Floristic Structure of Yukarisevindikli Natural Pasture in Tekirdag, Turkey

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Abstract— *This research was conducted in Yukarisevindikli village natural pasture in Tekirdag province at Trakya (Thrace) region in Turkey. The objective of this study was to determine the relation between plant species composition and different management techniques of Yukarisevindikli natural pasture. Measurements on pasture were made at 3 different management system (grazed, abondened, mowed) units. Some ecological indicators were investigated such as frequency families, lifeforms, life spam and phytogeographical regions. The most widely spread species on grazed and abondened units were scented grass (Chrysopogon gryllus). Lolium perenne and Trifolium repens were determined common in mowed pasture units. Hemicryptophytes were dominant in the investigated area, followed by therophytes, chamaphytes and geophytes.*

Keywords— Pasture, biodiversity, land use, vegetation.

I. INTRODUCTION

Vegetation ecology, the study of the plant cover and its relationships with the environment, also called synecology, is a complex scientific undertaking, both regarding the overwhelming variation of its object of study in space and time, and its intricate interactions with abiotic and biotic factors (Van der Maarel, 2005). Vegetation is a plant community which is in a land portion and it is affected by environmental factors, affecting each other mutually. Nevertheless, hosting many plant species, soil organisms, and wild animals is among the ecological functions of pastures. Understanding the biological diversity of natural pastures can lead to improvement of pastures and optimal use (Tuna, 2010). Livestock products provide the major economic return from most range and pasture lands and compared with harvested or purchased feeds, pastures and pasture provide a relatively inexpensive and energy-efficient feed source for livestock (Valentine, 1990).This natural pasture are rich in terms of biological diversity. The many vegetation types and species diversity often found in natural and seminatural pastures are an important part of biodiversity. Floristic studies are fundamental for the applied sciences such as pasture management and conservation (Jankju et al.2011). There are about 12,000 flowering plant taxa in Turkey's flora and approximately 4,000 of them are endemic (Davis, 1985; Kaya, 2014).This number increases every day with the identification of new species Turkey. This diversity is presently threatened by intensive agriculture. Biodiversity conservation will require management to improve the condition and cover the native vegetation within the productive agricultural landscape (McIntyre and Hobbs 1999, 2001, Fischer *et al.* 2005, Vesk and Mac Nally2006). Phytosociological studies are essential for protecting the natural plant communities and biodiversity as well as understanding the changes experienced in the past and continuing on into the future (Sağlam , 2013). Call and Roundy (1991) stated that ''A more mechanistic research approach is needed to better understand factors governing germination, seedling establishment, and plant community development in natural and synthetic systems to guide revegetation toward biological diversity.'' The objective of this study was to determine the relation between plant species composition and different management techniques of Yukarisevindikli natural pasture.

II. MATERIAL AND METHODS

The study area is situated in Yukarisevindikli village of Tekirdag city. Latitude 41°23' 47 N Longitude 27°34'54 E of Yukarisevindikli village, Tekirdag (Europe Part) in Turkey (Anonymous 2016).This zone belongs to the A1(E) grid-square in flora of Turkey according to Davis (1985) grid system. In this study, the vegetation analysis was performed according to traditional Braun-Blanquet's «floristic unit system». The relieves were determined by according to «minimal area» method which was 16 m^2 . Measurements on pasture were made at 3 different units. We determined differences found in the species composition between grazed, abondened, mowed sites. Measurements were made from 1May to 15 July 2013. 22 study sites

were selected for vegetation analyses . These sites were grazed, abondened and mowed. Presence/absence data of all vascular plant species were recorded in the sites. Each sites consisted of a 16 m^2 plot. The lists of species, floristic characteristics such as life forms and life span, phytogeograhical region levels of these species, their families, are recorded. The plants of which herbariums and phytogeograhical region are made by collecting out of research area are determined according to the principles which Davis (1985) pointed out in Flora of Turkey. The taxa can also be classified according to their life forms Raunkiaer (1934), Raunkiaer's (1934) classification, five major classes, arranged according to increased protection of the renewing buds: phanerophytes, chamaephytes, hemicryptophytes, cryptophytes, and therophytes.

Percentages of frequency are separated as 5 frequency classification as in the following. In this process, the frequency data were transformed using a five point scale:

I = 1-20%, II = 21-40%, III = 41-60%, IV=61-80%, V = 81-100%.

Frequency = (number of quadrate a species occurs in / total number of quadrates analysed) x100%,

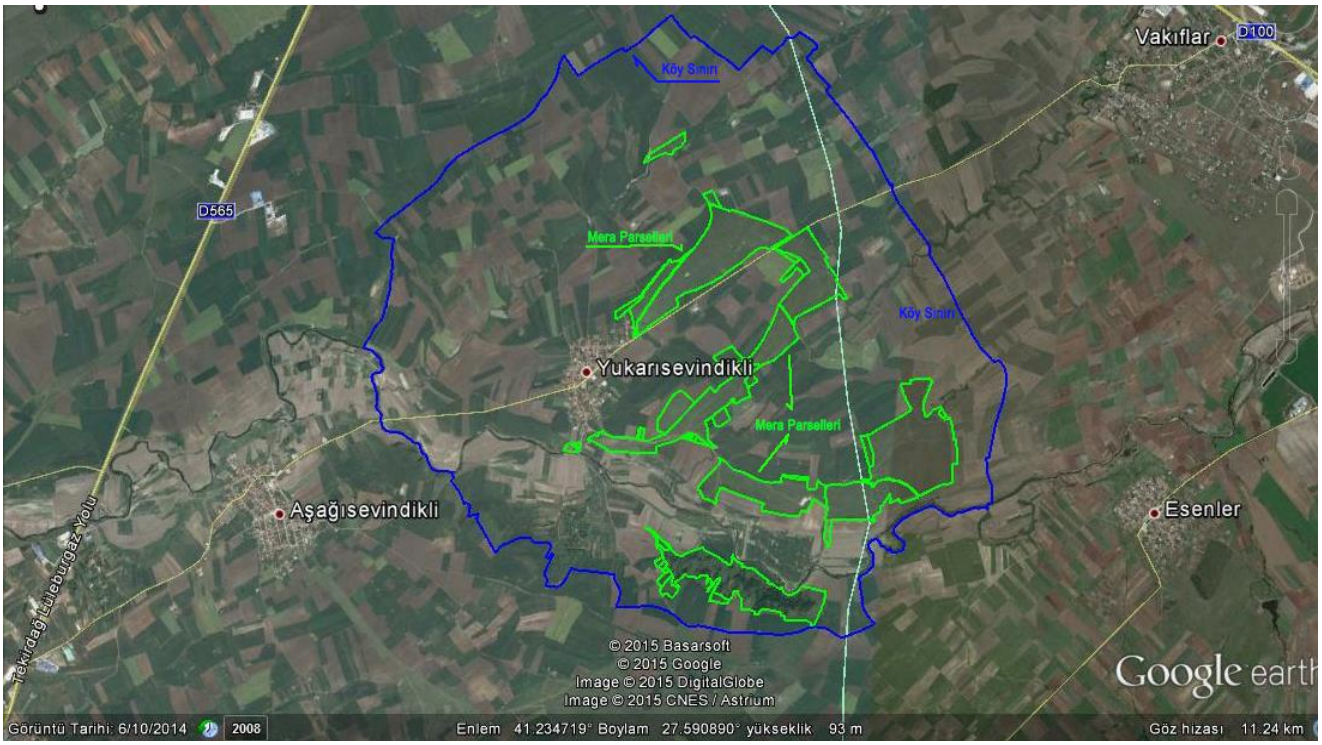

FIG. 1: Google earth image of Yukarisevindikli pasture

Climatic data representing the study area were provided by Tekirdag meteorological stations. Long-term total precipitation and annual mean temperature were 585 mm and 14°C, respectively. Tekirdag examined in the gross of Trakya (Thrace) lands is extremely young geologically. The dominant land types are limeless brown lands and grumusol in Trakya (Thrace). Following these two fundamental land types, rendzina and brown forests and potzolic lands cover large areas. There is also azonal land types except for these lands included in zonal and intrazonal groups in the region. These are usually new alluviums and hydromorphic saltya alluviums under the name of alluvium.

III. RESULTS AND DISCUSSIONS

3.1 Frequency of Pasture Species

Livestock grazing has a considerable effect on community structure and floristic composition (Milchunas and Lauenroth, 1993; Bullock et al. 1995; Dengler et al. 2014). Biodiversity can alter due to grazing, mowed or abondened of pasture. Vandvik and Birks, (2002) stated that land use has strongly influenced vegetation cover and distribution. The change in species composition was related to the change in structure from open to semi-open grasslands under active grazing to close in abandoned sites (Vassilev et al.2011).

TABLE 1
FREQUENCY RATIO OF DOMINANT SPECIES IN GRAZED, MOWED AND ABONDENED PASTURE UNITS

Grazed Pasture	F%	Mowed Pasture	F%	Abondened	F%
Chrysopogon gryllus	100	*Trifolium repens*	100	*Chrysopogon gryllus*	87.5
Dactylis glomerata	100	*Lolium perenne*	100	*Dactylis glomerata*	75
Aegilops triuncialis	87.5	*Vicia villosa*	87.5	*Sanguisorba minor*	63.5
Vulpia ciliata	87.5	*Carex flacca*	87.5	*Trifolium arvense*	63.5
Avena fatua	87.5	*Trifolium campestre*	87.5	*Achillea millefolium*	63.5
Festuca ovina	87.5	*Chrysopogon gryllus*	75	*Bromus tectorum*	50
Thymus longicaulis	87.5	*Hordeum murinum*	75	*Rumex crispus*	50
Eryngium campestre	75	*Achillea millefolium*	75	*Trifolium campestre*	50
Aegilops geniculata	75	*Poa trivialis*	63.5	*Anthemis tomentosa*	50
Bromus tectorum	75	*Medicago minima*	63.5	*Hypericum thasium*	37.5
Trifolium campestre	75	*Plantago lanceolata*	63.5	*Poa trivialis*	37.5
Cirsium laniflorum	63.5	*Hordeum bulbosum*	63.5	*Medicago minima*	37.5
Rumex acetosella	63.5	*Trifolium arvense*	63.5	*Koeleria lobata*	37.5
Convolvulus elegantissimus	63.5	*Lotus corniculatus*	63.5	*Plantago lanceolata*	37.5
Centaurea cyanus	63.5	*Cynosourus echinatus*	63.5	*Lolium perenne*	37.5
Poa bulbosa	50	*Ornithogalum montanum*	63.5	*Festuca ovina*	37.5
Hypericum thasium	50	*Cynodon dactylon*	63.5	*Hordeum bulbosum*	37.5
Cynodon dactylon	50	*Rumex acetosella*	50	*Trifolium subterraneum*	37.5
Poa trivialis	50	*Gastridium phleoides*	50	*Convolvulus elegantissimus*	37.5
Medicago minima	37.5	*Trifolium subterraneum*	50	*Cynodon dactylon*	37.5
Koeleria lobata	37.5	*Aira caryophyllea*	50	*Vicia villosa*	37.5
Vicia sativa	37.5	*Sinapis arvensis*	50	*Anchusa azurea*	25
Bromus rubens	37.5	*Convolvulus elegantissimus*	50	*Pallenis spinosa*	25
Medicago falcata	37.5	*Trifolium nigrescens*	50	*Avena fatua*	25
Geranium dissectum	37.5	*Dactylis glomerata*	37.5	*Thymus longicailus*	25

F: Frequency

In this research,the high percentage of frequency recorded for *Chrysopogon gryllus, Dactylis glomerata, Vulpia ciliata, Festuca ovina, Avena fatua, Thymus longicaulis, Aegilops triuncialis* indicated a high adaptation of these species to livestock grazing. Moreover, the more common species *were determined Lolium perenne, Trifolium repens, Chrysopogon gryllus, Carex flacca, Trifolium campestre* in vegetation structure of mowed pasture while the more common species were *Chrysopogon gryllus, Dactylis glomerata, Sanguisorba minor,* in vegetation structure of abondened pasture (Table 1).Specially, the most widely spread species on Tekirdag pasture was scented grass *(Chrysopogon gryllus*) (Uluocak, 1974; Davis, 1985; Tuna et al. 2011) According to previous research Adams et al. (1986), grasses are usually dominant in pastures all over the world. Indeed, it was determined that *Chrysopogon gryllus* among these common species are found in grazed dry pasture sites. *Chrysopogon gryllus,* grows on warm, dry, illuminated, sandy grassy slopes and hills as well as on dry pasture land (Djurdjevıć et al.2005, Dajıć Stevanovıć et al. 2008).

3.2 Families of Pasture Species

In the protected pasture sites, the three families which have the largest number of species are; Poaceae (35.11%), Fabaceae (19.84%), Asteraceae (16.79%) and other families (28.26%) (Figure 2).According to Adams et al. (1986), grasses are dominant in many pastures all over the world. Erik and Tarıkahya, 2004 .said that the first three families according to number of species in Turkey are *Asteraceae*, *Fabaceae* and *Lamiaceae* which agreed with this research. Fabaceae, Poaceae and Asteraceae members is characterised by step vegetation(Atamov et al. 2007). The fact that therophytes whichconsist of an important part of these three families are found abundant in Mediterranean region makes these families to be on the first line. In this research, Poaceae was the largest family, being the fourth largest family of the flora in Turkey and having wide

toleration limits and involving large genera that contain many species. Lauenroth (1979) said that fundamental family of pasture vegetations are Poaceae and they are common especially in the districts in which the total rainfall is between 250-1000 mm and a lot of pastures around the world has a large number of Poaceae species and, thus, they are called as «Grassland». Grasses formed dense communities in large areas of this pasture as in the local pastures, thereby increasing the area covered by vegetation. Similar results were obtained from the studies conducted in this type of pastures that are mainly made up of graminae. However, based on the results of one recent study carried out in Turkey, plant species of other families were dominant in areas of pasture that were grazed excessively, although grasses were dominant in protected areas of pasture (Vassilev et al.2011). Asterecae is in the third family, and related to being the largest family of the flora of Turkey, having many family members and greater ecological toleration and breaking up seeds easily (Cansaran 2002). Asteraceae has been adapted to these arid and semiarid conditions with a wide diversity (Mood 2008). Abondened pasture units are secondary succesion. Therefore, Asterecea proportion can be higher than others.

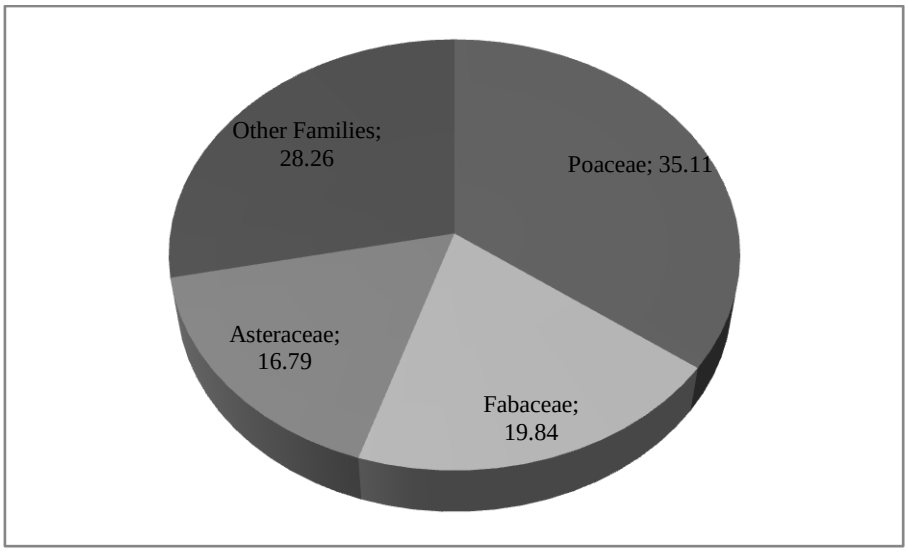

FIG. 2: Distribution of families in abondened pasture units (%)

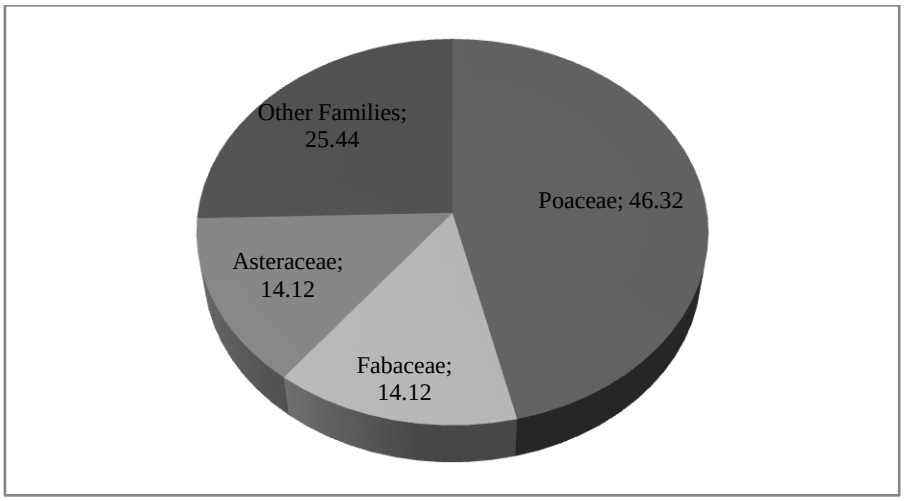

FIG. 3: Distribution of families in grazed pasture units (%)

In the grazed sites, the three families which have the largest number of species are; Poaceae (46.32%), Fabaceae (14.12%), Asteraceae (14.12%) and other families (25.44%) (Figure 3).The rate of the species belonging to the Poaceae family evaluated as productive plants of pastures was high in the research area indicator in pasture, as species may vary significantly in their acceptability to grazing herbivores, not only due to differences in palatability, but also due to phonological differences. In addition to, Fabaceae proportion lowers than other units. It has decreased due to grazing. Hence sheeps specially prefer legumes.

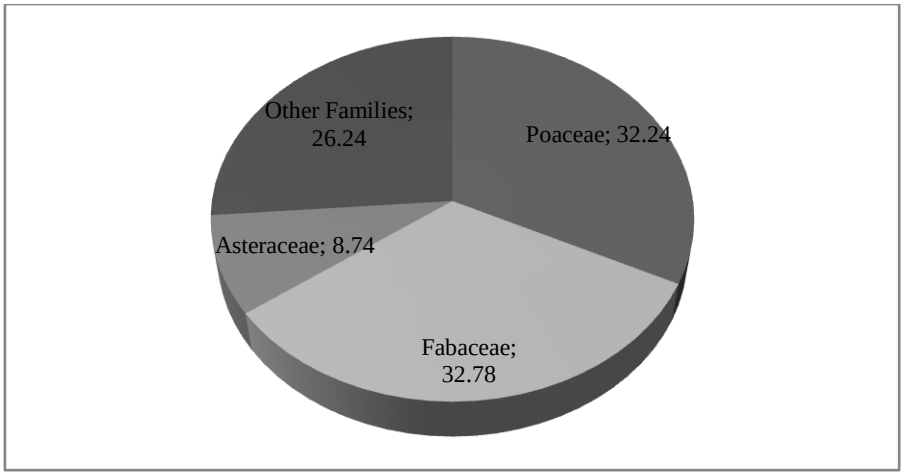

FIG. 4: Distribution of families in mowed pasture units (%)

In the mowed sites, the three families which have the largest number of species are; Poaceae (32.24%), Fabaceae (32.78%), Asteraceae (8.74%) and other families (26.24%) (Figure 4). Fabaceae family's proportion was determined higher than other pasture units. Fabaceae in grasslands are often therophytes with a mesomorph leaf anatomy and persistent seed bank (Dupre and Diekmann 2001). Lok and Fraga (2008) stated that Fabaceae makes that the combined action of sunshine and wind be lower on the soil, favoring higher conservation of humidity and, from the ecological point of view, improving the grasslands conditions. In my previous study, 27.7, 31.0, and 41.3 % distribution were obtained according to the Poaceae, Fabaceae, and other family species in Trakya region pastures (Tuna 2000).

3.3 Life Form of Pasture Species

A life-form is characterized by the adaptation of the plants to certain ecological conditions (Mera et al. 1999). Raunkiaer (1934), explains the form of life, organs keeping generations of plants namely sprouts and buds as a protection kind and situation in the unfavourable season (in cold and dry conditions) and in the term of rest of vegetation. Plant life form composition was consistent with climate, floristic composition, and habitats (Wang 2002 a,b). Life forms reflect a particular strategy of resource use, and their diversity is significantly correlated with climatic heterogeneity (Cowling et al.1994).Diaz et al. (2007) stated that plant functional type and response rules need to be defined for each different climatic context and grazing history.

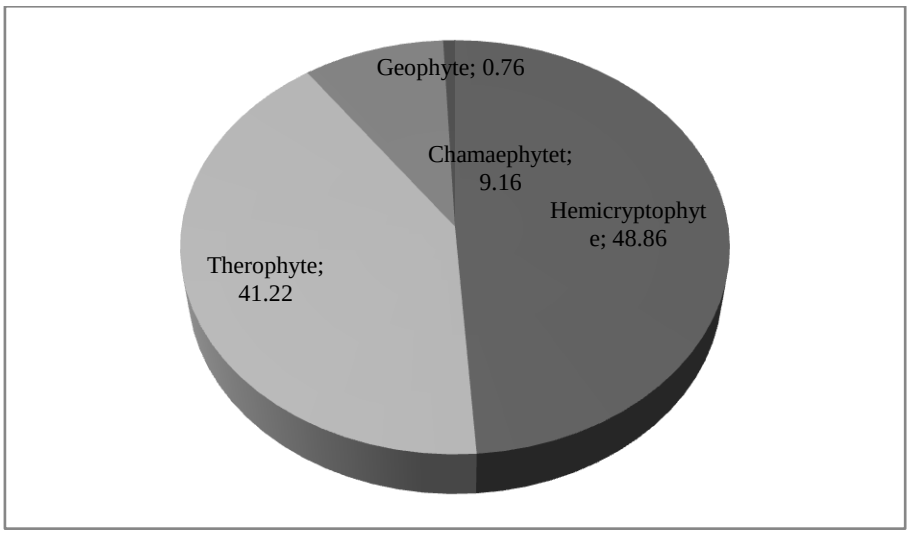

FIG. 5: Distribution of life form in abondened pasture units (%)

As can be seen in figure 4, hemicryptophytes were dominant in the investigated area, followed by therophytes, chamaephytes and geophytes. Species having hemicryptophyte life forms in the vegetation biological spectrums were in 48.86 %, and plants with therophyte life forms were 41.22 %, chamaephytes 9.16 %, and geophytes 0.76 % (Figure 5). Tuna (2010) pointed out that determining quantitative plant diversity of natural pastures is very important. Therophyte recruitment

depends on seed banks for population survival, and as they have a short life cycle they are more responsive to environmental and biotic changes than other life forms (Vila‘1 et al.2006). Because of low rainfall and continuous drought, they finished their life cycle in a short time (Mood 2008) Annual plants which had the rophyte life form were less abundant in vegetations as the height grew up above the sea level. The research area is also situated sea level. Similar results were stated by Cerit ve Altın 1999; Tuna 2000; Tuna 2010) . According to Raunkiaer (Akman and Ketenoglu, 1992) the biological spectrum is an indicator of climate and the total flora of Mediterranean countries contain30% hemicryptophytes and 40% therophytes, whereas other countries (far from the Mediterranean) contain 50% hemicryptophytes, 30% cryptophytes an 20% therophytes.

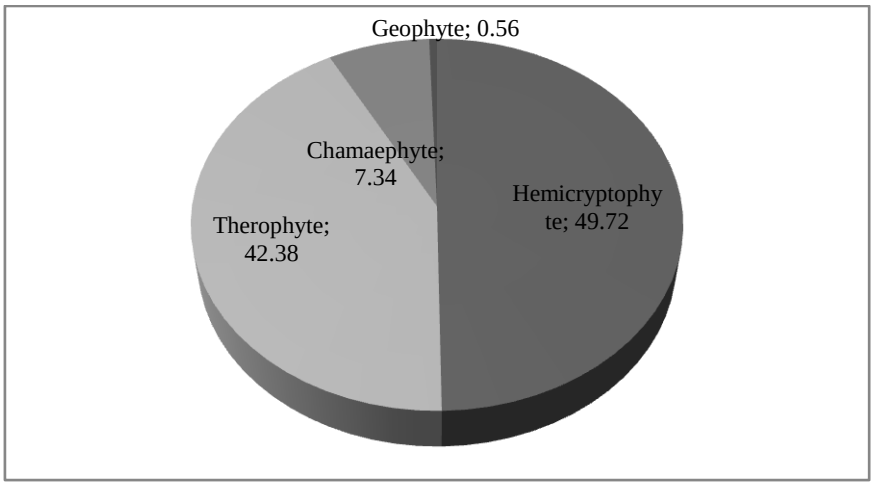

FIG. 6: Distribution of life form in grazed pasture units (%)

As can be seen in figure 6, hemicryptophytes were dominant in the grazed unit, followed by therophytes, chamaephytes and geophytes. Species having hemicryptophyte life forms in the vegetation biological spectrums were in 49.72%, and plants with therophyte life forms were 42.38 %, chamaephytes 7.34 %, and geophytes 0.56 % (Figure 6). According to Box (1981), the study of plant life forms is important, because it provides the basic structural components of vegetation stands and explaining vegetation structure. Hemicryptophytes includes the species of perennial plants. Meanwhile, these species are the feed plants producing quality feeds and are among the plants which animals prefer. Grazing caused changes in species composition in the native pasture (Milchunas and Lauenroth 1993, Milton et al. 1994, Pykälä 2004, Mosallam 2007), especially palatable plants eaten by livestock. Hence, heavy grazing pastures may not demonstrate original plant diversity. In addition to, the relation between human activities and disturbance (some anthropogenic and grazing) effects and the increase of therophytes were reported (Grime, 2001; Naqinezhad et al., 2006; Ravanbakhsh et al. 2007).

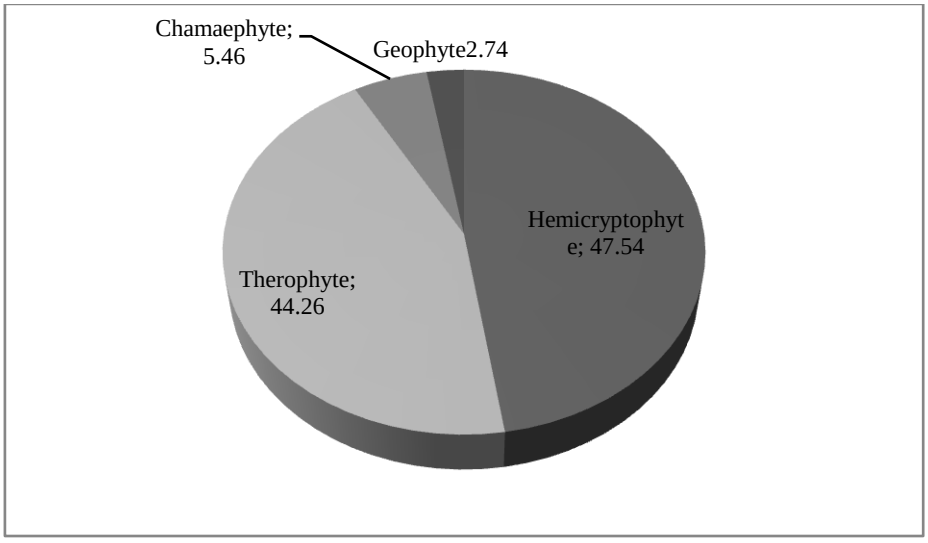

FIG. 7: Distribution of life form in mowed pasture units (%)

As can be seen in figure 6, hemicryptophytes were dominant in the mowed area, followed bytherophytes chamaephytes and geophytes. Species having hemicryptophyte life forms in the vegetation biological spectrums were in 47.54%, and plants

with therophyte life forms were 44.26%, chamaephytes 5.46 %, and geophytes 2.74 % (Figure7). Braun- Blanquet (1964), reported that grass and pasture plants have usually hemicryptophytes life form. In other a study, Panahy et al. *(*2008) stated that, the frequency of hemicryptophytes and therophytes among the plants of the region showed that the effect from two types of climate-Mediterranean and cold temperate-affected them. Additionaly, therophyte proportion were calculated higher than other units. Therophytes which *Aegilops triuncialis*, *Avena fatua*, *Vulpia ciliata* were found dominant ingrazed pasture units while therophytes like as *Trifolium campestre*, *Medicago minima* and *Lotus corniculatus* were determined common in mowed pasture units.

3.4 Life Span of Pasture Species

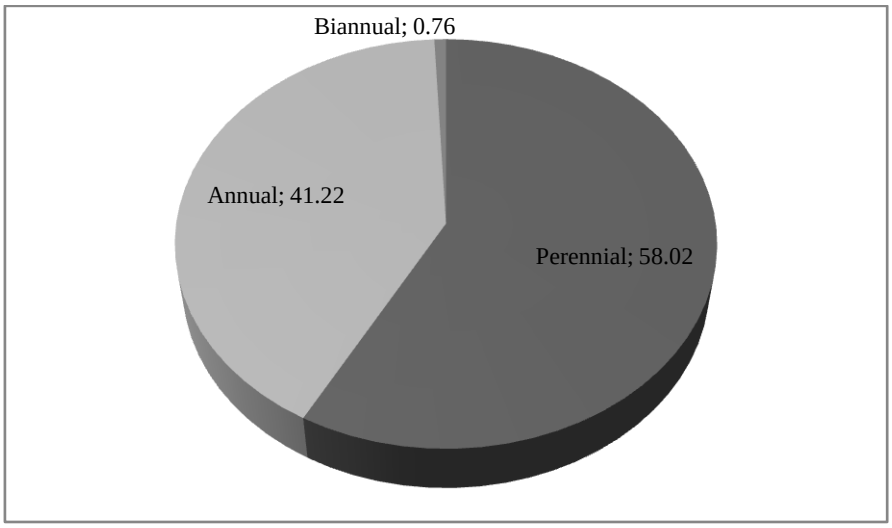

FIG.8: Distribution of life span in abondened pasture units (%)

In the assessment of life span, the dominant life span are perennials, which constitute 58.02 % of studied flora, followed by annuals (41.22%), and biannuals (0.76%) in the protected sites. (Figure 8) . It was concluded that annual species are resistant to grazing are more common in the sites that are exposed to heavy grazing. Annual or perennial herbaceous plants that easily spread, easily settle and quickly develop grow especially in areas that are plowed and abandoned (Holechek et al. 1989). In addition to, McIntyre and Lavorel (1994) found significant associations between individual plant species and various environmental and grazing-related factors in Australian range and Vegetation in the grazed treatments was dominated by short annual grasses and annual thistles, while under long-term protection from grazing tall annual and perennial grasses were dominant (Golodets et al. 2010) protected areas were dominated by tall perennials and tall annual grasses.

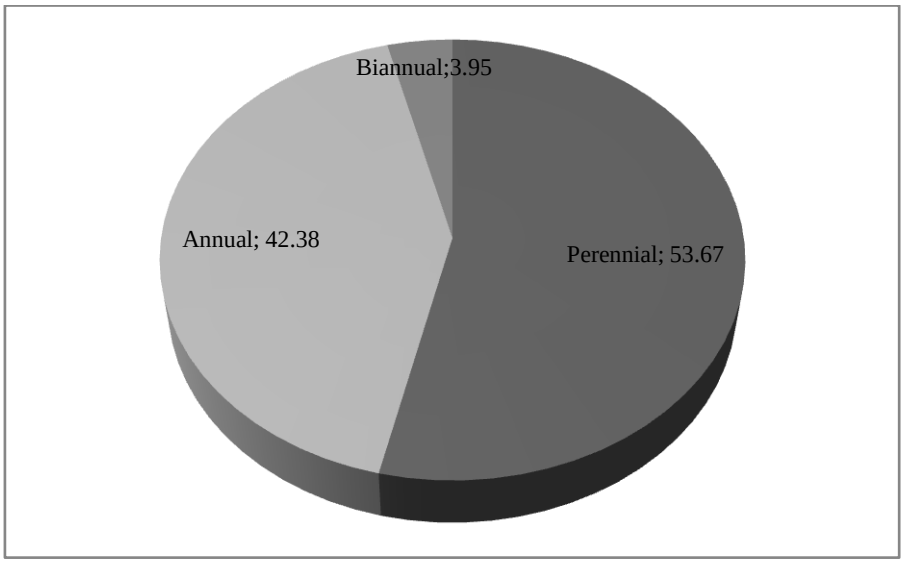

FIG.9: Distribution of Life span in grazed pasture units (%)

In the assessment of life span, the dominant life span are perennials, which constitute 53.67 % of studied flora, followed by annuals (42.38%), and biannuals (3.95%) in the grazing sites (Figure 9). Annual species may tolerate grazing due do their

fast growth and early and often prolific seed set. Fabaceae in grasslands are often therophytes with a mesomorph leaf anatomy and persistent seed bank (Dupre and Diekmann 2001). Arid and semi-arid regions are often characterized by an abundant flora of annual plants that complete their life cycle within a relatively short favourable growth period (Alhamad 2006). Similar to earlier reports by Smith (1994) and Snyman (1998), grass species are important as an indicator pasture, as species may vary significantly in their acceptability to grazing herbivores, not only due to phonological differences.

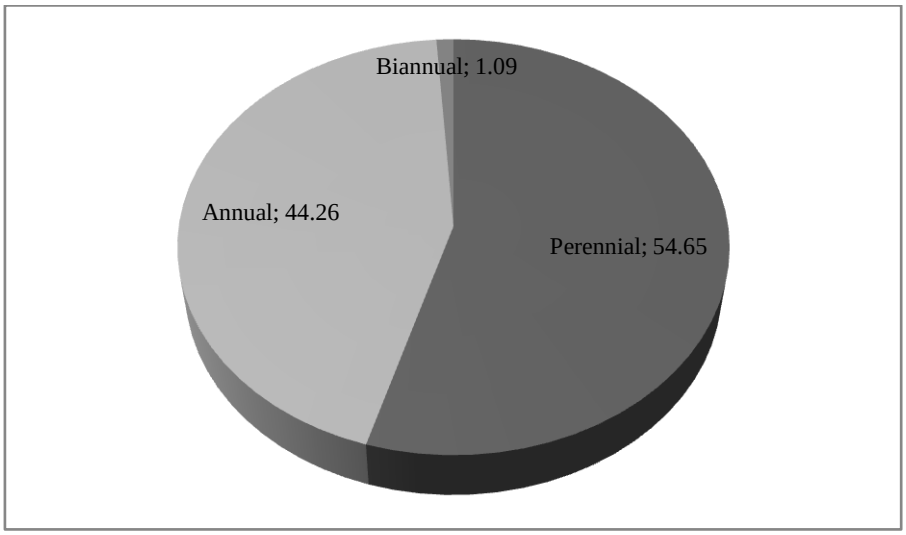

FIG. 10: Distribution of life span in mowed pasture units (%)

In the assessment of life span, the dominant life span are perennials, which constitute 54.65 % of studied flora, followed by annuals (44.26%), and biannuals (1.09%) in the Mowed sites(Figure 10). *Lolium perenne, Trifolium repens, Chrysopogon gryllus , Vicia villosa, Carex flacca, Trifolium* were determined as dominant in mowed pasture units. (Table 1). These plants are perennial. Meanwhile, *Lolium perenne, Trifolium repens , Carex flacca* more common in humid area than dry area .A similar result for Carex flacca was determined by Tölgyesi et al. (2015).According **to** Altın (1992), *Lolium perenne* is a graminae that prefers damp, fertile and heavy soils .

3.5 Pytogeographical Elements of Pasture Species

Together with this, pytogeographical analysis of the study area showed the presence of two uni-regional chorotypes (pytogeographical groups), namely Mediterranean, and Euro-Siberian in addition to multiregionalor is not known groups.

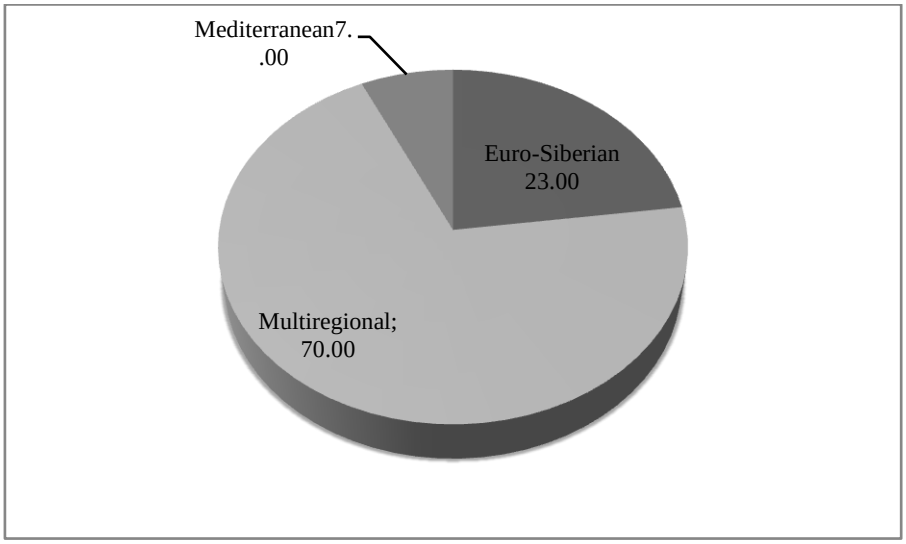

FIG. 11: Distribution of pytogeographical region in abondened pasture units (%)

The distribution of species according to phytogeographical regions is given in Figure 2. Distribution of the taxa according to phytogeographical regions, is follows; 23.00 % Euro-Siberian, 7.00 % Mediterranean, and the ratio of the type which is unknown region and or multi regionals is 70.00% (Figure 11)As the researchers like Zohary (1973) and Donmez (1968) said,

especially parts of coasts consist of elements having Mediterranean vegetation. Cerit and Altin (1999) also said that the research area in Tekirdag is under the effect of Europe-Siberian and Mediterranean elements. Donmez (1968) said that Mediterranean vegetation is seen in the southwest of Trakya (Thrace), in the district of Tekirdag and in the northeast part of Black Sea coast. Deniz and Sumbul, (2004), point out that Turkey serves as a bridge between southwest. Asia and south-east Europe, and little information about the distribution of some species is available, the percentages of multiregional species and those of known phytogeographical origin in Turkey are generally high.

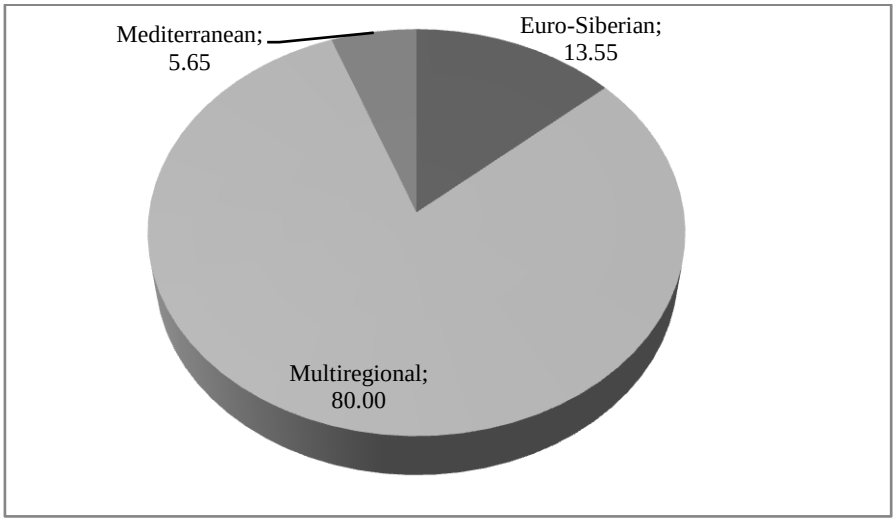

FIG. 12: Distribution of pytogeographical region in grazed pasture units

The distribution of species according to phytogeographical regions is given in Figure 12. Distribution of the taxa according to phytogeographical regions, is follows; 13,55 % Euro-Siberian, 5.65% Mediterranean, and the ratio of the type which is unknown region and or multi regionals is 80.8% (Figure 12).According to; Heithschmidt and Stuth, (1991) the climate, intense grazing pressure can also be a determinant factor for the relative abundance and geographic distribution of different life forms.

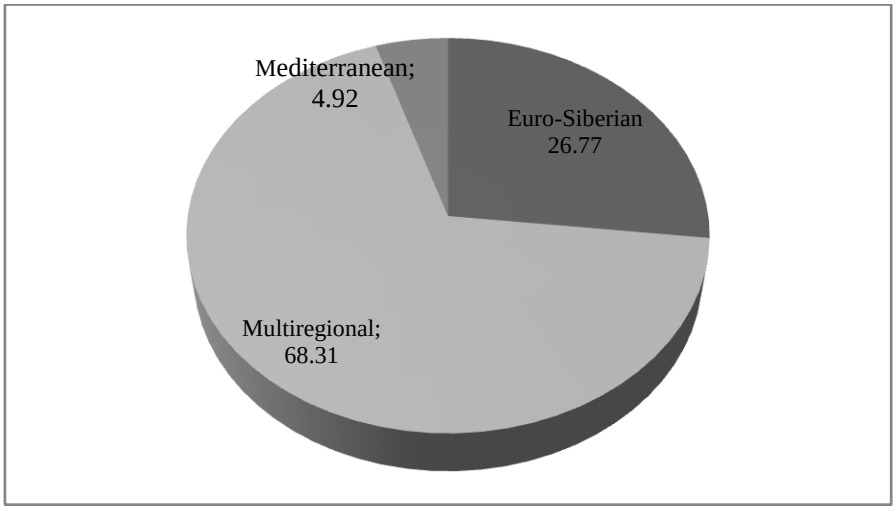

FIG. 13: Distribution of pytogeographical region mowed pasture units (%)

Distribution of the taxa according to phytogeographical regions, is follows; 26,77 % Euro-Siberian, 4,92 % Mediterranean, and the ratio of the type which is unknown region and or multiregionals is 68,31% in mowed pasture (Figure 13).The level of Euro –Siberian elements were determined highest other pasture sites in research area. Europe-Siberian elements prefer usually humid regions and watery and marshy habitats. The majority of elements spreading large fields can arise from the fact that some species of which tolerance are extreme have spread out largely in similar climate and soil conditions (Tuna 2010).In my previous study, distribution of the taxa according to phytogeographical regions, is follows; 13.2% Euro-Siberian, 24.5% Mediterranean, and the ratio of the type which is unknown region and or multiregionals is 62.3 % in Trakya region (Tuna, 2000).

IV. CONCLUSION

The results indicate that species composition changes by grazed, abondened, mowed .It was determined that the diversity can get better in pastures with corrupt vegetation by protecting them against heavy grazing.Pasture management strategies change based on species compositions and, therefore, this information should be available to select for future pasture management decisions . The combination of the frequency, families, life form and life span, phytogeographical region of species identifies of plants that have different importance depending on the duration of land practices, like the increase or reduction in grazing pressure (Tuna 2010). In other words, this quantitative study has the potential to ensure sample for developing suitable management techniques for semiarid and arid region pastures.

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