Anadolu Tarım Bilimleri Dergisi
Anadolu Journal of Agricultural Sciences
http://dergipark.gov.tr/omuanajas

Research/Araştırma

Anadolu Tarım Bilim. Derg./Anadolu J Agr Sci, 33 (2018)
ISSN: 1308-8750 (Print) 1308-8769 (Online)
doi: 10.7161/omuanajas.320232

Effects of different growth media to the nutrient content of primula (*primula obconica*) plant

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Geliş/Received 09.06.2017 Kabul/Accepted 12.01.2018

ABSTRACT

Imported moss peat (IMP) and native peat (NAP) that is taken from Akgöl/Turkey were used in the growth medium of primula (*Primula obconica*) plants. Five different growth media were prepared using IMP and NAP, and some of their basic chemical and physical properties were determined. Then, the effects of media characteristics on nutrient contents of primula plant were evaluated. All growth media was found inadequate in concentration for water soluble nutrients NO_3-N, P, K, Fe and Zn but other nutrients were acceptable levels. Bulk density (BD) of growing media was found between 0.071-0.139 g cm^{-3}. When the ratio of NAP was increased in mixtures, BD also increased. Moreover, the growth media was prepared with IMP and NAP had enough aeration capacity (AC), low available water content (AWC), and very low water buffering capacity (WBC). Cation exchange capacity (CEC) values were determined as 83.32-105.70 me 100 g^{-1}. pH and EC of the media varied between 4.56-5.88 and 0.39-1.00 dS m^{-1}, respectively. On the other hand, when the NAP ratio was more than 75% in the mixtures, pH level was a little out of the desired limits. Organic C level was the highest in 100% IMP media. The quality parameters and the classical growth characteristics of primula plants were not significantly different across growing media. K, Mg, S and Na contents of the plants were generally at normal levels. However, significant differences were found in total Fe, Mn and Cu contents of plants. Fe amount was enough but Mn and Cu were lower than the acceptable levels in all media. All in all, primula plants were grown successfully in all media and reached saleable quality levels despite of the differences in some nutrient contents. It was suggested that NAP can be used as an alternative to IMP for horticultural purposes, such as a production of ornamentals in a greenhouse.

Keywords:
Peat
Plant growth medium,
Physical and chemical properties
Primula
Plant nutrients

Farkli yetiştirme ortamlarinin primula (*primula obconica*) bitkisinin besin içeriğine etkileri

ÖZET

Primula bitkisinin yetiştirme ortamı olarak yosun kökenli ithal organik toprak (İOT) ve Akgöl/Türkiye den elde edilen yerli organik toprak (YOT) kullanılmıştır. İOT ve YOT'ın temel fiziksel ve kimyasal özellikleri belirlendikten sonra beş farklı yetiştirme ortamı hazırlanmıştır. Daha sonra primula bitkisinin besin maddesi içeriğine hazırlanan ortamların etkileri incelenmiştir. Yetiştirme ortamlarının suda çözünebilir NO_3-N, P, K, Fe ve Zn içerikleri yetersiz bulunurken, diğer besin elementlerinin yeterli seviyede olduğu belirlenmiştir. Ortamların hacim ağırlığı (HA) 0.071-0.139 g cm^{-3} arasında bulunmuştur. Karışımlardaki YOT oranı arttıkça HA'ları da artmıştır. Ayrıca yetiştirme ortamı olarak hazırlanan İOT ve YOT yeterli havalanma kapasitesine (HK), düşük kolay alınabilir su içeriğine (KAS) ve çok düşük su tamponlama kapasitesine sahiptir. Katyon değişim kapasitesi (KDK) değerleri ise 83.32-105.70 me 100 g^{-1} olarak belirlenmiştir. Ortamların pH ve EC değeri sırası ile 4.56-5.88 ve 0.39-1.00 dS m^{-1} arasında değişmiştir. Karışımlarda YOT oranı % 75'den fazla olduğunda, pH düzeyi istenilen sınırların biraz dışındadır. Organik C ise, % 100 İOT karışımında en yüksek seviyededir. Farklı yetiştirme ortamları bakımından primula bitkisinin klasik büyüme özellikleri ve kalite parametreleri arasındaki farklılıklar önemli değildir. Bitkilerin toplam K, Mg, S ve Na içerikleri genel

Anahtar Sözcükler:
Organik toprak
Bitki yetiştirme ortamı
Fiziksel ve kimyasal özellikler
Primula
Bitki besinleri

olarak normal seviyelerdedir. Bununla birlikte, bitkilerin toplam Fe, Mn ve Cu içeriklerinde önemli farklılıklar bulunmuştur. Tüm ortamlarda Fe miktarı yeterli iken, Mn ve Cu miktarları kabul edilebilir seviyelerden daha düşüktür. Sonuç olarak, primula bitkileri tüm ortamlarda başarılı bir şekilde yetiştirilmiş ve bazı besin içeriğindeki farklılıklara rağmen satılabilir kaliteye ulaşmıştır. YOT'ın İOT'a bir alternatif olarak ve serada süs bitkileri üretiminde kullanılması önerilmiştir.

1. Introduction

Recently, the use of peat has been popular both in the world and in Turkey, especially in ornamental plants growing (Lohr et al., 1984; Chong et al., 1994; Kütük et al., 1998; Papafotiou et al., 2004; Erdoğan,2004; Meral, 2006; Bağcı et al., 2011; Najafi, 2014; Çiçek Atikmen et al., 2014). Each year, considerable amount of peat is imported to Turkey from various countries, among them Scandinavian countries and Russia are the leading exporters (Çiçek, 2010). Imported peat is generally used for its desirable physical and chemical properties in plant growing media (Varış et al., 2004). The native peat does not perform as successfully as the imported peat, due to its poor uniformity and having some deficiencies regarding to its physical and chemical properties (Çaycı, 1989; Ataman et al., 1999). However, the native peat is also used, especially by small budgeted growers, due to its lower price compared to the imported peat. As a results of the quality concerns for the native peat, each year more than 100.000 m3 of peat is imported in Turkey (Najafi, 2014). Unfortunately, the amounts of peat lands in Turkey is limited due to the climatic conditions. Hence, alternative ways are searched to supply growers' demands.

Peat formations in Turkey occur at low elevations affected by hydrologic and topographic conditions, and their botanical origin are reeds and sedges (Dengiz et al., 2009). Peat formations and horticultural values have to be examined in detail, due to Turkey's limited available peat lands. Primula plant has been predominantly grown in peat based media (Çiçek, 2004; Erdoğan, 2004). Hessayon (1980) explains that primula is an important ornamental plant and it has brilliant flowers changing from white to dark red colors. This plant can blossom either at spring or winter seasons (Güran, 1992; Öge, 1997). The blossom and the flower quality-relates with medium properties as well. Sufficient water and available nutrients must be in the medium of this plant to have a long blossom period (Najafi, 2014). Moreover, different results have been obtained about effects of media on nutrient contents of ornamentals. Çiçek (2010) reported that the significant differences were determined in some nutrients of primula plant depending on growing media. Similar data was also reported by Najafi (2014). Erdoğan (2004) stated that the media significantly affected the N, P, Mg, Zn, Mn and Cu contents of test plants, while no considerable changes were found in K, Ca, Na and Fe.

The aim of this research was to determine the effects of different media containing imported and native peat materials on nutrient contents of primula plant.

2. Material and method

2.1. Growing media and test plant

In order to prepare the growing media, imported moss peat (IMP) was obtained from Netherlands and native Akgöl peat (NAP) was collected from peat land around Lake Akgöl in Sakarya-Turkey (Çaycı et al., 2011). IMP and NAP peat were milled and screened (6.35 mm), in order to obtain homogeneity, and then were steam-pasteurized before being filled to pots. Before beginning the experiment, NAP was adjusted to suitable moisture level, but IMP had suitable moisture level. In addition, 8 g L^{-1} CaCO3 was added to just IMP to supply the desired pH level, it would be useful not to add as much as the imported peat, but small amount of lime to mixture for pH correction at the NAP. It was properly mixed and incubated about two months to reach suitable pH value for primula plant growing. Finally, IMP and NAP were volumetrically (v/v) mixed according to the ratios. In this research, primula (*Primula obconica* 'Poison primrose'), which is one of the most common ornamentals, was used as a test plant and seedlings were obtained from a commercial floriculture firm.

2.2. Experimental conditions and methods

Experiment was performed in the greenhouse located at Ankara University, Faculty of Agricultural, Soil Science and Plant Nutrition Department. Average day and night temperatures in the greenhouse were 28ºC and 22ºC, respectively. The relative humidity varied between 60% and 70%, and the light regime ranged from 400 to 500 µmol m^{-2} for a 12 hours photoperiod. The experiment was conducted in a factorial randomized block design with five replicates, and the total pots number was 25. Primula seedlings were implanted in late May into black plastic pots containing 1000 cm^{-3} of growing medium, and were irrigated every other day with distilled water during the first 3-4 weeks, for adoption of the seedlings to the new environment. Afterwards, primula plants were watered with a nutrient solution, as recommended by Sannoveld and Straver (1992), once a week until the end of the experiment.

Primulas were harvested when they reached to saleable quality and leaf samples were prepared for analyses. Harvested leaves were washed with distilled water and dried in air oven at 65-70 ºC for 48 hours. The experimental data were evaluated using an analysis of variance Anova procedure and the significant differences between treatments were determined with Duncan's Multiple Range Test.

2.3 Media and Plant Analyses

In growth media, the following parameters were determined: Aeration capacity (AC), available water content (AWC), water buffering capacity (WBC) (De Boodt et al., 1974), bulk density (BD), cation exchange capacity (CEC) (Soil Survey Laboratory Methods Manual, 2004), reaction (pH), electrical conductivity (EC) (Kirven, 1986), organic matter (OM) (Anonymous, 1978), total N (Bremner, 1982), water soluble NO3-N, NH4-N, P, K, Ca, Mg, S, Na, Fe, Zn, Mn, Cu, B (Kirven, 1986). Total organic carbon (TOC) was determined by the Scalar Total Organic Carbon Analyzer. In leaf samples, total N, P, K, Ca, Mg, S, Na, Fe, Zn, Mn, Cu and B were measured using Perkin Elmer Optima 2100 model of ICP-OES (Kacar and İnal, 2008).

3. Results and Discussion

Some physical and chemical properties of mixtures used in the growth media of primula plant are shown in Table 1-2. Accordingly, the prepared growing media showed different properties. Bulk density (BD) of growing media varied between 0.071-0.139 g cm^{-3} (Table 3). BD of IMP is low due to its botanical origins. IMP is formed from *Sphagnum mosses*, its formation environment is oligotrophic characterized and its decomposition degree is lower. On the other hand, BD of NAP is higher, because its botanical base is herbaceous, formation environment is eutrophic and decomposition degree is higher. It was determined that, if the ratio of NAP was increased in a mixture, BD increased relatively. The aeration capacity (AC) of growing media were found between 28.05-35.24 %, the available water content (AWC) was between 9.73-15.29 % and the water buffering capacity (WBC) was between 1.30-3.49 % (Table 1). Good and suitable physical properties will provide better conditions to stimulate plant growth Therefore, special attention is given to the volume percent of air and available water contents in the root zone (Bağcı et al. 2011). For optimum growing, a substrate should have 20-25 % AC, 20-30% AWC and 5-7% WBC (De Boodt and Verdonck, 1972; Verdonck et al., 1984). Hence, the growth media prepared for primula plant had enough AC, low AWC and very low WBC. Considering the AC values of the growing media used in this study, all media had high AC. In contrast, none of the mixtures investigated had high AWC and WBC. Previous research indicated that native peats have some problems due to the high level of decomposition and theirs other properties (Kütük et al., 1998; Çaycı et al., 2000; Baran et al., 2001; Çaycı et al., 2011; Çiçek Atikmen et al., 2014). It was determined that the cation exchange capacity (CEC) values of growth media were between 83.32-105.70 me 100 g^{-1} (Table 2). CEC value of NAP was found lower than IMP and the increase of the ratio of NAP in the mixture caused CEC value to be decreased a little. CEC is generally high in peat based media and it can change depending on other basic components in the mixtures (Çiçek, 2010). Erdoğan (2004) reported that CEC values ranged 113.48-239.86 me 100 g^{-1} in the mixtures prepared for primula plant. Çiçek, (2004) also determined CEC value as 135.06 me 100 g^{-1} for moss peat used in ornamental growing. During the experiment, reaction (pH) and electrical conductivity (EC) of the growing media ranged between 4.56-5.88 and 0.39-1.00 dS m^{-1}, respectively. While pH changed from slightly acidic to strongly acidic, none of the mixtures had high EC levels. Although the desired pH levels vary according to the chosen plant type in the growth media, this value must be between 5.3-6.0 in the mixtures which include large quantities of organic materials (Lucas et al., 1975). Here, pH level was a little out of the desired limits in the mixtures which NAP ratio was more than 75 %. In the beginning of the experiment, it was observed that the mixing lime to IMP for correcting pH level was effective. In the media, which NAP was dominant, pH was under 5, so it was understood that it would be useful not to add as much as the imported peat, but small amount of lime to mixture for pH correction. Total amount of N was found lower (1.05%) in 100% IMP medium, but it raised to 1.87 % in 100% NAP medium with the increase of NAP ratio in the mixtures (Table 2).

Total N content of peat could be different depending on their formation environment conditions and botanical origins. According to Robinson and Lamb (1975), in the United States of America, N content varied between 0.5-1.5% in the moss origin peats and it varied between 0.8-1.2% Ireland moss peats. It is known that the nitrogen content of woody and herbaceous peats are 2-4 times more than moss peat. Williams (1974) indicated that lowering the water table significantly decreased the amount of nitrogen mineralized. Dengiz et al. (2009) reported that different sedimentation periods, fluctuation of the ground water table level, vegetation types, and their intensities affect the decomposition of organic matter, which leads to a varied distribution of N.

Table 1. Some physical analysis of mixtures used in the experiment

Growth media	Bulk density (BD), g cm^{-3}	Aeration capacity (AC), %	Easily available water (AWC), %	Water buffering capacity (WBC), %
100 % IMP	0.071±0.0066	28.05±0.86	13.08±0.464	2.97±0.173
75% IMP+25 % NAP	0.098±0.0052	32.24±1.670	15.29±0.837	3.49±0.115
50 % IMP +50 %NAP	0.113±0.0025	30.59±0.765	15.14±0.458	3.06±0.066
25 % IMP +75 % NAP	0.128±0.0395	30.74±1.240	12.07±0.435	2.01±0.074
100 % NAP	0.139±0.0319	35.24±1.07	9.73±0.0255	1.30±0.026

N=4, ±: standard error of the mean

Table 2. Some chemical analysis of mixtures used in the experiment

Growth media	CEC (me $100g^{-1}$)	pH	EC (dS m^{-1})	Total N (%)
100 % IMP	105.70±4.590	5.88±0.840	0.39±0.070	1.05±0.031
75% IMP+25 % NAP	87.71±1.700	5.57±0.790	0.68±0.050	1.29±0.030
50 % IMP +50 %NAP	86.67±0.820	5.47±0.240	0.76±0.090	1.54±0.017
25 % IMP +75 % NAP	85.60±1.510	4.98±0.560	0.96±0.040	1.69±0.017
100 % NAP	83.32±1.880	4.56±0.990	1.00±0.050	1.87±0.019

N=4, ±: standard error of the mean

The organic material (OM) and the total organic carbon (TOC) contents of the media varied between 70.78-92.42 % and 35.81-45.64 % (Tab. 5). Both OM and TOC amounts were found at higher levels in 100% IMP medium. As expected, the decomposition rate of IMP is lower, therefore OM and TOC values are higher. Similar results were explained by Çaycı et al. (2011) and Bağcı et al. 2011. Ratio of the organic material to the organic C varied between 1.98 and 2.02. Although this ratio is accepted as 1.65 in Soil Survey Staff (1999), it is also stated that this value could not be accepted as a constant value for peat like for mineral soils (1.72). The decomposition degree of peat, the botanical origin and the changes related to the environmental chemistry which they have been formed, and their contents varied between 1.41-4.0 % (Çaycı, 1989). According to the TOC and total N values of the mixtures, it was determined that the highest C/N ratio was at the 100% IMP (Table 3). Szajek et al. (2007) explained that TOC varied between 37-45 % in peat samples. OM contents of the mixtures prepared for primula were found between 77.12-97.49 % by Najafi (2014). Accordingly, OM and TOC contents of the peat materials can be different due to their physical and chemical characteristics.

Table 3. Some chemical analysis of mixtures used in the experiment (cont.)

Growth media	Organic matter (OM), %	Total organic carbon (TOC), %	OM/TOC	TOC/N
100 % IMP	92.42±0.069	45.64±0512	2.02	43.47
75% IMP+25 % NAP	85.91±0.254	41.84±0.257	2.05	32.43
50 % IMP +50 %NAP	78.89±0.998	39.45±0.511	2.00	25.62
25 % IMP +75 % NAP	75.36±0.341	37.91±0.869	1.99	22.43
100 % NAP	70.78±0.501	35.81±0.927	1.98	19.15

N=4, ±: standard error of the mean

Furthermore, the water soluble nutrient levels were rather variable in the saturated media extract (SME) depending on many factors; such as the differences in botanical origin, the formation environment, and the degree of decomposition. The water soluble NO_3-N quantities ranged between 5.63-10.85 mg kg^{-1}, and the NH4-N contents varied between 11.16-21.71 mg kg^{-1} in the media prepared for primula plant (Table 4). Michigan State University concluded that the optimum limit is between 100-199 mg kg^{-1} for the soluble NO3-N in the SME for media based on organic materials, but didn't give any limit value for NH_4-N (Kirven, 1986). When the advised nitrate values were considered, all media were insufficient in terms of NO_3-N. In addition, water soluble nutrients P and K amounts were determined at low levels in the prepared media. Peat materials can contain low or unbalanced available nutrients, generally. Therefore, it is suggested that the supporting media with nutrients in the beginning are advised, or nutrient solutions should be applied to the media during growth period (Meral, 2006; Çiçek, 2010; Bağcı et al., 2011; Najafi, 2014).

Ca content of media was found at an acceptable level (Table 4). An increase of NAP in the media caused an increase of this nutrient. According to the Michigan State University reported, the optimum Ca limit is > 200 mg kg^{-1} for peat based media. All media met required levels of Ca, except 100% IMP. The optimum limit is >70 mg kg^{-1} for Mg in the media thus Mg content wasn't sufficient for all of the media (Table 4). These results are harmonious with data obtained by Çiçek (2004) and Meral (2006). There isn't any information about limits for soluble Na and S content in peat based media. It is observed that the water soluble Fe, Zn, Mn, Cu and B amounts are rather low (Table 4). For the media prepared for primula, these values varied: Fe 0.052-0.118 mg L^{-1}, Zn 0.099-0.503 mg L^{-1}, Mn 0.144-1.297 mg L^{-1}, Cu 0.382- 0.755 mg L^{-1} and B 0.000 mg-0.115 mg L^{-1}. This is expected in a media having different physical and chemical properties, where either total amount or water soluble amounts can be different. Puustjarvi (1980) reported that the sufficient limits for water soluble Fe, Zn, Mn, Cu changed between 2-3 mg L^{-1}, 0.1-05 mg L^{-1}, 0.5-2 mg L^{-1} and 0.05-0.1 mg L^{-1}, respectively.

Table 4. Amounts of water soluble nutrients used in the mixtures in the experiment

Growth media	NO_3-N (mg L^{-1})	NH_4-N (mg L^{-1})	P (mg L^{-1})	K (mg L^{-1})	Ca (mg L^{-1})
100 % IMP	9.25±1.04	11.16±2.11	0.309±0.04	12.46±0.73	171.52±4.58
75% IMP+25 % NAP	7.64±1.23	19.70±2.53	0.086±0.03	10.63±0.29	299.55±10.90
50 % IMP +50 %NAP	10.85±1.16	15.68±1.97	0.075±0.02	9.37±0.34	455.15±10.00
25 % IMP +75 % NAP	5.63±0.92	17.29±2.12	0.048±0.01	7.70±0.30	584.37±24.60
100 % NAP	10.25±0.81	21.71±1.19	0.037±0.01	6.40±0.14	562.82±4.97

N=4, ±: standard error of the mean

The effect of media on quality characteristics and classical growing parameters of primula plant were statistically non-significant (data is not shown). Differences of K, Mg, S, Na, Fe, Mn and Cu in the plants grown in media containing IMP and NAP were found significant (Table 5). However, the growth media did not have important effects on N, P, Ca, Zn and B contents. Although it is statistically non-significant, N and P contents of primula plants were determined at an optimum level, according to Poole et al. (1981). Zn and B contents were found sufficient or very close to sufficient levels as explained by Jones et al. (1991). Ca was generally over desired levels. However, none of the plants have problems with these nutrients.

Table 5. The effect of growth media over the nutrients of primula plant

Growth media	Total N (%)	Total P (%)	Total K (%)	Total Ca (%)	Total Mg (%)	Total S (%)
100 % IMP	3.35 ^{ns}	0.19 ^{ns}	2.69*C	3.23 ^{ns}.	0.43*C	0.33*C
75% IMP+25 % NAP	3.55	0.18	2.87 C	3.59	0.48 BC	0.44 B
50 % IMP +50 %NAP	3.79	0.19	2.66 C	3.76	0.58 A	0.60 A
25 % IMP +75 % NAP	3.77	0.18	5.18 A	3.54	0.55 AB	0.39 BC
100 % NAP	3.46	0.16	4.52 B	3.34	0.50 ABC	0.39 BC

ns: non significant, $^{*}p<0.05$

On the other hand, some of the nutrient composition of plants showed significant differences (Tab. 6). The highest K and Mg amounts were determined at the 25% IMP+ 75% NAP and 50% IMP+ 50% NAP media with 5.18% and 0.58%, respectively. It was thought that this situation could be caused by the different properties of the media. Similar approaches were reported by Handreck (1993), Kütük et al. (1998), Meral (2006) and Najafi (2014). Erdoğan (2004) stated that K and Mg contents of primula plant grown in different organic media changed between 4.13-4.64 % and 0.36-0.72 %. K and Mg contents of plants were also in agreement with the values for most of the flowering ornamentals given by Jones et al. (1991). The effect of various growing media to the S and Na contents of primula plant were different and the highest values were found at the 50 % IMP+ 50 % NAP with 0.60 % for S and at the 75 % IMP+ 25 % NAP with 0.53 % for Na. On the other hand, the lowest S and Na amounts were determined as 0.33 % and 43.24 % at the 100 % IMP medium. (Table 5). Because of the high water soluble S content of NAP (Table 5), the plants may uptake much more of this nutrient. However, S level was sufficient in primula plant when compared with the limit values reported by Jones et al. (1991). Normally, a limit value is not stated for Na content of primula or for ornamentals. But the Na amount of plants mostly varies between 0.004-2.00% (Bergman, 1992). In other studies performed with ornamentals by Handreck (1993) and De Kreij and Van Leeuwen (2001), Na content was found as 0.10-0.22% and 0.018-0.420%, respectively. Rose and Haase (2000) stated that plants grown in media containing moss based peat and coco peat contain Na between 0.064-0.10%. In our case, it was seen that S and Na contents of the plants are at normal levels.

The highest Fe, Mn and Cu amounts were found as 154.30 mg kg^{-1}, 19.95 mg kg^{-1}, and 4.10 mg kg^{-1} respectively at the 100 % NAP medium. On the other hand, the lowest Fe and Mn contents were obtained with 103.08 mg kg^{-1}, 11.90 mg kg^{-1} at the 100 % IMP media. In addition, the lowest Cu amount was found in the plants grown at the 75 % IMP+ 25 % NAP medium with the value of 2.72 mg kg^{-1} (Table 5). When compared with the data of Jones et al. (1991) for various ornamental plants, it is observed that the Fe amount is enough but the Mn and Cu amounts are lower than the acceptable levels. Researchers mentioned above stated that the sufficient level limit values of Fe and Mn would be between 50-200 mg kg^{-1}, and the sufficient level limit values of Cu could vary between 8-28 mg kg^{-1} for Begonias. It is interesting to note that the plants were grown with solutions including Mn and Cu, but these nutrients were not found at sufficient amounts in the plants. This result implies that the plants could not use the Mn and Cu in the nutrient solution at enough levels. The reason of this situation may be caused by the strong adsorption of Cu and Mn by the organic fraction in the media (Çiçek, 2010)

Table 6. The effect of growing media over the nutrients of primula plant (cont)

Growth media	Total Na (%)	Total Fe (mg kg^{-1})	Total Zn (mg kg^{-1})	Total Mn (mg kg^{-1})	Total Cu (mg kg^{-1})	Total B (mg kg^{-1})
100 % IMP	0.37*C	103.08*B	21.12 ^{ns}.	11.90*C	3.10* AB	43.24^{ns}
75% IMP+25 % NAP	0.53 A	142.40 A	16.36	14.04 BC	2.72 B	48.42
50 % IMP +50 %NAP	0.49 AB	154.00 A	19.10	15.88 B	3.93 A	47.73
25 % IMP +75 % NAP	0.43 BC	144.29 A	16.76	14.98 BC	3.08 AB	53.32
100 % NAP	0.41 C	154.30 A	16.90	19.95 A	4.10 A	54.14

ns: non significant, $^{*}p<0.05$

4. Conclusion

In this study, native peat (NAP) obtained from "Akgöl-Turkey" was evaluated in comparison with imported moss peat (IMP) in terms of its properties in a plant growing media and its effect on nutrition of primula plant. NAP and IMP were used as a growth media either individually or by mixing them in different proportions with each other. All media had high aeration capacity but low available water content and water buffering capacity. Nutrient contents of primula plants grown in different media were generally found sufficient with respect to typical limit values. However, the levels of some nutrients such as Mn and Cu were determined as insufficient in plants grown in all media; but these nutrients didn't cause a serious deficiency in the plants and all plants reached saleable quality. This is related to the physical-chemical properties of the media and root zone conditions, since fertilization was performed regularly by a nutrient solution through the growing period. It is important to note that if NAP is used in a growth medium, Mn and Cu concentrations in nutrient solution must be kept a little higher. This investigation determined that the physical characteristics of the media, especially the available water content and the water buffering capacity, affect some of the nutrient contents of primula plant. This study showed that quality characteristics and classical growing parameters of primula plant, all in all, primula plants were grown successfully in all media and reached saleable quality levels despite of the differences in some nutrient contents. Additionally, NAP is cheaper than IMP. All of these reasons were considered NAP could be an important alternative material for ornamental growers.

Acknowledgement

This study was supported by TUBITAK (Project no: 105O459). This study is submitted to Ankara University as a part of the requirements for the PhD dissertation of Nuray Çiçek.

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