b and carotenoids content:

Data from Figure (1) and (2) showed a significant difference after different treatments on chl. a, chl. b, and carotenoids content. After applying Nigella Eo at 200 mg/l the maximum Chl. a, Chl. b

and carotenoids content, was obtained, while control plants recorded the lowest ones, in both seasons. According to the same Figure, nigella oil at 100 and 200 mg. l⁻¹ significantly increased the carotenoids content (8.56 and 9.34mg. g fresh leaf) in both seasons. The cut spike without treatment and the lowest carotenoids content (4.81 and 4.43 mg/g FW), respectively.

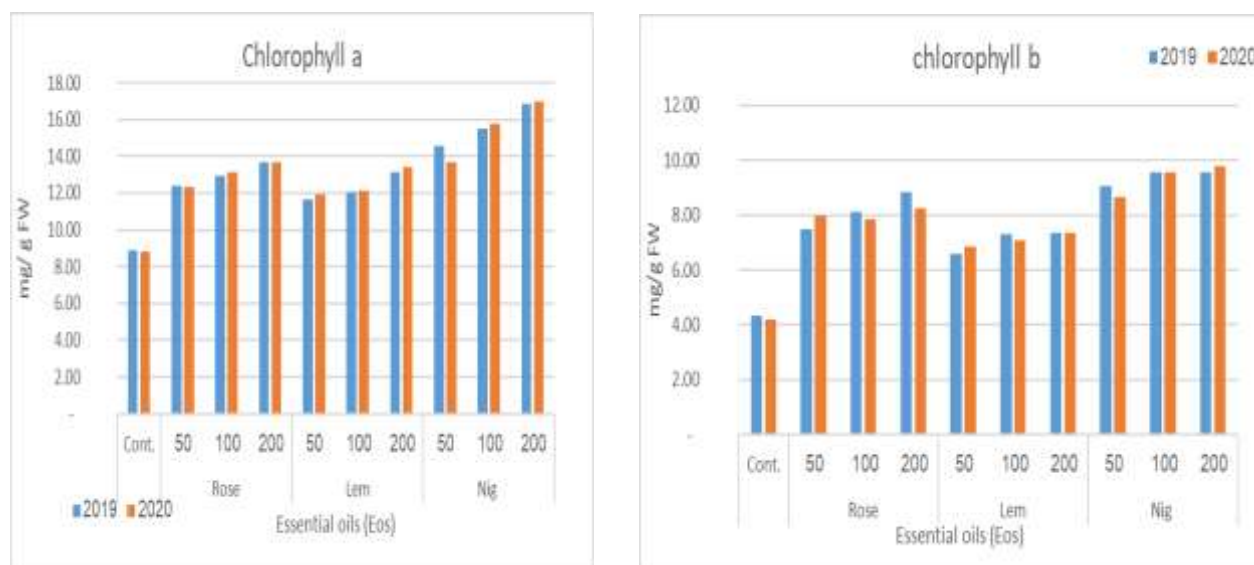


Fig 1. Effect of some essential oils at different concentrations on chlorophyll a and b in the seasons of 2019 and 2020.

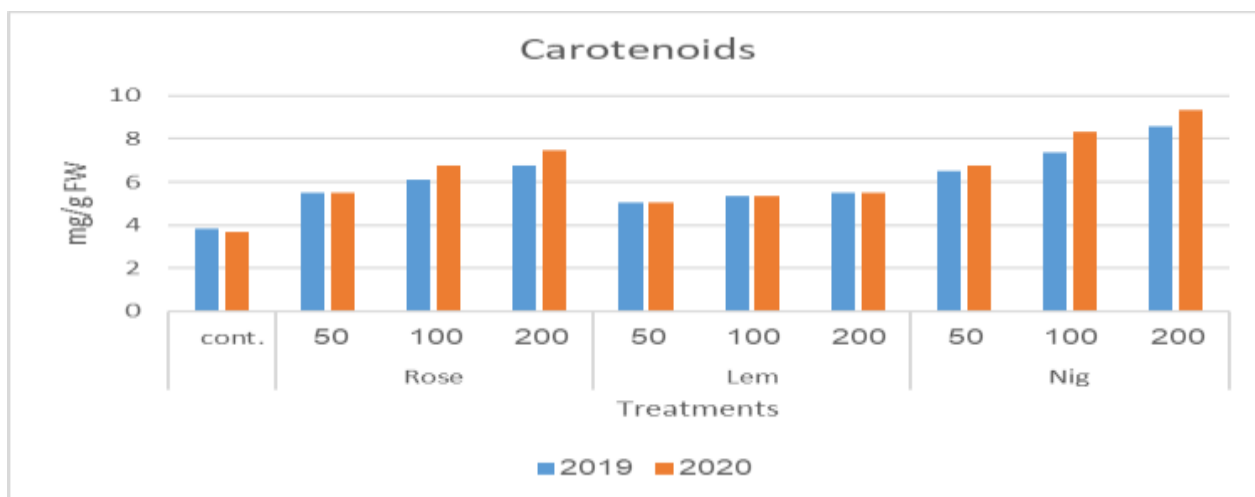


Fig 2. The effect of different essential oil (EO) levels on carotenoids mg/g FW in the seasons of 2019 and 2020.

3.7.2. Reducing sugars content.

Data in figure (3) revealed that there was a large variation in reducing sugar content by using various treatments as the highest reducing sugar content (13.87 and 13.19 mg/g dry weight) was

obtained by using nigella Eo at 200 mg/l where's, using lemon EO 50 mg/l (9.43 then 9.34 mg/g dry weight) resulted in the lowest reducing sugar content.

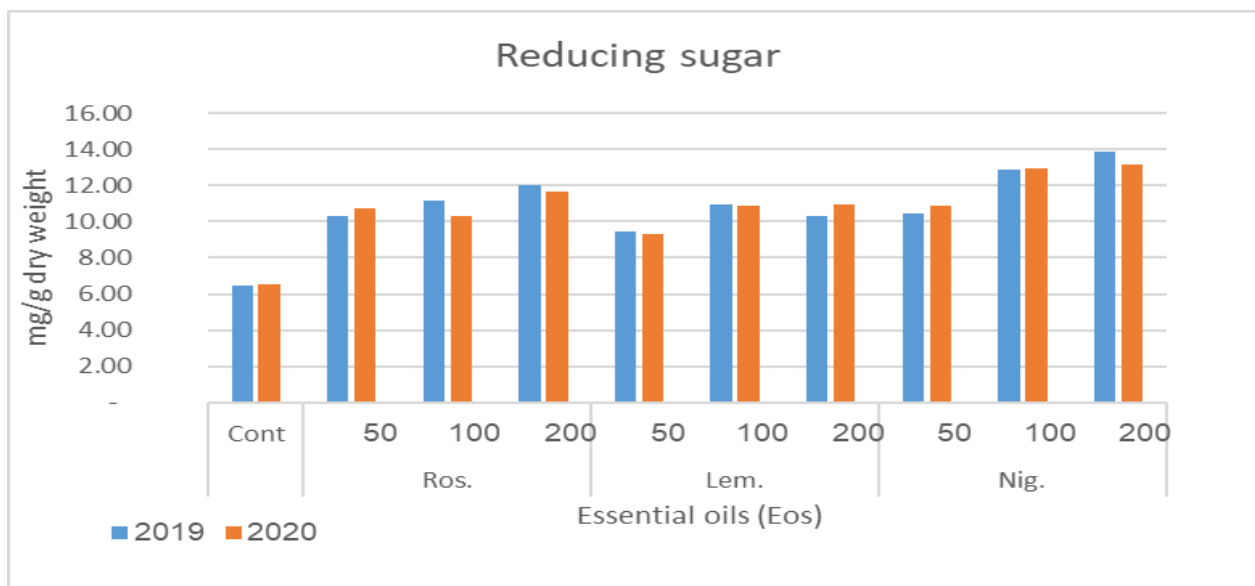


Fig 3. Effect of different levels of Essential oils (Eos) on reducing sugar (mg/g dw) in the seasons of 2019 and 2020.

3.7.3. Number of bacterial colonies

Data in Figure (4) showed that there was a significant difference in the number of bacterial colonies after application of different treatments. Control treatment recorded the highest number of bacterial colonies. All treatments caused significant decrease in the number and the highest significant reduction in bacterial colonies number was obtained by application of nigella oil at 200 mg/l which recorded (7.52X 10⁵) CFU/ml in the first season and treatments nigella at 100 mg/l (6.53X 10⁵ CFU/ml)

and rosemary at 200 mg/l (11.11X 10⁵ CFU/ml) in the second season. After having the lowest significant number of bacterial colonies (nigella at 100 and 200 mg/l), these treatments also had the lowest significant decrease in vase life (Table 1). Furthermore, in both seasons, the treatment nigella at 200 mg/l resulted in the most important statistical increase in vase life (15.78 and 16.85 days). This technique greatly decreased the number of bacterial colonies (7.52 X 10⁵ CFU/ml) and (6.53X 10⁵ CFU/ml) in 1st and 2nd seasons, respectively (Figure 4).

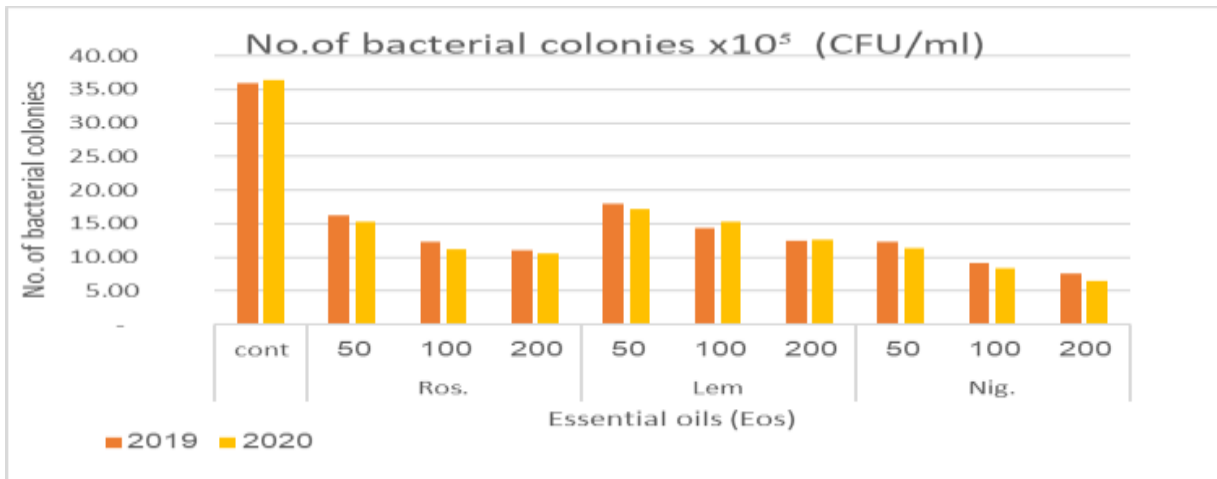
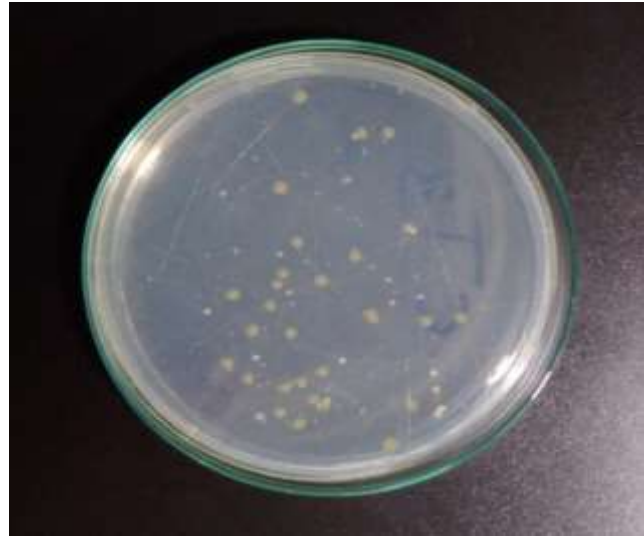


Fig 4. Effect of different concentrations of essential oils (EOs) on number of bacterial colonies (X 10⁵ CFU/ml) in the seasons of 2019 and 2020.



Control



Nigella (EO) at 200 mg/l

Fig 5. Pattern of bacterial abundance in vase solution on NA (nutrient agar) media treated with Nigella (EO) at 200 mg/l as compared to the control (Tap water).

4. DISCUSSION

The preliminary research for this experiment focused on the antibacterial and antifungal agents of three different purified natural essential oils on solidago (*Solidago canadensis*, L) cut spikes. The oils are obtained from rosemary, nigella, and lemon oil. Since reviewing results for all the values gathered with solutions containing oils, the authors opted to use one of this nigella oil, followed by rosemary and lemon oil.

The results cleared that the application of Nigella Eo at 200 mg/l resulted in the highest significant vase life (16.85 days) and decrement of the number of bacterial colonies of solidago

(*Solidago canadensis*, L) cut spikes over the two seasons. The current findings are consistent with (Hegazi and Gan2009) on Gladiolus and Lisianthus (*Eustoma grandiflorum*) (Bayat *et al.* 2013) cut flowers, in general, all essential oil preservative solutions can be concluded to considerably prolong the vase life compared with the distilled water (control), (Hossein *et al.*, 2014).

These results can be construed to the essential oils lead to an increase in the permeability of bacteria cell due to the incapability of cell membrane to separate the constituents can lead to destabilization of the phospholipid layer of cytoplasmic and on cellular components of microorganisms, including essential enzymes in cell

membranes and protoplasm this damage causes cell inactivation and death (Borges *et al.* 2013).

On the other hand, the highest significant decrease in the number of bacterial colonies was observed after the treatment of *Nigella* Eo at 200 mg/l. The reduction growth of the microorganisms caused decrement in stem blockage and increase final water uptake, decrement of LFFW, and increment of FW/DW Ratio, which resulted in an increment of flower longevity on *solidago* cut spike.

According to several studies, one of the most significant causes of decay in cut flowers is a reduction in water uptake due to occlusions, mostly at the basal stem end, which is most likely caused by microbe growth and vascular blockage, as well as an increase in water loss due to leaf transpiration (He *et al.*, 2006 and Alimordiet *al.*, 2013). Furthermore, the higher the measured leaf relative water content, the better the treatment's ability to retain water. Abbaszadehet *al.*, 2008 and Hoogerwerf and Van Doorn, 1992).

When flowers are cut from the plant, water loss continues. The perfect flower preservative allows water absorption in flower tissues, or water absorption from the preservative solution maintains a better water balance and flower, enhancing vase-life. Our study cleared that recorded a high value of RFW and VSU along the first six days from the experiment start after application of *Nigella* Eo at 200 mg/l which may illustrate the freshness and longevity of stems after this treatment which probably helps in increasing water uptake, improved water balance which in turn helps in increasing fresh weight. (Irfan *et al.*, 2018).

According to the findings of this study, plant essences, which are naturally degradable, safe, and environmentally friendly compounds, are suitable replacements for chemicals in the longevity increase after harvest of *Gerbera* (Hossein 2014).

According to the current findings, on day 7 of the study, measurements placed in untreated control were also under severe pressure and were unable to absorb and retain water adequately. In comparison, EO treatments were carried out under normal circumstances (Wilkins and Board., 1989 and Sikkema *et al.*, 1995).

This study's findings are consistent with recent research findings such as (Babarabie *et al.* (2015) and (2016). Those who discovered essential oils with powerful antibacterial activities, like rosemary and peppermint, reduce the number of microorganisms in the solution, optimize the vitality and consistency of flower color and help avoid yellowing and pigment loss in the petals of *Alstroemeria* cut flowers.

5. CONCLUSION

Finally it could be recommended to use *Nigella* Eo at 200 mg/l as pulsing for 24hr. then holding in tap water to complete their shelf life period in the case of cut *Solidago canadensis* cut spike at the normal commercial harvest stage (where only 10 % of florets are opened). This treatment caused increment of the spike vase life (15.78 and 16.85 days) by 140 % more than control plants (6.98 and 7 days), increase in final water uptake, chlorophyll a and b and decrease of number of bacterial colonies in vase solution. Also, *Nigella* EO surpassed on rosemary and Lemon Eos for extended *Solidago* vase life.

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المخلص العربي

تأثير الزيوت العطرية على حياة إنباء الزهور المقطوفة لنبات السوليداجو.

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فرع بحوث نباتات الزينة بأنتونيداس الإسكندرية- قسم بحوث الزينة وتنسيق الحدائق معهد بحوث البساتين مركز البحوث الزراعية

أجريت الدراسة الحالية في فرع بحوث الزينة بأنتونيداس ، قسم بحوث نباتات الزينة وتنسيق الحدائق معهد بحوث البساتين ، الإسكندرية ، مصر ، خلال الموسمين المتتاليين لعامي ٢٠١٩ و ٢٠٢٠. كان الهدف من هذا العمل هو تقييم القدرة على استخدام زيوت حبة البركة وحصالبان والليمون عند (صفر, ٥٠ , ١٠٠, ٢٠٠ مجم/لتر) كمحلول للحد كم النمو الميكروبي وإطالة عمر ازهار السوليداجو المقطوفة. تم الحصول على أعلى زيادة معنوية في عمر المزهرة بعد تطبيق زيت حبة البركة عند ٢٠٠ مجم/ لتر -١ والتي كانت ١٥.٧٨ يوم في الموسم الأول و ١٦.٨٥ يوم في الموسم الثاني على التوالي بالمقارنة بكلا من زيت الحصالبان والليمون ومعاملة المقارنة (الماء) . بينما كان عمر المزهرة لمعاملة المقارنة ٦.٩٨ و ٧.٠٠ يوم في كلا الموسمين على التوالي. كما سجلت هذه المعاملة أعلى زيادة معنوية في امتصاص الماء النهائي ونسبة الوزن الرطب / الوزن الجاف للزهار ومحتوى الكلوروفيل أ&ب. من ناحية أخرى ، أدى هذا العلاج إلى خفض الفقد في الوزن الطازج للأزهار واختزال النمو البكتيري في محلول الفازة