The effect of growth medium and nutrient solution concentration on the growth of narcissus bulbs in soilless system

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Abstract:
The research was conducted in the greenhouse of flowers in Abo-jarash farm-Agriculture college in Damascus university during the year of 2020. to study the effect of growing media and nutrient solution concentration on the growth of Narcissus bulb. The growth medium included 4 types, which are turb (control), turb: perlite(1:1, v:v) and turb: volcanic pumice (1:1, v:v), in addition to hydroponics with Deep flow technique(DFT) ; Each medium was irrigated with two concentrations of Hoagland and Amon nutrient solution (full and half concentration). The experiment was designed according to Randomized Complete Block Design (RCBD). Results indicated that the growth of narcissus bulbs (Number and length of leaves, length of roots) and its flowering standards (appearance date of the floral tube, date of flowers bloom and number of flowers on the floral tube) were improved significantly by using hydroponic system, followed by the treatment of turb: volcanic pumice and then turb: perlite. Where, the number of leaves increased by (87.98, 46.99, 34.43) % respectively in the treatments (hydroponic system, turb: volcanic pumice and turb: perlite) compared to the control (3.66 leaf/plant). The floral induction was after 62.41 days of cultivation in hydroponic system compared to the control (turb) (80.20 days).
For the number of bulblets, the results showed that the treatment turb: volcanic pumice (3.76 bulbs/plant) outperformed significantly all treatments, including the control (1.60 bulbs/plant), followed by the treatment turb: perlite which had significant differences with hydropnic system.
Regarding the nutrient solution concentrations, no significant differences were recorded.

Keywords: Narcissus, Growth Media, Concentration, Hydroponic , Nutrient Solution.

Received:31/3/2022
Accepted: 18/7/2022

تأثير وسط النمو وتركيز المحلول المغذي في نمو أبصال النرجس في نظام الزراعة بدون تربة

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الملخص:

تم تنفيذ البحث في بيت الزهور بمزرعة أبي جرش في كلية الزراعة – جامعة دمشق خلال عام 2020. بهدف دراسة تأثير وسط النمو وتركيز المحلول المغذي في نمو أبصال النرجس. تضمن وسط النمو 4 أنواع وهي: التورب (شاهد)، تورب: بيرليت (1:1، V:V)، تورب: خفان بنسبة (1:1، V:V) ،إلى جانب الزراعة المائية بتقنية الفيض أو التدفق العميق (DFT) Deep Flow Technique؛ و تم ري كل وسط بتركيزين من المحلول هوغلاند وأرنون المغذي (كامل التركيز، نصف التركيز). صممت التجربة وفق القطاعات العشوائية الكاملة.

أظهرت النتائج أن نبات النرجس تحسن نموه (عدد الأوراق، طولها، طول الجذور)؛ ومعايير إزهاره (موعد ظهور الشمراخ، موعد تفتحه، عدد الأزهار على الشمراخ) وحقق أفضل القيم معنوية عند الزراعة المائية تليها معاملة تورب: خفان ومن ثم تورب: بيرليت، حيث سجل مؤشر عدد الأوراق زيادة بنسبة (34.43، 46.99، 87.98) % للمعاملات تورب: بيرليت- تورب: خفان- زراعة مائية، على الترتيب مقارنة بالشاهد (3.66 ورقة/ النبات). وظهر الشمراخ الزهري بعد 62.41 يوم من الزراعة في الزراعة المائية مقارنة بالشاهد (80.20 يوم). أما بالنسبة لعدد البصيلات، تفوقت معاملة تورب: خفان (3.76 بصلة/نبات) على كافة المعاملات بما فيها الشاهد (1.60 بصلة/نبات)، تلتها معاملة تورب: بيرليت التي تفوقت على الزراعة المائية.

وفيما يتعلق بتركيز المحلول المغذي، فلقد لوحظ عدم وجود فروق معنوية بين التراكيز المستخدمة.

الكلمات المفتاحية: نرجس، وسط نمو، تركيز ، زراعة مائية، محلول مغذي

تاريخ الايداع: ٢٠٢٢/٣/٣١

تاريخ القبول: ٢٠٢٢/٧/١٨

Introduction:

Narcissus is a genus of predominantly spring flowering perennial plants of the amaryllis family, Amaryllidaceae (Allen, 2008). Various common names including daffodil، narcissus and jonquil are used to describe all or some members of the genus (An Leewen, 2014). Narcissus has conspicuous flowers with six petal-like tepals surmounted by a cup- or trumpet-shaped corona (Hanks, 2002). Narcissus were well known in ancient civilization, both medicinally and botanically (Zonneveld, 2010), but formally described by Linnaeus in his Species Plantarum (1753). The genus is generally considered to have about ten sections with approximately 50 species (Cullen, 2011). The flowers are generally white and yellow (also orange or pink in garden varieties), with either uniform or contrasting colored tepals and corona (Johnston, 2007). The genus is primarily found in the Mediterranean area and the center of origin is Europe (Spain, Portugal and the Iberian Peninsula) (Kington, 2014). Species are also found in northern Africa, France and Greece (Kingsbury, 2013). These have originated from Northern Hemisphere, i.e. Europe, especially Spain and Portugal, France, Switzerland, Yugoslavia and North Africa. A narrow band of N. tazetta grows naturally into China and Japan. Later these were distributed, planted and spread along ancient trade routes (Kraft, 2001). Narcissus is an old Greek name, its flower is perceived quite differently in the east than in the west where the flower is seen as a symbol of vanity (Michaux, 2009). In China, the same flower is seen as a symbol of wealth and good fortune. The ancient Greeks believed this plant originated from the vain youth, Narcissus. He died after becoming so obsessed with his reflection in a pool. The Greeks say that the gods turned his remains into the Narcissus flower. this also led to the daffodil being a symbol of unrequited love(Steinbergs,2008). In ancient China, there is a legend about a poor but good man, who received many cups of gold and wealth by this flower. Since the flower blooms in early spring, it has also become a symbol of Chinese New Year (Thalia,2014). Narcissus bulb carving and cultivation is even an art akin to Japanese Bonsai (Vigneron,2014). If your Narcissus blooms on Chinese New Years, it is said to bring you extra wealth and good fortune throughout the year(Todt,2012). On top of that, it has one of the sweetest fragrances of any flower. So it is highly revered in Chinese culture. In Hawaii, the Chinese Chamber of Commerce of Hawaii sponsors a Chinese cultural festival, called the 'Narcissus Festival', culminating with a beauty pageant whose winner is called the 'Narcissus Queen'(Trinklein,2007). Narcissus was cultivated in Netherlands since 16th century and it was famous and occupied eighth position as a cut flower and sixth position for bulb production during 1998(Van Beck and Steve,2005). It became one of the important commercial bulbous crops during 2005 (Zonneveld, 2008).

Daffodil (Narcissus tazetta L.) is one of the ornamental plants with high consideration both in cosmetics and folk medicine (Mozhgan *et al*, 2021). Narcissus flowers are used in different fields such as medicine, landscape architecture, and cosmetics industries (Kebeli and Celikel, 2013). Different parts of Narcissus tazetta are used in the treatment of different diseases in many parts of the world (Hanks, 2002). Bulbs are used for abscesses, wounds, joint pains, sores, sedatives, hypertension, and boils, roots are used for the treatment of skin problems; flowers are used for aromatherapy and cancer (Katoch and Sharma, 2019).

Soilless culture is one of the proper techniques to increase water use efficiency, overcome local water scarcity, and facilitate the growth of high-quality products even in areas with poor soil and unfavorable conditions (Gruda, 2019). This growing system is less harmful to the environment and provides optimal conditions for plant growth and higher yield in comparison to conventional farming. This approach, can improve productivity regardless of the climate conditions and also optimize the management of inputs (fertilizers, pesticides), in a given economic and environmental circumstances (Montagne et al. 2016).

An effective soilless growing medium is the fundamental component of the soilless culture and nowadays various mineral and organic substrates are used as the bed on these culture systems. Coir, pine bark, wood fiber, and green composts have become the most commonly used alternative materials to peat (Barrett et al. 2016).

Darzi and Ghalavand. (2008) reported that the application of vermicompost improved the growth characteristics of fennel. The integration of coco peat into cockscomb substrate showed that 100% and 70% cocopeat with two other organic matters increased plant height, canopy diameter, and leaf number as compared to 40% cocopeat (Avange et al, 2010). Ahmad (1989) found that the mixture of leaf mold, garden soil and sand improved the flowering and flower number of roses (Ahmad, 1989). The highest plant highest and leaf number in Dieffenbachias was observed in plants planted in leaf mold. (Sreerama et al. 1999) reported that root length of the chrysanthemum cuttings was significantly higher in cocopeat than in other substrates (sand or soil). In a study on different growth media for the propagation of bulb scales of lilium, it was found that the number of bulblets per scale and mean diameter and weight of bulblets were significantly higher in vermiculite than in other treatments (Kapoor et al., 2000).

The aim of this research:

Narcissus plant is considered one of the most important plant as a cut flower or in medicine and perfume industry and many researches must be done to increase the productivity of this plant as a flowering bulbs. Flowering bulbs generally and narcissus particularly, are affected with the media around the roots which is required a perfect balance between ventilation and humidity. Growth media with its physical and chemical characteristics, quality of water, accessibility of mineral elements to be absorbed and the adaption of plant to grow in a suitable media are considered as a crucial factor to produce a wonderful flower in quality and quantity. Also, the compound of nutrient solution and the concentration of mineral elements in it are another factor which controls on the growth and production of plant especially in soilless system.

So that, this research aimed to study the effect of growing media (organic and inorganic) and soilless system on the growing of Narcissus bulb and flower production. In addition to compare between the concentrations of nutrient solution to improve the growth of plant.

Material and Methods:

Used plants: In this work**,** we used Narcissus bulb with diameter between 5-8 cm, the cultivar is Salome with white flowers. The bulb was planted in a pot with 24 cm diameter we bought them from the local shops.

Study area: The study was conducted in the greenhouse in agriculture college of Damascus university, the average of maximum temperature is about 25 ^{o}c, the average on minimum temperature is about 10 ^{o}c, the average of humidity is about 75%. The nutrition solution was prepared in the physiology laboratory. The bulbs were planted in the first of October.

Treatments: there were two variables:

(i) The growing media: control (turb), turb: perlite (1:1, v: v), turb: volcanic pumice (1:1, v: v) and hydroponic (RDT)

The hydroponic culture was as a closed system; the bulbs were planted in plastic glasses which were perforated in the lower side. The plastic glasses were put in the holes of PVC tubes that were perforated in the upper side. The distance between holes is about 10 cm. The tubes were filled with the Hogland solution.

(ii) The nutrient solution concentrations: Half and complete concentration.

Preparation of solution: Hogland and Arnon solution was prepared as in the table (1) for (1000 liter).

pH of solution was adjusted at the degree of 5.5 by using concentrated nitric acid (HNO3) in the vegetative growth stage to motivate the vegetative growth and by using concentrated phosphoric acid (H3PO4) in the flowering stage to motivate the flowering growth.

The aeration of solution was done by using an aeration pump which was attached to the solution tank.

Table (1): The compound of Hogland and Arnon solution to prepare a nutrient solution (1000 liter):

The Compound	g/1000l
MAP	115,03
KNO3	606,60
Ca(NO3)2.4H2O	656.40
MgSO4.7H2O	240.76
Fe-EDTA	5,30
H3BO3	2,86
ZnSO4.7H2O	0,22
(NH4)6.MO7	0,016
MnSo4.H2O	1,81
CuSo4.5H2O	0,08

Experimental design and statistical analysis:

The experiment was designed according to Randomized Complete Block (RCB) (four growth media and two solution concentrations). Each treatment included three replications and each replication was consisted of ten bulbs. The data were analyzed by using XL state٢٠١٤ program to find the differences between the means of all the studied treatments and least significant differences (LSD) at 0.05 level of significances.

Measurements:

The date of initiation of first flowering cluster and the date of flowers opening were recorded. Number of leaves, length of leaves, length of roots, number of shoots, number of bulblets, number of flowers in each cluster and length of flowering stem have been determined at complete flowering stage.

Results and Discussion:

1-Effect of growing media and nutrient solution on the number of leaves (leaf/plant):

The data in table (2) showed that the number of leaves was affected with growing media and nutrient solution concentration.

Concerning the growing media, the hydroponic treatment was significantly the best in term of leaves number compared to turb: volcanic pumice, turb: perlite and the control. While no significant difference was observed in leaves number according to nutrient solution concentration.

Regarding the interaction, the interaction hydroponic * 0.5 X increased significantly the leaves number (7.05 leaf/plant) as compared to all other interactions. The lowest leaves number was significantly noticed at the interaction turb * 1X (3.45 leaf/plant).

Table (2): Effect of growing media and nutrient solution on the number of leaves (leaf/plant):

Concentration Media	0.5X	1X	Mean
Turb	3.80^{G}	3.45^{H}	3.66^{d}
Turb : Perlite	5.06^{E}	4.78^{F}	4.92^{c}
Turb : Pumice	5.53^{C}	5.23^{D}	5.38^{b}
Hydroponic	7.05^{A}	6.73^{B}	6.88^{a}
Mean	5.36^{a}	5.19^{a}	
LSD0.05	Media=0.23, concentration= 1.03, interaction =0.16		

The small letters in row and colon indicate to significant differences between treatments and concentrations, respectively, while the capital letters indicate to significant differences for interaction at 0.05.

2- Effect of growing media and nutrient solution on the length of leaves (cm):

For the growing media (table 3), the hydroponic treatment had significantly higher length of leaf (49.25 cm) as compared to other growth media (44, 39.91 and 36.90 cm) respectively for turb: volcanic pumice, turb: perlite and control). For nutrient solution concentration, no significant differences were recorded in leaf length.

Concerning the interaction, the interaction hydroponic * 0.5X (half concentration) increased significantly leaf length (50.66 cm) compared to other interactions. The lowest leaves number was significantly noticed at the interaction turb* 1X (35.50 cm).

Table (3): Effect of growing media and nutrient solution on the length of leaves (cm):

Concentration / Media	0.5X	1X	Mean
Turb	37.83^{E}	35.50^{F}	36.90^{d}
Turb : Perlite	41.66^{D}	38.16^{E}	39.91^{c}
Turb : Pumice	45^{C}	43^{D}	44^{b}
Hydroponic	50.66^{A}	47.83^{B}	49.25^{a}
Mean	43.79^{a}	41.63^{a}	
LSD0.05	Media=2.15, concentration= 4.30, interaction =1.87		

The small letters in row and colon indicate to significant differences between treatments and concentrations, respectively, while the capital letters indicate to significant differences for interaction at 0.05.

3- **Effect of growing media and nutrient solution on the length of roots (cm):**

The data in table (4) indicated that the hydroponic increased significantly the roots length by 48.90, 19.38 and 30.38 %, respectively compared to other growth media (turb, turb: volcanic pumice, and turb: perlite). In addition, all the growth media achieved an increase in this indicator by 14.19, 24.72, 48.90 %, respectively as compared to the control (turb). But, there weren't any significant differences between the nutrient solution concentrations.

For interaction, hydroponic * 0.5X interaction was the best in term of root length (27.66cm), while turb * 1X interaction was the lowest (17.50 cm).

Table (4): Effect of growing media and nutrient solution on the length of roots (cm):

Concentration / Media	0.5X	1X	Mean
Turb	18.73^{E}	17.50^{F}	18.24^{d}
Turb : Perlite	21.33^{CD}	20.33^{D}	20.83^{c}
Turb : Pumice	23.16^{B}	22.33^{BC}	22.75^{b}
Hydroponic	27.66^{A}	26.66^{A}	27.16^{a}
Mean	22.72^{a}	22.09^{a}	
LSD0.05	Media=0.92, concentration= 2.98, interaction =1.02		

The small letters in row and colon indicate to significant differences between treatments and concentrations, respectively, while the capital letters indicate to significant differences for interaction at 0.05.

4- **Effect of growing media and nutrient solution on the number of shoots (shoot/plant):**
For the growing media, turb: volcanic pumice treatment increased significantly the number of shoots as compared to other growth media (table 5). While turb: perlite and the hydroponic treatment were the last in comparison with the control (turb). For the nutrient solution concentration, there weren't significant differences in shoots number.
Concerning the interaction, the interaction turb: volcanic pumice * 0.5 X increased significantly the number of shoots (2.26 shoot/plant), as compared to all interactions. The lowest number of shoots was significantly noticed at the interaction turb * 1X (1.15 shoot/plant).

Table (5): Effect of growing media and nutrient solution on the number of shoots (shoot/plant):

Concentration / Media	0.5X	1X	Mean
Turb	1.36[D]	1.15[E]	1.28[c]
Turb : Perlite	1.86[B]	1.56[C]	1.71[b]
Turb : Pumice	2.26[A]	1.90[B]	2.08[a]
Hydroponic	1.63[C]	1.33[D]	1.48[c]
Mean	1.78[a]	1.51[a]	
LSD0.05	Media=0.22, concentration= 0.28, interaction =0.13		

The small letters in row and colon indicate to significant differences between treatments and concentrations, respectively, while the capital letters indicate to significant differences for interaction at 0.05.

5- Effect of growing media and nutrient solution on the number of bulblets: (bulblet/plant):
For the growing media (table 6), the treatment of turb: volcanic pumice was significantly superior in number of bulblets (3.76 bulblet/plant), then turb: perlite (3.20 bulblet/plant) then hydroponic treatment (2.33 bulblet/plant) in contrast with control treatment (turb) (1.60 bulblet/plant). For nutrient solution concentration, there weren't any significant differences in number of bulblets.
For interaction, the interaction turb: volcanic pumice * 0.5X was the best number of bulblets (3.93 bulblet/plant) and the lowest value of this indicator was at the interaction turb* 1X (1.50 bulblet/plant).

Table (6): Effect of growing media and nutrient solution on the number of bulblets(bulblet/plant):

Concentration / Media	0.5X	1X	Mean
Turb	1.73[G]	1.50[H]	1.60[d]
Turb : Perlite	3.43[C]	2.96[D]	3.20[b]
Turb : Pumice	3.93[A]	3.60[B]	3.76[a]
Hydroponic	2.53[E]	2.13[F]	2.33[c]
Mean	2.90[a]	2.65[a]	
LSD0.05	Media=0.26, concentration= 0.73, interaction =0.14		

The small letters in row and colon indicate to significant differences between treatments and concentrations, respectively, while the capital letters indicate to significant differences for interaction at 0.05.

6- Effect of growing media and nutrient solution on the date of the initiation of the first flowering cluster (day):
It was noticed in the table (7) that in the treatment hydroponic, the initiation of first flowering cluster was earlier than other treatments with the rate of 27.18% as compared to the control (80.20 days). The second treatment was turb: volcanic pumice (70.68 days) then turb: perlite (75.08 days). For nutrient solution concentration, there weren't any significant differences in the initiation date of the first flowering cluster.

For interaction, the best value of the given indicator was at the interaction hydroponic * 0.5X (60.50 days) and the highest number of days for the initiation of the first flowering cluster was at the interaction turb * 1X (82.50 days)

Table (7): Effect of growing media and nutrient solution on the date of the initiation of the first flowering cluster(day):

Concentration / Media	0.5X	1X	Mean
Turb	78.66[B]	82.50[A]	80.20[a]
Turb : Perlite	72.66[C]	77.50[B]	75.08[b]
Turb : Pumice	67.33[D]	72.83[C]	70.68[c]
Hydroponic	60.50[F]	64.33[E]	62.41[d]
Mean	69.79[a]	73.54[a]	
LSD0.05	Media=3.16, concentration= 6.02, interaction =1.37		

The small letters in row and colon indicate to significant differences between treatments and concentrations, respectively, while the capital letters indicate to significant differences for interaction at 0.05.

7- Effect of growing media and nutrient solution on the date of flowers opening (day):

Concerning the growing media, the hydroponic treatment was significantly the best treatment (70.50 days) then the treatment turb: volcanic pumice (80.31 days) then turb: perlite (86.06 days) in comparison with the control (turb) (89.80 days). No significant differences in date of flowers opening were observed.

Regarding the interaction, the best value was recorded at the interaction hydroponic * 0.5 X (69.83 days), which had a significant difference as compared to the most of other interactions. The lowest was significantly noticed at the interaction turb * 1X (91.25 days).

Table (8): Effect of growing media and nutrient solution on the date of opening flowers (day):

Concentration / Media	0.5X	1X	Mean
Turb	88.83[AB]	91.25[A]	89.80[a]
Turb : Perlite	85.33[C]	86.80[BC]	86.06[b]
Turb : Pumice	79.46[D]	81.16[D]	80.31[c]
Hydroponic	69.83[E]	71.16[E]	70.50[d]
Mean	80.86[a]	81.80[a]	
LSD0.05	Media=2.03, concentration= 6.70, interaction =2.70		

The small letters in row and colon indicate to significant differences between treatments and concentrations, respectively, while the capital letters indicate to significant differences for interaction at 0.05.

8- Effect of growing media and nutrient solution on the number of flowers in each cluster (flowers/cluster):

For the growing media, the hydroponic treatment was significantly superior in term of number of flowers (5.41 flowers/cluster) , then turb: volcanic pumice (4.70 flowers/cluster) then turb: perlite (4.20 flowers/cluster) in contrast with control (3.54 flowers/cluster). For nutrient solution concentration, there weren't any significant differences in number of flowers per cluster.

For interaction, the interaction hydroponic * 0.5X was the best (5.56 flowers/cluster) and the lowest interaction was turb* 1X (3.50 flowers/cluster).

Table (9): Effect of growing media and nutrient solution on the number of flowers per cluster(flowers/cluster):

Concentration / Media	0.5X	1X	Mean
Turb	3.66[G]	3.50[H]	3.54[d]
Turb : Perlite	4.33[E]	4.06[F]	4.20[c]
Turb : Pumice	4.86[C]	4.53[D]	4.70[b]
Hydroponic	5.56[A]	5.26[B]	5.41[a]
Mean	4.60[a]	4.39[a]	
LSD0.05	Media=0.21, concentration= 0.62, interaction =0.12		

The small letters in row and colon indicate to significant differences between treatments and concentrations, respectively, while the capital letters indicate to significant differences for interaction at 0.05.

9- Effect of growing media and nutrient solution on the length of flowering stem (cm):

The data in table (10) indicated that the growth media increased significantly the flowering stem length by 15.32, 27.43, 54.79 %, respectively in turb: perlite, turb: volcanic pumice and hydroponic, respectively, as compared to the control (33.30cm). Hydroponic treatment was significantly the superior then the mixture turb: volcanic pumice then turb: perlite

There weren't any significant differences between the nutrient solution concentrations concerning the floral tube length(flowering stem).

For the interaction, the best interaction was at hydroponic * 0.5X (51.66cm) and the lowest was at the turb * 1X (31.50 cm).

Table (10): Effect of growing media and nutrient solution on the length of flowering stem (cm):

Concentration / Media	0.5X	1X	Mean
Turb	34.50[G]	31.50[H]	33.30[d]
Turb : Perlite	38.50[E]	36.00[F]	37.25[c]
Turb : Pumice	42.33[C]	40.00[D]	41.16[b]
Hydroponic	51.66[A]	48.33[B]	50[a]
Mean	41.75[a]	39.63[a]	
LSD0.05	Media=2.00, concentration= 5.66, interaction =1.23		

The small letters in row and colon indicate to significant differences between treatments and concentrations, respectively, while the capital letters indicate to significant differences for interaction at 0.05.

The survival of the plants depends on optimum environmental factors including suitable growing media. Presently, several soilless substrates are used to grow seedling, to propagate the plants, and to produce ornamental plants (Ahmad,1989) (Noureen et al, 2010). The elements of the soilless compounds should bear stable physical and chemical features during the plants' cultivation (Chavez et al, 2008). In total, an optimum growing media should be capable of supplying high water retention capacity, appropriate drainage, and high cation exchange capacity (Hamid pour et al, 2013). An optimum growth medium should supply good aeration (air exchange), water retention capacity, and adequate nutrients. When integrated into soilless substrates, some fertilizers perform well in providing the plants with nutrients (Khobragade, 1٩٩٧). Flowering bulbs are very sensitive to high humidity which effects negatively on the growth of roots, this is agree with this research which the soilless system was significantly the superior in all studied indicators by using pump aeration which provides a good aeration and that will allow the roots to grow better (Noureen et al,2010). We use the growth media (turb: volcanic pumice) which all the studied indicators were the best in it, that's because of the volcanic pumice gives a high porosity and has less capacity to keep water so the aeration will be so good to encourage the plant to grow in good way (Ahmad,1989). For the growth media turb: perlite, it was better than the control (turb) also because of the aeration spaces between the perlite grains but of course the aeration between perlite grains was less than in the volcanic pumice grains as mentioned by (Babarabie *et al*, 2018) and that is agree with our results. Good media growth reflects positively on the growth indicators where the length of plant, number of leaves, length of roots increased and consequently the photosynthesis increases and all the food savings increases and reachs to the flowers and leaves to let them grow better (Chavez *et al*, 2008)

When the balance between humidity and aeration decrease, the leaves and length, roots and flowering stems will decrease and that's will cause an inhibition in cell elongation because of the reduction of water stress, So the absorbed water will become inadequate to compensate the lost water by transpiration, this will cause a reduction in turgor pressure inside the cells and the elongation of cells will decrease as a result. So that the growth of leaves, roots and flowering stems will decrease (Kapoor *et al*, 2000)

The reduction of leaves number when the aeration increases, is due to that growth regulators like cytokine in roots which cause an attention to the hormones in the foliage parts to decrease the number of leaves(Ahmad,1989), this will cause a reduction in the number of shoots and bulblets (Rezaei et al, 2013). For nutrient solution, there wasn't any significant effect on the growth indicators of Narcissus plant. The reduction of nutrient elements concentration causes a reduction in electric conductivity in nutrient solution and a good growth for Narcissus (Raviv and Lieth, 2008). Of course when the leaves appear quickly, the flowers will appear earlier (Babarabie et al, 2018) and in the result the number of flowers will increase by the increasing of leaves and roots. (Rezaei et al, 2013).

Funding information: this research is funded by Damascus university – funder No. (501100020595).

References:

1. Ahmad k.k., 1989. Effect of different potting media on different rose cultivars under plastic tunnel. M.Sc. Hons Thesis, NWFP Agricultural University, Peshawar, Pakistan.
2. Allen, Robert, ed. (2008). "narcissus". Pocket Fowler's Modern English usage (2nd ed.). Oxford: Oxford University Press. p. 455. ISBN 978-0199232581. Retrieved 2014-11-16.
3. An Leewen, Paul J (October 2014). "Fungal diseases and hot-water treatment in Galanthus". Daffodil, Snowdrop and Tulip Yearbook 2014: 48–50Gage, Ewan; Wilkin, Paul; Chase, Mark W.; Hawkins, Julie (June 2011). "Phylogenetic systematics of Sternbergia (Amaryllidaceae) based on plastid and ITS sequence data". Botanical Journal of the Linnean Society. 166 (2): 149–162.
4. Avang Y., Shaarom A.S., Mohammad R.B., Selamat A., 2010. Growth dynamics of Celosia cristata grown in cocopeat, burnt rice hull and knaf core fiber mixture. Am J Agri Bio Sci. 5(1), 70-76.
5. Babarabie M., Zarei H., Maryam M., Danyaei A., and Badeli S. 2018. Effect of Various Planting Substrates on Morphological and Chlorophyll Traits of Narcissus Plant. Journal of Chemical Health Risks 8(3) pp:191–197.
6. Barrett GE, Alexander PD, Robinson JS, and Bragg NC, 2016. Achieving environmentally sustainable growing media for soilless plant cultivation systems a review. Scientia Horticulture 212: 220-234
7. Canadian Nursery Landscape Association. 2014.R. Bulbs, Corms and Tubers: 16.6 Narcissus and Daffodils". Archived from the original on 2014-10-14. Retrieved 2014-10-17.
8. Chavez W., Di Benedetto A., Civeira G., Lavado R., 2008. Alternative soilless media for growing Petunia×hybrida and Impatiens wallerana: Physical behavior, effect of fertilization and nitrate losses. Bioresource Technol. 99, 8082–8087
9. Cook, Danielle. 2009. "Daffodil". Archived from the original on 2014-05-31. Retrieved 2014-11-14.
10. Garner, Brian (2009). "narcissus". Garner's Modern American Usage (3rd ed.). New York: Oxford University Press, USA. p. 559. ISBN 978-0199888771. Retrieved 2014-11-16.
11. Cullen, James .2011. "Narcissus". In Cullen, James; Knees, Sabina G.; Cubey, H. Suzanne Cubey (eds.). The European Garden Flora, Flowering Plants: A Manual for the Identification of Plants Cultivated in Europe, Both Out-of-Doors and Under Glass: Vol. 1. Alismataceae to Orchidaceae (2nd ed.). Cambridge: Cambridge University Press. pp. 205 ff. ISBN 978-0521761475. Retrieved 2014-10-21.
12. Darzi M.T., Ghalavand V.F. 2008. Effect of Mycorrhiza, vermicompost and phosphate fertilizer on flowering, biological yield and root symbiosis on fennel. Iran J Crop Sci. 10, 88-109.
13. Gruda NS, 2019. Increasing sustainability of growing media constituents and stand-alone substrates in soilless culture systems. Agronomy 9: 1-24
14. Hamid pour M., Heydari S., Roosta H.R. 2013. The effect of zeolite and vermicompost on growth characteristics and concentration of some elements of Petunia. J Sci Technol Greenhouse Culture. 4(13), 95-102.
15. Hanks, G. R 2002. Narcissus and Daffodil: The Genus Narcissus. London: Taylor and Francis. ISBN 978-0415273442. Retrieved 2014-10-02.
16. Johnston, Brian . 2007. "A Close-up View of the "Daffodil"" (Close up images). Micscape Magazine. Retrieved 2014-11-14.
17. Katoch, D. and Sharma, U. 2019. Simultaneous quantification and identification of Amaryllidaceae alkaloids in Narcissus tazetta by ultra-performance liquid chromatography-diode array detector-electrospray ionisation tandem mass spectrometry. J. Pharm. Biomed, 175: 112750.
18. Kapoor M., Grewal H.S., Arora J.S., 2000. Effect of media on propagation of Lilium. J Ornam Hort. 3, 58-59.

19. Kebeli, F. and Celikel, F.G. 2013. Effect of planting time on flower quality and flowering period of natural and cultural Narcissus bulbs. In V. Ornamental Plants Congress (pp. 6-9).
20. Khobragade R.I., Damke M.M., Jadhao B.J., 1997. Effect of planting time and spacing on growth, flowering and bulb production of tuberose (cv. Single). Acta Hort. 21, 44-47.
21. Kingsbury, N; Whitworth, Jo .2013. Daffodil: the remarkable story of the world's most popular spring flower. Timber Press. ISBN 978-1604695595. Retrieved 2014-11-08.
22. Kington, Sally .2014. The Daffodil Register and Classified List (2008). 6th supplement. United Kingdom: Royal Horticultural Society. ISBN 9781907057502. Archived from the original on 2014-11-10. Retrieved 2014-10-25
23. Kraft, Rachel . 2001. "Propagation of Daffodils (Narcissus pseudo narcissus)". Plant Propagation. North Dakota State University, Department of Plant Sciences. Retrieved 2014-11-14.
24. Michaux, Jean .2009. "Narcissus tazetta". La Flore. Académie de Besancon. Archived from the original on 2015-05-06. Retrieved 2014-11-26.
25. Montagne V, Capiaux H, Cannavo P, Charpentier S, Renaud S, Liatard E, Grosbellet C, and Lebeau T, 2016. Protective effect of organic substrates against soil-borne pathogens in soilless cucumber crops. Scientia Horticulturae 206: 62-70.
26. Mozhgan, Zarifikhosroshahi ,Şevket A and Ebru Kafkas1 .2021. Characterization of aroma compounds of Daffodil (Narcissus tazetta L.) ecotypes from Turkey, Cukurova University, Agriculture Faculty, Department of Horticulture, January 2021
27. Noureen F., Jilani M.S., Waseem K., Kiran M., 2010. Performance of tomato hybrids under hydroponic culture. Pak J Agri Sci. 47, 19-25.
28. Raviv M., Lieth J.H., 2008. Soilless Culture: Theory and Practice. London, UK. pp. 245-269.
29. Rezaei A., Mobli M., Baninasab B., Khoshgoftarmanesh A.M., 2013. The effect of different substrates in the greenhouse on the yield and quality of cut roses. J Sci Technol Greenhouse Culture. 4(13), 106-113.
30. Sreerama R., Reddy T.V., Narayansamamy S., 1999. Effect of cocopeat on root growth of Chrysanthemum plants. Current Research, University of Agriculturall Sciences Bangalore. India. 28, 3-4.
31. Steinbergs, A .2008. "Daffodils". Spring-flowering Bulbs. The Plant Expert. Archived from the original on 2015-03-19. Retrieved 2014-11-26.
32. Thalia.2014. Daffodils/Narcissus. Brent and Becky's Bulbs. Archived from the original on 2014-10-15. Retrieved 2014-10-09
33. Todt, D. L. 2012. "Relict Gold: The Long Journey of the Chinese Narcissus". Pacific Horticulture. Archived from the original on 2015-09-07. Retrieved 2014-10-14.
34. Trinklein, David .2007. "Spring Flowering Bulbs: Daffodils". University of Missouri Extension. Retrieved 2014-10-25.
35. Van Beck, John; Christman, Steve . 2005. "Narcissus". Floridata. Retrieved 2014-10-25.
36. Vigneron, Pascal.2014. "Narcissus". Amaryllidaceae.org (in French). Archived from the original on 2014-12-29. Retrieved 2014-10-23.
37. Zonneveld, B. J. M. 2008. "The systematic value of nuclear DNA content for all species of Narcissus L. (Amaryllidaceae)". Plant Systematics and Evolution. 275 (1–2): 109–132. doi:10.1007/s00606-008-0015-1
38. Zonneveld, B.J.M. 2010. "The involvement of Narcissus hispanicus Gouan in the origin of Narcissus bujei and of cultivated trumpet daffodils (Amaryllidaceae)". Anales del Jardín Botánico de Madrid. 67 (1): 29–39. doi:10.3989/ajbm.2219