

DETERMINATION OF MEDICINAL AND AROMATIC PLANT SPECIES AND ITS SOME MORPHOLOGICAL TRAITS IN BOTANICAL COMPOSITION OF PROTECTED RANGELAND AT KUBRAT, BULGARIA

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Abstract

The investigation was carried out the protected rangeland of Kubrat district in northern Bulgaria. In each patch, ten 0.5 m × 0.5 m quadrats were randomly placed for sampling vegetation and measuring green and dry matter yields, plant coverage, botanical composition (Poaceae, Fabaceae, different botanical families, medicinal and aromatic plants ratios in different botanical families) in the south aspect of ungrazed pasture at full bloom stage of dominant species. Five dominant medicinal and aromatic plants [*Paeonia peregrina* Mill. (Fam. Paeoniaceae), *Papaver rhoeas* L. (Fam. Papaveraceae), *Chamomilla recutita* (L.) Rauschert. (Fam. Asteraceae), *Sambucus ebulus* L. (Fam. Caprifoliaceae), *Artemisia absinthium* L. (Fam. Asteraceae)] were identified. The green fodder yield, dry matter yield, plant coverage, Poaceae ratio, Fabaceae ratio and ratio of different botanical families, ratio of medicinal and aromatic plants in different botanical families at full bloom stage of dominant species in ungrazed pasture ranging from 30.13 t ha⁻¹, 8.79 t ha⁻¹, 96-98%, 70.12%, 19.78%, 10.1% and 4.77%, respectively.

Keywords: aromatic plant, medicinal plant, morphological properties, pasture.

1. INTRODUCTION

Permanent rangelands and meadows area is cover almost 72 million hectares in the European Union (EU28) (FAO, 2017). In EU 28, there are various types of grasslands, ranging from almost desertic types in southeast Spain through steppic and mesic types to humid grasslands/meadows, which dominate in the north and north-west (Silva et al., 2008). The principal forage sources in Bulgaria are mainly the natural meadows and rangelands, supplemented by shrubby-like and tree vegetation, and some forage crops cultures, grown on arable areas, as well as waste rough forages (Kirilov and Mihovski, 2014). In Bulgaria, the agricultural area is essentially made up of arable land (86%) and permanent rangelands and meadows (11%). Over the 2003-2013 timeframe, arable land increased by 18 % to 3.4 million hectares and the area of permanent rangeland and meadow almost quadrupled in size from 107 390 to 382 020 hectares (Anonymous, 2018).

Worldwide, it is estimated that up to 70000 species are used in folk medicine (Farnsworth and Soejarto, 1991). The WHO reports over 21000 plant taxa used for medicinal purposes (Groombridge, 1992). But there is no idea how many species are used in the other areas of use, like cosmetics, spirits or aromas which makes determining exactly the number of all medicinal and aromatic plant species used worldwide impossible. However, it can be stated, that at least every fourth plant is in use, a calculation based upon the estimated total number of 300-350000 flowering plants.

Medicinal and aromatic plants are plants, whose roots, leaves, seeds, bark or other parts possess therapeutic, tonic, purgative or other pharmacologic properties. Bulgaria is very rich in medicinal and aromatic plants (MAPs) and other natural resources and has a high biodiversity. Bulgaria's diverse relief, geological features and soil, the characteristic microclimatic conditions along with thousands of years of human activity have determined the wealth and diversity of plant species, communities and natural habitats on the territory of the country.

Around 770 species or 19 % of all plant species in the country are medicinal. Most of them, around 760 species, are wild. Around 250 of them are used in large quantities for trade and processing. The rest are not subject to economic interest, although there is scientific data and practical proof of their useful properties.

The aim of this research was to determine the dominant medicinal and aromatic plant species and its some morphological properties in botanical composition of protected rangeland at Kubrat, Bulgaria.

2. MATERIALS AND METHODS

The investigation was carried out the protected rangeland of Kubrat District in northern Bulgaria (Figure 1). Rangeland soil where the study was conducted was good in organic matter (4.9 %), rich in P content (average of 127.7 kg ha⁻¹), but moderate in K content (71.3 kg ha⁻¹) and with pH 6.1. The mean altitude of this pasture (43° 48' N, 26° 39' E) ranged from 538 to 570 m, with a total precipitation of 525 mm on average and an annual overall temperature of 10.8 °C.



Figure 1. Kubrat District in Northern Bulgaria

In each patch, twenty 1 × 1 m quadrats (Cetiner et al., 2012; Erkovan et al., 2016) were randomly placed for sampling vegetation and measuring total green and dry matter yields, plant coverage, botanical composition (*Poaceae*, *Fabaceae*, different botanical families, medicinal and aromatic plants ratios in different botanical families) in the south aspect of ungrazed natural pasture at full bloom stage of dominant species for the three times a year. Five dominant medicinal and aromatic plants [*Paeonia peregrina* Mill. (Fam. *Paeoniaceae*), *Papaver rhoeas* L. (Fam. *Papaveraceae*), *Chamomilla recutita* (L.) Rauschert. (Fam. *Asteraceae*), *Sambucus ebulus* L. (Fam.

Caprifoliaceae), *Artemisia absinthium* L. (Fam. *Asteraceae*)] were identified. Plant height (cm), number of stem per plant, number of leaves per stems, main stem diameter (mm) and leaf length (cm) were determined in ten plants for each dominant MAPs. Leaf length was measured at the fourth node of the species. The main stem diameter was measured between the third and fourth node (Ates, 2011). Mean comparisons were performed using an ANOVA protected *t* test.

3. RESULTS AND DISCUSSIONS

The results of the statistical analyses for the measurements studied are given Tables 1 and 2.

Table 1. Botanical composition, herbage yield and plant coverage of protected rangeland

Total green fodder yield	Total dry matter yield	Plant coverage	Poaceae ratio	Fabaceae ratio	Other families ratio	Ratios of MAPs in other families
30.13 t ha ⁻¹ year	8.79 t ha ⁻¹ year	96-98%	70.12%	19.78%	10.1%	4.77%

Table 2. Morphological properties of five MAPs in protected rangeland

	<i>Paeonia peregrine</i> Mill.	<i>Papaver rhoeas</i> L.	<i>Chamomilla recutita</i> L.	<i>Sambucus ebulus</i> L.	<i>Artemisia absinthium</i> L.
Plant height (cm)	64.77±2.11	48.77±1.88	57.11±1.23	94.45±5.74	88.77±10.11
Number of stem per plant	3.79±1.3	12.62±1.66	14.12±1.47	2.77±0.42	10.47±2.33
Number of leaves per stems	4.87±0.73	13.41±0.44	7.87±0.33	11.0±0.12	15.2±1.04
Main stem diameter (mm)	10.07±0.22	8.1±0.21	9.5±0.14	26.17±1.07	17.11±1.31
Leaf length (cm)	10.97±1.31	9.45±1.02 cm	6.47±0.33	16.42±1.37	18.41±2.11

The green fodder yield, dry matter yield, plant coverage, *Poaceae* ratio, *Fabaceae* ratio and ratio of different botanical families, ratio of medicinal and aromatic plants in different botanical families at full bloom stage of dominant species in protected rangeland ranging from 30.13 t ha⁻¹ year, 8.79 t ha⁻¹ year, 96-98%, 70.12%, 19.78%, 10.1% and 4.77%, respectively (Table 1). Grasslands are important part of the world vegetation and these area feed and plant species diversity sources as well as wild and domesticated animal and researcher (Tenikecier and Ates, 2018). Erosion inflicts multiple, serious damages in managed ecosystems such as crops, pastures, or forests as well as in natural ecosystems (Durán Zuazo and Rodríguez Pleguezuelo, 2008). Plant cover is certainly the most important factor for erosion. Plant cover is effective in preventing erosion (Bakoglu, 1999) to the extent that it absorbs the kinetic energy of raindrops, covers a large proportion of the soil during periods of the year when rainfall is most aggressive, slows down runoff, and keeps the soil surface porous (Roose, 1996). Bakoglu et al. (2009) reported that the annual species percentage was 13.99 and 16.57% on the grazed and ungrazed rangeland sites, respectively. Tekeli and Ates (2013) studied the agronomic and botanical characters of ungrazed forest range in Northern Bulgaria, who determined that

the green fodder yield, cover index and height of vegetation ranging from 32.1 t ha⁻¹, 97-99 % and 49-51 cm, respectively. Cacan and Kokten (2014) reported that the mean basal cover percentage of the range vegetation was 62.50%. They found a grasses ratio of 46.67 %, a legumes ratio of 4.85 % and other families of 48.47 % in the total plant cover. Furthermore, the data of this research is higher than hay yield in protected pastures in the different ecological conditions in studies conducted by Tuna (2000) and Gur et al. (2015).



Figure 2.
Paeonia peregrina
Mill.

Figure 3.
Papaver rhoeas L.

Figure 4.
Chamomilla recutita
L.

Figure 5.
Sambucus ebulus L.

Figure 6.
Artemisia absinthium
L.

The plant heights of MAPs were ranged from 48.77 to 94.45 cm. The highest plant height (94.45cm) was obtained from *Sambucus ebulus* L., while minimum number of stem per plant (2.77) was measured in same plant (Table 2). Ebadi and Hisoriev (2011) determined that plant height of *Sambucus ebulus* L. was between 50 and 150 cm. Our results were found within the limits reported by these researchers.

The plant height and number of leaves per stems of *Paeonia peregrina* Mill. was determined 64.77 cm and 4.87, respectively (Table 2). Passalacqua and Bernardo (2004) indicated that plant height of *Paeonia* L. genus was between 30 and 90 cm, and the number of leaves per plant were ranged from 3 to 8. The plant height of *Chamomilla recutita* L. was determined 57.11 cm in this study (Table 2). Many researchers reported that *Chamomilla recutita* L. is one of the best examples crop with variability for plant height. Means of plant height in chamomile populations were between 21.83 and 34.73 cm (Taviani et al., 2002), the plant height of wild chamomile populations varied between 5 and 68 cm (Gosztola, 2012), the plant heights of chamomile species were ranged from 42.00 to 48.66 cm in Karaj, Iran (Adeli et al., 2013). The maximum leaf length (18.41 cm), number of leaves per plant (15.2) and main stem diameter (17.11 mm) were found in *Artemisia absinthium* L. (Table 2). Judzentiene (2016) reported that the plant height of *Artemisia absinthium* L. were ranged from 0.5 to 1.1 m and the leaves are up to 20cm in length. In addition to Nguyen et al. (2017), reported that average leaf length of nine *Artemisia absinthium* L. accessions was 17 cm, similar to the present findings. Mitroi et al. (2010) reported that the average of plant height in *Papaver rhoeas* L. was 74.7 cm, number of stem per plant 13.58, and also Sherifi and Shabani (2014) indicated that the length of the leaves in *Papaver rhoeas* L. was 10.5 cm, similar to the present findings.

4. CONCLUSIONS

According to results, total green fodder yield and dry matter yield, plant coverage and plant species diversity of protected rangeland was determined to be higher. The morphological characters of dominant MAPs found in protected rangeland of in this region has not to be investigated. However, this research will help the scientists to uncover the critical areas of morphological characters in *Paeonia peregrina* Mill. (Fam. *Paeoniaceae*), *Papaver rhoeas* L. (Fam. *Papaveraceae*), *Chamomilla recutita* (L.) Rauschert. (Fam. *Asteraceae*), *Sambucus ebulus* L. (Fam. *Caprifoliaceae*), *Artemisia absinthium* L. (Fam. *Asteraceae*) under northern Bulgaria ecological conditions that many researchers were not able to explore. Thus, a new theory on animal feeding, medicinal and aromatic plants may be arrived at.

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