Some Succulent Plants for Ground Cover, Spreading out on The East Anatolia, TÜRKİYE

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ABSTRACT

Though the lawn fields have some aesthetic and functional advantages, some problems were faced due to the high expenditures of upkeeping and restoration of it, especially in the environment influenced from the steppe climate conditions as in the East Anatolia Region. The aim of the research is to estimate the convenient plants belong to Crassulaceae family, which are succulent plants. Those cover the open fields and prevent the soil erosion of sloping surfaces, and endure the ecological circumstances of the East Anatolia. The facilities of utilising it in the different areas, the botanical features, habitats and the blossoming periods of 26 taxa belong to 6 genera are stated one by one in the field. The distributions of the endemic and rare taxa according to the red data is a follows: 1 taxon in vulnerable "VU", 1 taxon in near threatened "NT" and 1 taxon in least concern "LC".

Key Words: Succulent plants, East Anatolia, Türkiye.

Doğu Anadolu Bölgesi'nde (Türkiye) Yayılış Gösteren, Yer Örtücü Olarak Kullanılabilecek Bazı Sukkulent Bitkiler

ÖZET

Estetik ve işlevsel avantajları olmasına karşın çim alanların yapım, bakım ve onarım masraflarının yüksek olması nedeniyle, özellikle Doğu Anadolu Bölgesi gibi step iklim koşullarının etkilediği ortamlarda tesisi ve sürekliliği çeşitli sorunlar ortaya çıkartmaktadır. Araştırmanın amacı Van Gölü Havzası ekolojik şartlarına dayanıklı sukkulent bitkilerden ***Crassulaceae*** familyasından açık alanların zemin örtüsü ile eğimli alanlarda erozyonu önleyecek bitkilerin tespit edilmesidir. Alanda 6 cinse ait 26 taksonun farklı kullanım alanlarda yararlanma imkanlarını, botanik özellikleri, habitatları çiçeklenme dönemleri ayrı ayrı belirtilmektir. Endemik ve nadir olan taksonların tehlike kategorilerine dağılımları: 1 takson zarar görebilir "VU", 1 takson tehdit altına girebilir "NT**"** ve 1 takson az endise verici "LC" seklindedir.

Anahtar Kelimeler: Sukkulent bitkiler, Doğu Anadolu, Türkiye.

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INTRODUCTION

People have begun to change the nature with their agricultural activities since the first century. The first cultural landscape was agricultural fields which appeared through that way. Generally, natural elements determine the features of agricultural landscape. Natural elements as the structure of land, soil and topograpfic characteristics, water and climate, with people's tradition, custom and cultures, constitute the agricultural landscapes with endless variety that changes from one place to another.

The succulent plants, which store water in its stem and leaf, have a significant place in the ground cover plants. The succulent plants resist the circumstances of the steppe climate as well as conducting important aesthetic contribution. Though, providing permanent care in some fields, it's true that lawn plants don't give good results all the time. For instance, the result of the ground cover constructed from lawn plants is often observed to the unsuccessful on the dry and sterile, cliff, slopped and sunny fields. However, the succulent cover plant kinds have superior qualities against lawn plants for that kind of special fields, and conduct more secure ground. As known, with the determination and using some permanent green succulent plant kinds, which exist naturally in the ecological surrounding of the East Anatolia Region in which the summers are generally warm and dry and winters are generally cold and long, the matters concerned with cover plant would noteworthy, be solved. The succulent cover plants seriously conduct as aesthetically and functionally on the collection gardens, rock gardens, dry-stone walls, parterres, and the box of plants, roof and terrace gardens, slopped fields, and the arrangement of the edges of the roads. The succulent cover plant, apart from its water – storing function in its thick leaf and stem, enduring of which are xerophyte, have superiorities regarding with its form, tissue and colour features, flower and compelling feeds and aesthetic.

The succulents are the plants which adapts to the extreme environment conditions with their habitats and life forms. The summer months are generally warm and dry and the winter months are generally cold. Using them on landscape architecture, some permanent green or half permanent green succulent plant species which survive in that ecological environment, endure drought, short, expanding, end requiring minimum care, the vegetal ground cover matters will have been significantly solved (Öztan, Arslan 1992).

The succulent plants can store water in its leaf and stem and those plants, most of them are xerophyte, have adapted extreme environment circumstances.

The most succulent taxa take place in *Cactaceae, Amaryllidaceae, Euphorbiaceae, Crassulaceae, Asclepiadaceae* and *Liliaceae* families. *Hyalotelephium, Phedimus, Sedum, Rosularia, Sempervivum* and *Umbilicus* kinds can be used especially in the *Crassulaceae* family as ornamental plant in the East Anatolia Region.

The *Crassulaceae* family, which has about 33 genera and 1500 taxa in the world, has six genera and as much as 65 taxa in Turkey (Davis 1972; Güner et al, 2000; Hart & Alpınar, 1991; Karahan et al, 2006).

The succulent plants spread on fields which the ecological requirements of the succulent plants, especially sloped, cliff, stony-slopes, and abysses, volcanic rock, limy fields, in which there exist little worm, wet and humus, and especially the sort of *Sedum* members of the succulent plants spread on the fields in which the soil has little capacity to store water and

basic-featured lands and the fields which take much sunlight. Determining these characteristics will make the procedures of keeping up and improving easy.

The steppe land flora of the East Anatolia Region is rather rich as regard succulent plants. So many vicinity of the region are sunny, dry and the soil is not too deep. Therefore, it's possible to use on a large scale from the samples of this plant for the projecting urban and rural landscape work. The species qualified in this way can be used for designing various segetal arrangements as well as have truly little expense of practising and care comparing lawn and other culture-plants.

MATERIAL and METHOD

The research material consists of the samples of succulent plants which we picked up on the East Anatolia Region. The aide materials are ecological data concerned with the investigation zone and the colour slides and pictures. Phytosociological, phytoecological and fenological data have been registered during the study of finding the natural plant cover of the area. The general appearance, stem form, the flower manner, leaf features, improvement forms and areas of cover of the targeted plants which can be used as ground cover have been determined.

For choosing the plants suitable to these criteria; sloping fields, stony, rock, arid lands in Van, Bahçesaray (Van), Özalp (Van), Erciş (Van), Muradiye (Van), Çaldıran (Van), Başkale (Van), Gevaş (Van), Şırnak, Pervari (Şırnak), Hakkari, Yüksekova (Hakkari), Çukurca (Hakkari), Şemdinli (Hakkari), Siirt, Eruh (Siirt), Batman, Bingöl, Karlıova (Bingöl), Tunceli, Pülümür (Tunceli), Erzurum, Pasinler (Erzurum), Çat (Erzurum), Tekman (Erzurum), Hınıs (Erzurum), Erzincan, Elazığ, Palu (Elazığ), Malatya, Darende (Malatya), Ağrı, Doğubeyazıt (Ağrı), Tutak (Ağrı), Diyadin (Ağrı), Kars, Digor (Kars), Muş, Malazgirt (Muş), Bulanık (Muş), Varto (Muş), Bitlis, Hizan (Bitlis), Mutki (Bitlis), Tatvan (Bitlis), on the East Anatolia have been investigated in the vegetation periods of them. Suitable featured taxa have been choosen for using landscape plannings according to the visual features (flower, stem, leaf) at the end of the research combings. These gathered plant samples have been dried by pressing them with the herbarium technique after necessary land registers written down and given numbers with their localities. "Flora of Turkey and the East Aegean Island" work has been used as the basic source to identificate these samples. The books like Flora Europaea (Tutin 1964), Flora of the USSR (Kamarov 1939); and the samples in the herbarium of the University of Yüzüncü Yıl, Faculty of Science and Arts, Department of Biology have been used for some problematic taxa. All the taxa on the floristic list have been given alphabetically in each other. All these taxa have been kept in the VANF herbarium.

RESULT and DISCUSSION

The family *Crassulaceae* number ca. 1500 species in 33 genera distribute all over the globe. Owing to the variety of forms and the relative ease of vegetative propagation, the *Crassulaceae* requires special attention as ornamental plants suited for widely different climatic zones. Numerous species are widely cultivated, such as certain species of *Sedum* and *Sempervivum*. The cell sap of the *Crassullaceae* contains malic acid, traces of tartaric acid, and tanin. Nearly all species of the *Rosularia, Sedum, Hyalotelephium, Phedimus,* and *Sempervivum* are exellent for ornamental plants in carpetlike flower beds. The convenient taxa that were founded at the conclusion of the research and investigation expeditions in the border of the East Anatolia Region have been presented in the following Table 1. To continue the life in the world depends on practising the principle of "continuable life = continuable

development = continuable planing." It's seen that there is a lack of nationalistic planing on the basis of faced problems concerned with continueability when considered the relation between development and planing. The solution for that; urban and rural planing should be handled in the context of the continueable planing of field usage that provide urban and rural development and continueability of natural sources.

Urban and rural landscape planing that has socio-economic and ecological dimension includes the process of making a multi-disciplined decide. When the convenient activities and fields, that compensate the needs of the community, be choosen to present to usage, it should be based on quoting the sources that will serve better for the next generations.

The matters of seeding, care and restoration is very important for would be problems and the solutions of theirs in the works concerned with landscape architecture, the plant coverage of open fields and vegetal coverage that would prevent the erosion of the slopped lands on the ecology of the East Anatolia Region of which the summer months are usually worm and dry and the winter months are generally cold and long. The succulent plants take place not only for the arrangements of the urban open and green fields but also on rural lands such as roads, slopped lands, picnic areas, airports, problematic fields and the fields requiring minimum care conditions, for economic, functional and aesthetic aims. At the end of our research, on some fields like; Rock Garden, Roof Garden, Dry Wall Garden, Medical Plants Garden, the Garden of Plant species which prevent the erosion, the Garden of Issue Featured Plant Kinds, Coverage Plants (Sunny and Shadow field) Garden, can be used for profiting some succulent taxa and choosing places for that taxa. The need for alternative ground covers instead of lawn is inevitable because especially it's difficult to provide, the high price of its seeds, watering, fertilising and arrangement difficulties. The importance of the succulent plants, which adapt to the extreme environment conditions such as high warm and lack of water, appears between the cover plants. *Sedum polystriatum* R.T. Clausen B9, Van castle tough we searched so much, it hasn't been found. The distributions of the endemic and rare taxa according to the red data is a follows: 1 taxon in vulnerable "VU", 1 taxon in near threatened "NT" and 1 taxon in least concern "LC".

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Table 1. Natural spreading fields and Botanical features of Ascertained Species

Species/collected number	Inforasens	Petal Colour	Flower Period	Leaf Colour	Leaf Form	Leaf Rank	Stem Form	Stem Height (cm)	Altitude (m)	Habitat	IUCN (2001)	Locality
Hyalotelephium telephium (L.) H. Ohba OK 3013, F 11245	Corymbose	Creamy grenish-white	7-9	Green	Broadly Ovat-oblong to ovat-orbicular	Opposite	Erect	30-45	-2300	Rocky, dry places		Babacan village, Muradiye
Phedimus obtusifolius (C.A.Mey.) 't Hart OK 3412	Corymbose	Pinkish or red	7-8	Green	Ovate -oblong	Alternate	Erect	10-40	-2160	Rocky Slopes		Görecek village, Muradiye
Sedum album L. F 4639, M 8884	Subcorymbose	White-pinkish	6-9	Green	Linear to ovoid	Alternate imbricate	Caespitose	5-20	100-2500	Rocky slopes		A.Koçkıran village Ozalp; near Giyimli village Gürpınar;
S. subulatum (C.A. Mey) Boiss. F 8077, M 8836	Subcorymbose	White-pinkish	6-8	Green	Linear	Alternate imbricate	Caespitose	5-20	1500-3200	Rocky Slopes		Askın village Ozalp; Hamurkesen village Gürpınar
S. tenellum Bieb. B 6299	Cymose	White	6-8	Green	Linear-oblong	Alternate	Ascending-caespitose	4-10	1700-3400	Rock depressions		Artos mountain, Gevas
S. gracile C. A. Mey. F 4583	Cymose	White	6-8	Green	Linear-oblong	Alternate	Ascending-caespitose	5-10	1850-3500	Rocky ledges		Sagmalı vilages, Ozalp
S. sempervivoides Bieb. F 11059,	Corymbose	Redish	6-9	Green	Ovate-Acute	Alternate-rosette	Erect	5-20	1200-2900	Rocky slopes		Pelli mountain, Gevas
S. pilosum Bieb. (Observation)	Corymbose	Pink	6-7	Reddish	Obovate-oblong	Alternate	Caespitose	5-10	1100-2400	Basic rocks		South of Ozalp
S. annuum L. (Observation)	Cymose	Yellow	6-7	Green	Linear-spathulate	Verticillate	Erect-tufted	10-15	1830-2700	Rocks ledges		Mount Ararat, Agrı
S. nanum Boiss. B 5774	Corymbose	Yellow	6-7	Green	Linear	Alternate	Erect	2-8	1250-3000	Damp slops		Mount sat, Hakkari
S. tetramerum Trautv. B5203	Spicate	White	5-6	Green	Oblong-conical	Alternate	Erect	2-6	1750	Dry slopes		South of Ercis
S. inconspicum Hand.& Mazz. B2994	Cymose-Spicate	White	8	Reddish	Ovate-acuminate	Opposite	Erect	2,5-4	2250	Rocky places	VU	Mount of Meto, Sason
S. hispanicum L. var. *hispanicum* B1864	Cymose	White	4-7	Green	Linear-oblong	Alternate	Erect-ascending	5-15	0-2400	Limestone rocks		East of Dogubeyazıt
S. hispanicum L. var. *semiglabrum* Fröder B 2395	Cymose	White	6	Green	Linear-oblong	Alternate	Erect-ascending	5-15	1700-2200	Limestone rocks		Van to Ercek village
S. pallidum *Bieb. var.* pallidum *F589*	Cymose	White or pink	6-8	Green	Linear-subteret	Alternate-imbricate	Erect or ascending	5-15	0-1900	Basic rocks		Altınboga village, Ozalp
S. stoloniferum Gmelin F 4358	Corymbose	Pale pink	7-8	Green	Elliptic	Alternate	Erect-ascending	10-20	900-1800	Moist banks		Altınboga village, Ozalp
Rosularia elymatica (Boiss. & Hausskn.) Berger (Observation)	Terminale	Pale pink	6-7	Green	Obovate-oblanceolat	Rosette	Scape	9-15	1850	Rock cleft		Piskasir village, Hakkari

Table 1. (Continued).

R. sempervivum (M. Bieb.) A. Berger F 4448	Raceme	Deep pink	6-9	Green	Obovate-oblong	Rosette	Scape	6-25	900-3000	Shady limestone		Bodur Agac village, Ozalp
R. radiciflora Boriss. subsp. *radiciflora* F 7782 , M 7150, OK 1742	Cymose-panicle	White to deep pink	6-9	Green	Ovate-oblong	Rosette	Scape	6-22	900-3000	Igneous rocks		Gündüzlü village, Ozalp; Bölmeçalı village Gürpınar; Alkasnak village Muradiye
R. sempervivum (M.Bieb) A. Berger subsp. *kurdicum* Eggli F 8089, M 7232, OK 1817	Cymose-panicle	Yellow (drying red brown)	6-9	Green	Ovate-oblong	Rosette	Scape	5-20	900-3000	Igneous rocks		Gündüzlü village, Ozalp; Bölmeçalı village, Gürpınar; Alkasnak village, Muradiye
R. aizoon (Fenzl.) Berger M 7263	Cymose-panicle	Pale yellow	6-7	Green	Obovate	Rosette	Scape	5-10	1500-3400	Limestone slopes		Bömeçalı village, Gürpınar
R. davisii Muirhead MÜ 8404a	Raceme	White	6	Green	Oblong to broadly spathulate	Rosette	Scape	1-3	2700-3000	Igneous rock crevices		Between Hamurkesen – Işıkpınar village, Gürpınar
Sempervivum armenum Boiss. & Huet. var. *armenum* F 8226,	Cymose-panicle	Pale yellow-greenish	7-8	Blue-Green	Ovate-lanceolate	Rosette	Scape	5-20	1600-3200	Limestone gravel	LC	West of Yavuzlar village, Ozalp
Se. davissi Muirhead (Observation)	Cymose-panicle	White	6-7	Green	Oblanceolate-obovate	Rosette	Scape	5-20	700-2300	Grassy slopes		Mount Ararat
Se. minus Turrill var. minus F 11040	Cymose-panicle	Pale yellow	7-9	Green, base purple	Oblenceolate to Oblong-eliptic	Alternate	Erect	5-15	600-2000	Rocky crevices	NT	Side of Aktaş lake, Ardahan
Umblicus erectus DC. F 3491, F 11053	Racemose	Greenish	(-5)6-8	Green	Orbicular-peltat	Alternate	Erect	30-80	300-2500	Slope		East of Bitlis; side of Aktaş lake, Ardahan