RESEARCH ARTICLE

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Nutritional value of *Juncus acutus* in the wetland of Kızılırmak delta

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Abstract

Juncus acutus, a wetland plant, helps improve habitats for both terrestrial and aquatic creatures and spawning grounds for fish. A variety of wetland birds use between the trunks of the *juncus* as a shelter. They also help prevent soil erosion due to their extensive root systems. On the other hand, it can be said that it has a negative effect on the feeding of grassland animals due to the high density in wetlands.

Plant materials from Juncus acutus, which is intensively located in the Kızılırmak Delta, were taken in two different periods, in April and July. The changes in the nutrient content of the plant during the spring and summer periods were investigated and the quality features were divulged. According to the research results; It was observed that the water buffaloes in the Kızılırmak Delta were not fed with *Juncus acutus* for feeding purposes, the forage quality was low, but the livestock grazed a little on *Juncus acutus* when they first went to the wetland in early spring.

Keywords: Kızılırmak Delta, *Juncus*, Quality, Buffalo

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INTRODUCTION

When the main habitat types and related habitats are examined in the Kızılırmak Delta, it has been determined that there are 12 different species groups (plant associations, plant communities). These groups of species have come together in different parts of the delta according to their relations and contacts with fresh and salt water, changes in soil structure and formed plant communities with different floristic compositions (Şahin et al. 2013). One of these plant communities is salt marshes.

Salt marshes are distinguished from dunes and forests in the Kızılırmak Delta, especially in the vicinity of lakes, in that they grow on heavier textured alluvial soil at the base. The soil structure is relatively salty and is well salted in places. Most of these swamps are submerged in winter by the growth of lakes. Therefore, it consists of water and salt resistant species. The dominant species of these communities are *Juncus* species (Şahin et al. 2013).

Juncus species are generally considered beneficial in wild ecosystems. *Juncus* is used as food and habitat by a wide variety of mammal and bird species (Hoag and Zierke 1998). *Juncus* can be said to have positive effects on wetlands in erosion control, sediment deposition and stabilization, nutrient uptake and conversion, wildlife food and cover, restoration and creation of wetland ecosystems, and wastewater treatment applications (Stevens et al. 2012).

It is known that *Juncus* is soft during the fresh sprout period when they give new

shoots from the soil and are eaten fondly by buffaloes. In this way, the spread of the pods, which are eaten and atrophied during the sprouting period, is taken under control. However, due to the fluctuation of the buffalo population in the delta in the last 20-30 years, the pressure on grazing of cows has not followed a regular course. Buffaloes in the delta are not affected by this plant with their thick skin, and they spend a lot of time here as they like to lie in swampy soil. Therefore, the plants between the buffaloes are overgrazed, and pits are formed in the places where the buffaloes tread heavily on the soft soil. (Anonymous, 2018). The reason why buffaloes live in wetlands is that they have problems withstanding high temperatures. This is because they have skin that is about six times thicker than that of cattle and they have about one-sixth as many sweat glands as cattle (Sambraus and Spannl-Flor 2005).

In this study; The quality characteristics of *Juncus acutus*, which is densely located in the Kızılırmak Delta, were examined in two different periods, March and July.

MATERIALS AND METHODS

This research was carried out in the Kızılırmak Delta in March and July 2022. The study area, its northern end, is at 41° 4323´ N, 35° 5813´ E; Its southern end is located between 41° 3359´ N, 35° 5903´ E. The altitude of the area from the sea is in the range of 0-5 m. Plant samples were taken from *Juncus acutus*, which is densely located in the Kızılırmak Delta, in 2 different periods (March and July). The plant samples taken were dried in a drying cabinet at 70°C for 48 hours (Albayrak and Oten, 2020). For crude protein content, 1 g of each grinded sample was weighed and crude protein ratios were determined as % by applying the Kjeldahl method with the help of previously prepared solutions. ADF and NDF analyzes were made with the help of ANKOM 220 Fiber Analyzer (Ankom Technology, Magedon, NY, USA) according to the principles reported by ANKOM technology (Albayrak and Öten, 2020). Samples were analyzed in 3 replications.

Total digestible nutrients (TDN), Dry matter intake (DMI), Digestible dry matter (DDM), Metabolic energy (ME) and Relative feed value (RFV) were calculated according to the equation specified by (Albayrak et al. 2012).

TDN = (-1.291 x ADF) + 101.35

DMI = 120% NDF % dry matter basis

DDM = 88.9-(0.779 x ADF % dry matter basis)

ME = 0.15 x ADF (MJ/kg KM)

RFV = DDM x DMI x 0.775

RESULTS AND DISCUSSION

The values of the quality parameters of *Juncus acutus* are given in Table 1. In their studies on *Juncus acutus*, it was reported that the crude protein ratio was in the range of 4.85-7.10% (Erdem et al. 2015; Genç et al. 2017; Joshi et al. 2018). In order to maintain its weight in various ruminant animals, the crude protein ratio of the forage consumed should be at least 6 -8% CP (Esmaeli and Ebrahimi, 2003; Moinuddin et al. 2012). In our study, HP ratio of *Juncus acutus* decreased from 5.27% in April to 4.12% in July. Therefore, it can be said that the water buffaloes released to the delta in the Kızılırmak Delta in April ate the *Juncus acutus*, although partially, and the crude protein ratio of the plant remained within the quality limits during this period. The stem ends of *Juncus acutus* are pointed and stinging. Therefore, they do not graze in the late period. In the absence of grazing pressure, they develop and spread easily. However, it is known that *Juncus acutus* is soft during the fresh sprouting period when it gives new shoots from the soil, and it is fondly eaten by buffaloes taken to the delta with spring (Anonymous, 2018).

Table 1. Average Crude protein ratio (CP), Fiber insoluble in acid solvents ADF), Insoluble fiber in neutral solvents (NDF), Total digestible nutrients (TDN), Dry matter intake (DMI), Digestible dry matter (DDM), Metabolic energy (ME) and Relative Feed Value (RFV)

	CP (%)	ADF (%)	NDF (%)	TDN (%)	ME (MJ/kg)	RFV
April	5.27	45.82	72.58	42.20	6.87	68.18
July	4.12	48.94	77.23	38.17	7.34	61.14

The ADF rate of *Juncus acutus* was determined as 45.82% and the NDF rate as 72.58% in April, these values increased to 48.94% and 77.23%, respectively, in July. While the total digestible nutritional value (TDN) was 42.20% in April, it was 38.17% in July.

Fibers contain the least digestible parts of the herb. NDF ratio is always higher than ADF ratio (Cash and Bowman, 1993). In studies on the determination of ADF and NDF ratios of Juncus acutus plant; Young et al. (2017) found the ADF rate to be 48.81% and the NDF rate to be 74.83%. Çetinkaya and Erdem (2015) determined the ADF rate of *Juncus acutus* as 45.84% and the NDF rate as 73.14%. Like non-halophytic roughages, most halophytic roughages have high nutritional and palatability early in development, whereas the reverse is true late in growth (El Shaer, 2010). As a matter of fact, in our study, while the ADF and NDF ratios of *Juncus acutus* were lower at the beginning of spring, it was observed that the fiber content of the plant increased in the middle of summer. The chemical composition of halophyte roughages affects their flavor. For example, if the percentage of crude fiber is high in roughage, it will play an important role in the selection by the livestock. Forages with high fiber content are generally preferred by cattle more than sheep and goats (Attia-Ismail, 2018). Considering that the study area is grazed by the buffalo population, it should be considered that *Juncus acutus*, which lives in a salty environment, is preferred by this livestock.

The metabolic energy values of *Juncus acutus* were mea-

Figure 1. Grazing of *Juncus acutus* by water buffaloes

Figure 2. *Juncus acutus*. The measuring stick is 1 m long

Figure 3. Water buffaloes resting in mud in area surrounded by *Juncus acutus.*

sured as 6.87-7.34 MJ/kg DM. Nutritional value parameters differed from species to species, and it has been reported in many studies that the nutritional values of various species may differ from each other. As a matter of fact, Erdem et al. (2015) The metabolic energy value of *Juncus acutus* was 6.44, Genç et al. (2017) 6.89, Çetinkaya and Erdem (2015) determined 8.65 MJ/kg DM.

The Relative feed value (RFV) of the plant decreased from 68.18 in April to 61.14 in July. It is reported that if the RFV value of fodder is greater than 180, it is in the highest quality class, in the range of 150-180 superior, 125-150 good, 100-120 medium. If the RFV of the herb is below 100, it has low quality values (Albayrak and Öten, 2020). In the present study, relative feed value of *Juncus acutus* has low-quality class.

CONCLUSION

It was concluded that the quality values of *Juncus acutus*, which is densely located in the Kızılırmak Delta, are low. Although it is seen that the buffalo population grazing in the delta grazes the plant at the beginning of spring; *Juncus acutus* should not be seen as the main food source for livestock.

COMPLIANCE WITH ETHICAL STANDARDS

Conflict of interest

The authors declared that for this research article, they have no actual, potential or perceived conflict of interest.

Author contribution

The contribution of the authors to the present study is equal. All the authors read and approved the final manuscript. All the authors verify that the Text, Figures, and Tables are original and that they have not been published before.

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