Effect of Carbon-Rich Organic Soil Based Growth Media to The Quality and Growth Parameters of Primula (Primula obconica) Plant

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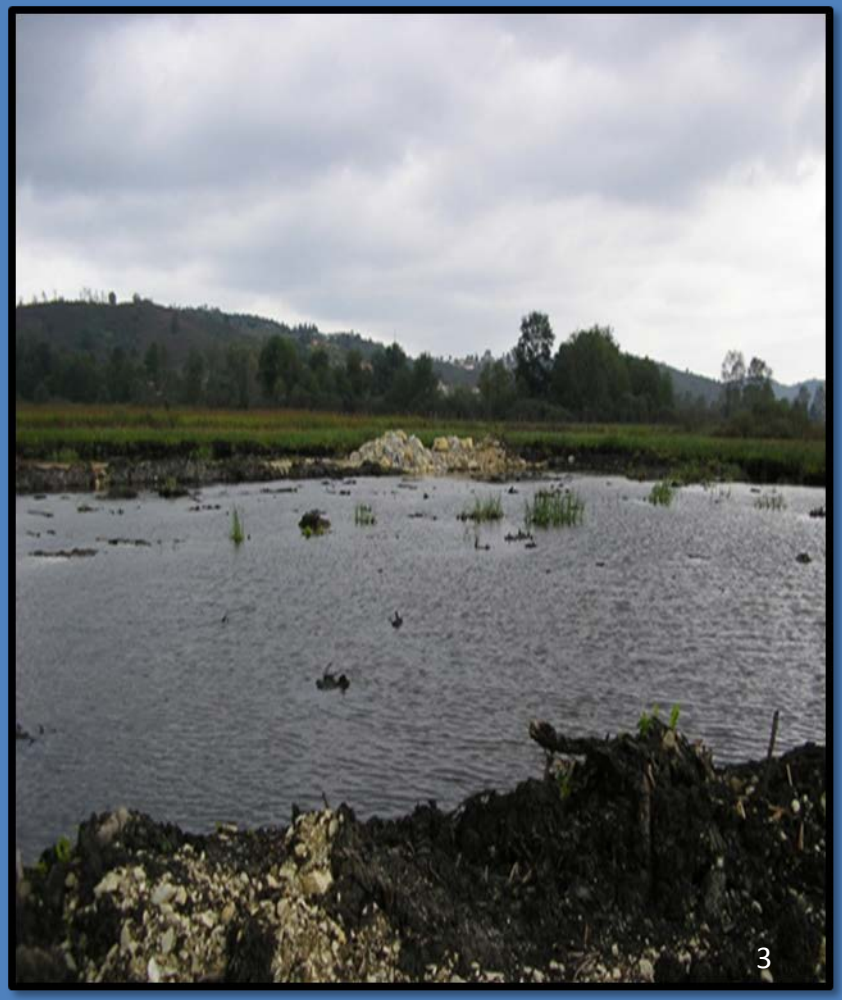
In recent years, usage of organic soil (peat) is getting common both in the world and in Turkey, especially ornamental plants growing. For this reason, organic soil is imported from various countries with increasing quantities every year. Imported organic soil is preferred for domestic organic soil desired physical and chemical properties in plant growing media.

On the other hand, due to domestic organic soil has lower price and quality when compared to the imported organic soil; domestic organic soil is also preferred especially by low budget farmers.



Generally, for the organic area, accumulation time of organic material, the level of decomposition in which layer and the mineral quantity in their structures are not known in Turkey.

Sakarya-Akgöl is an organic area which haven't been researched before. Formation of organic material, conditions, the decomposition status and mineral material were analyzed by using ^{14}C age determination method.

In this study, Sakarya Akgöl organic soil area, approximately 100 ha, was scanned according to its morphological, physical and chemical properties by using boring method and the sample profile locations which show the variance of the organic area are determined.

After some physical and chemical analyzed, profile no:1 was decided to be used in greenhouse studies.

Before beginning the experiment, domestic Akgöl organic soil was adjusted to suitable moisture level. On the other hand 8 g L^{-1} $CaCO_3$ was added to only the moss based organic soil (imported) to supply the desired pH level and it was properly mixed to supply incubation for a time in plant growing media.

One of the most important ornamental plants “primula” (Primula obconica) was used as test plant. Moss based imported organic soil (sphagnum peat) and domestic Akgöl organic soil (Akgöl peat) were volumetrically (V/V) mixed according to the ratios.

Table 1. Plant growth media ratios and used abbreviations

Growth media	Abbreviations
1- 100 % Imported Organic Soil	100 % IOS
2- 75 % Imported Organic Soil + 25% Akgöl Organic Soil	75% IOS + 25 % AOS
3- 50 % Imported Organic Soil + 50% Akgöl Organic Soil	50 % IOS + 50 % AOS
4- 25 % Imported Organic Soil + 75% Akgöl Organic Soil	25 % IOS + 75 % AOS
5- 100 % Akgöl Organic Soil	100 % AOS

Libby half life model was used for calculating radiocarbon ages. All radiocarbon ages were corrected by using 13/12 ratio measurement. After the results were analyzed, it is determined that ages of all samples are younger when compared to other quaternaries. It is a natural result that ages are higher at lower horizons especially in watery or terrestrial reservoirs.

Table 2. Profile depths and radio carbon age of Akgöl organic soil

Horizon name	Depth, cm	Radiocarbon age, years
oi1	0-13	116.1±0.6
oe	13-30	107±0.6
oi2	30-59	320±0.7
oi3	+59	350±50

Table 3. Some physical analysis results of mixtures used in the experiment

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

N=4, ±:standard error of the mean

Table 4. Some chemical analysis results of mixtures used in the experiment

Growing media	pH	EC, dS m^{-1}	Total N, %
100 % IOS	5.88±0.840	0.39±0.070	1.05±0.031
75% IOS + 25 % AOS	5.57±0.790	0.68±0.050	1.29±0.030
50 % IOS + 50 % AOS	5.47±0.240	0.76±0.090	1.54±0.017
25 % IOS + 75 % AOS	4.98±0.560	0.96±0.040	1.69±0.017
100 % AOS	4.56±0.990	1.00±0.050	1.87±0.019

N=4, ±:standard error of the mean

Table 4. Some analysis results of mixtures used in the experiment

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

N=4, ±:standard error of the mean

Nutrient solution (Sannoveld and Straver 1992) was applied because of the deficiency of the plant nutrients in the all of the organic soil mixtures.

Plant Nutrient	Primula
NO_3, mM/L	12.75
H_2PO_4, mM/L	1.00
SO_4, mM/L	1.00
NH_4, mM/L	1.25
K, mM/L	7.50
Ca, mM/L	2.50
Mg, mM/L	1.00
Fe, µM/L	60.00
Mn, µM/L	20.00
Zn, µM/L	3.00
B, µM/L	20.00
Cu, µM/L	0.50
Mo, µM/L	0.50

Table 5. Effect of various growth media on quality parameters of primula plant

Growth media	Visual quality(1-10)	Number of flower shoot	Total number of flower	Mean flower weight
100 % IOS	7.80^{ns}	2.80^{ns}	42.80^{ns}	0.119^{ns}
75% IOS + 25 % AOS	7.80	2.80	37.20	0.119
50 % IOS + 50 % AOS	7.80	2.80	38.20	0.115
25 % IOS + 75 % AOS	8.80	3.00	44.60	0.107
100 % AOS	9.00	3.40	46.80	0.130

N=5, ns: non signifacant

Table 6. Effect of various growth media on quality parameters of primula plant

Growth media	Number of leaf	Plant diameter width	Plant height
100 % IOS	20.40^{ns}	20.22^{ns}	11.54^{ns}
75% IOS + 25 % AOS	20.00	20.80	10.51
50 % IOS + 50 % AOS	22.40	18.87	10.26
25 % IOS + 75 % AOS	22.40	23.21	10.81
100 % AOS	25.00	23.32	10.44

N=5, ns: non signifacant

Plant growth media prepared in different ratios did not show significant differences in terms of such quality parameters of primula plant as visual quality performance , the number of flower shoot, total number of flower, mean flower weight, number of leaf, plant diameter width and plant height.

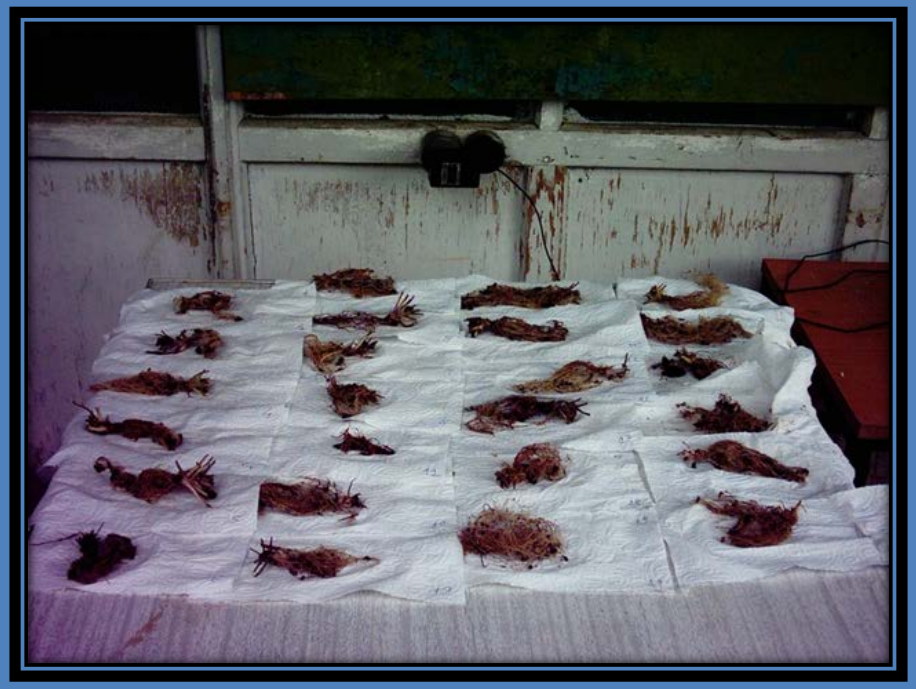
1- 100 % Imported Organic Soil
2- 75 % Imported Organic Soil + 25% Akgöl Organic Soil
3- 50 % Imported Organic Soil + 50% Akgöl Organic Soil
4- 25 % Imported Organic Soil + 75% Akgöl Organic Soil
5- 100 % Akgöl Organic Soil

Table 7. Effect of various growth media on growth parameters of primula plant

Growth media	Fresh weight	Dry weight	Fresh weight of root	Dry weight of root
100 % IOS	19.25^{ns}	3.26^{ns}	3.78^{ns}	0.84^{ns}
75% IOS + 25 % AOS	18.64	3.73	3.04	0.76
50 % IOS + 50 % AOS	16.97	3.38	3.19	0.72
25 % IOS + 75 % AOS	19.11	3.40	2.95	0.70
100 % AOS	20.20	3.61	3.71	0.90

N=5, ns: non signifacant

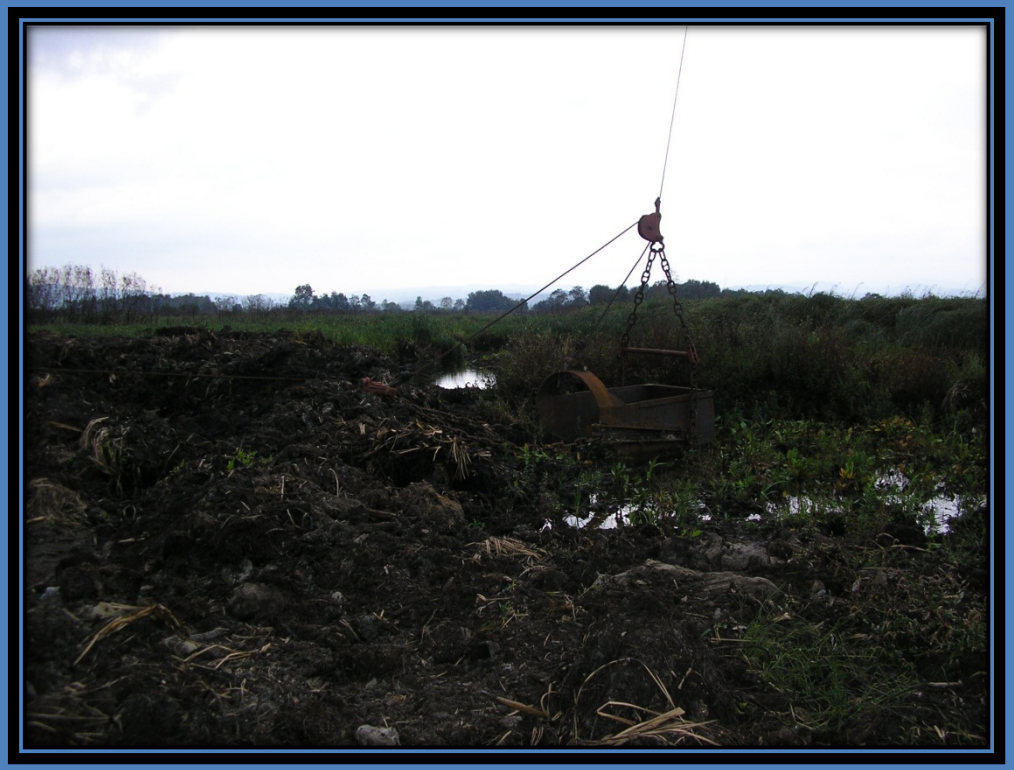
At the same time that growth media did not show significant differences in terms of growth parameters of primula plant such as plant fresh weight, plant dry weight, fresh weight of root and dry weight of root.



These results are both striking and promising. That there was not a difference in terms of quality parameters, which are basic elements affecting saleability and marketing possibility especially of an ornamental plant indicates that Akgöl organic soil can be used in the growth medium of this ornamental plant both in various mixtures, along with mossgenic imported organic soil and as alternatively pure matter mossgenic imported organic soil. It is clear that this situation is easy for application and will supply economical important benefits.

By using ^{14}C age determination method in this project for the first time in Turkey, formation process of organic soils, accumulation speed of organic materials and also the amount of organic carbon were determined in previously unexamined Sakarya-Akgöl organic area.

In the study, in which two different organic soils; imported and domestic, were used, we obtained interesting results that are applicable, especially in terms of using them as growth medium. This is a noteworthy case and indicates that just like imported organic soil, the domestic organic soil can also be used in growth medium, moreover can be an important alternative to the imported one.



RESULT

- **This study is researched by formation, agricultural potential and quality of Akgöl organic soil. It is concluded that it can have important alternative potentials to imported organic soil.**

Thank you for your attention…