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Nutritional Evaluation Of The Most Common Used Fodder Species By Rural People Of Sainj Valley District Kullu, Himachal Pradesh.

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Abstract
India is the world leader in livestock production, employing over 75% of the rural population. However, in our country, fodder production is not practiced, and animals eat naturally grown grasses and shrubs that are low in protein and energy availability. As a result, there is an urgent need to seek out new fodder resources that are both environmentally sustainable and capable of covering our fodder deficit. The current study will assess the most common fodder species in the Sainj valley. Interviews with key informants, group discussions, and field observations were used to collect primary data on the most common fodder species. The ten most common fodder species fed to livestock locally are Arundo donax, Bambusa arundinacea, Bauhinia variegata, Cyperus rotundus, Ficus carica, Morus alba, Phoenix sylvestris, Plantago asiatica, Sorghum halepense, and Thalictrum foliosum. Using traditional lab methods, data on leaf samples from ten different species of fodder were collected for a total of seven nutritional variables. Concerning the nutritional components, a one-way analysis of variance was performed using descriptive statistics. The ten most preferred fodder species were nutritionally analyzed in terms of moisture, ash, crude protein, crude fat, crude fiber, NDF, and ADF. The results revealed that Sorghum halepense had the highest amount of crude protein, Morus alba had the lowest NDF value, and Bambusa arundinacea had the lowest ADF value.

Keywords: *Livestock, Fodder, Nutritional value, Rural people.*

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I. Introduction

Livestock is a major source of income for rural people, and they heavily rely on forest-based fodder to feed them (Chander and Sharma, 2018).Livestock is considered one of the most important sources of income, with a significant dependence on fodder. Forests, grasslands, agricultural land, and agroforestry practices are utilized for fodder production. The largest component of biomass energy is forest fodder, playing a crucial role in improving livestock nutritional requirements.

The scarcity of green forage in summer and winter has always been a serious problem, resulting in nutritional deficiencies in milch animals. Fodder availability is abundant during the rainy season, but there is a fodder crisis during other seasons because people are not aware of scientific conservation of grasses for lean periods. Limited studies on fodder resources in the Northwest Himalayas have been conducted. Livestock owners in the Northwest Himalayas have developed traditional methods of treating animal ailments. The seasonal availability of fodder species varies by season, influenced by species availability during different seasons. The rainy season contributes to the abundance of green grasses and other herbaceous plants used as fodder, containing nutritional components such as crude protein, fat, fiber, carbohydrates, and minerals. The nutrient content of fodder tree species is high, but it varies from species to species (Mahato and Subba, 1998).Approximately 279 fodder species are known in the West Himalaya (Samant, 1998). Livestock is a major source of livelihood and an integral part of the economy. They mainly depend on forest-based fodder to feed livestock, although some fodder requirements are met from agricultural and agroforestry systems (Chander and Sharma, 2018). India, being rich in the diversity of foliage trees, has enormous potential for using tree foliage as a basal feed or forage supplement (Katoch, 2009). In hilly areas, livestock mostly rely on fodder from forests, and herbs are used as fodder mainly in the rainy season (Nautiyal et al., 2018).

India has the world's largest livestock population, accounting for approximately 15% of the total. The livestock sector's contribution to India's GDP has recently increased from 4.82 to 5.37 percent (Wangchuk et al., 2015). "Growth" refers to the process of increasing the size of a population through technology. Fodder trees provide nutritious feed to the livestock population of hill farmers (Diriba, 2014). Even landless laborers who keep small herds of animals rely on top feed resources from trees growing near habitats. The primary reason for this is the high population density. Fodder trees and grasses are common land use systems in the North-Western Himalaya, and they have always been used to feed livestock. Trees and grasses are increasingly recognized as important components of animal feed, particularly as protein sources. In the current situation, acute nutrient deficiency causes malnutrition, low productivity, and predisposes livestock to parasitism, epidemics, and breeding problems. Mismanagement of rangelands has harmed the ecosystem. The availability of high-quality fodder influences livestock productivity (Kohler et al., 2015). Forests provide 57 percent of India's total fodder requirement. Many studies on the chemical composition of browse species have been conducted in recent years, and the protein, mineral, and vitamin concentrations have generally been shown to be adequate for grazing maintenance requirements (Rani et al., 2015). Considering the significance of fodder quality, a study was conducted to evaluate the nutritional content of fodder species in the Sunder Nagar District of Mandi, Himachal Pradesh. The current study was carried out to determine the nutritional value of the most-used fodder species fed to livestock by rural residents of Sainj valley District Kullu. This study will aid in understanding the nutritive composition of local fodder species and recommending compositions in dietary supplements. The purpose of this research was to determine the nutritional value of the ten most-used fodder species in Sainj valley. Due to their high use value, ten fodder plants were chosen for nutritional analysis in the current study. Evaluating scientific documentation on fodder plants is critical.

II. Materials and Methods

Study site

The current survey was conducted in the Sainj Valley, District Kullu. Extensive field visits were undertaken during the period from 2022 to 2023. The most common fodder species in the study area, used for feeding livestock locally, were collected in July 2022. The fodder species included *Arundo donax*, *Bambusa arundinacea*, *Bauhinia variegata*, *Cyperus rotundus*, *Ficus carica*, *Morus alba*, *Phoenix sylvestris*, *Plantago asiatica*, *Sorghum halepense*, and *Thalictrum foliosum*.

Sample collection and preparation

Proximate analysis of Plant samples

The leaf samples were collected and thoroughly rinsed with both tap water and deionized water before being spread out on a sheet of paper to air dry. Subsequently, they were placed in a paper bag and subjected to drying in a hot air oven at 60 ± 5 0°C for 48 hours. To facilitate further chemical analysis, the dried samples were crushed, powdered, and then stored in polythene bags in a dry, dark place at room temperature.

Determination of the moisture

An empty weighing vessel was oven dried for one hour at 105° C, cooled in a desiccator, and weighed (W1). A dry leaf sample weighing (2.000±0.001) grams (W2) is placed in the jar and oven dried at 105°C until it achieves a constant weight. It was then weighed after cooling in a desiccator (W3). The percentage moisture will be calculated using the Unuofin et al., (2017) method.

Moisture (%) = W2 – W3/ W2-W1
x 100

Determination of Ash

A porcelain crucible marked with a heat resistant marking was dried for 1 hour at 105°C, and then weighed after cooling in a desiccator (W1). Then 2 grams of the ground leaf sample were weighed again in the previously weighted crucible (W2). The crucible and its contents ashes in a muffle furnace, first at 250°C for an hour and then at 550°C for five hours. The leaf sample weighed after cooling in a desiccator (W3). The ash % calculated using the Unuofin et al., (2017) approach.

Ash (%) = W2-W3 / W2-W1x100

Determination of crude fat

The leaf powdered sample (5g) was extracted in 100 mL of diethyl ether and then shaken for 24 hours on an orbital shaker. The extract then filtered, and the ether extract collected in a clean beaker that was previously weighed (W1). It was shaken for another 24 hours after being equilibrated with 100 mL diethyl ether. In the same beaker, the filtrate was collected (W1). The ether then dried in an oven at 40–60° C after being concentrated to dryness in a steam bath, and the beaker reweighed (W2). The crude fat content is determined using the Unuofin et al., (2017) method.

Crude fat (%) = Weight of flask with fat - weight of empty flask\ Weight of original sample x 100

Determination of crude fiber

2g of dried leaf sample was digested by boiling for 30 minutes in 100 mL of 1.25%sulphuric acid solution and then filtering under pressure. Boiling water is used to rinse the residue four times. This procedure was repeated with 100 mL of 1.25 %NaOH solution on the residue. The final residue dried at 100 degrees Celsius, cooled in a desiccator, and weighed (C1).

It was then be incinerated in a muffle furnace at 550°C for 5 hours before being moved to a desiccator to cool and reweighed (C2). Unuofin et al.(2017), method will be used to obtain crude fiber.

% Crude fiber = C2 − C1 \ Weight of original sample x 100

Determination of crude protein

2 gram powdered leaf sample was digested in a Kjeldahl flask by boiling with 20 ml of conc. The digest was filtered and made up to mark in a 250mLvolumetric flask, then distilled. The aliquot plus 50 ml of 45% Sodium hydroxide solution is transferred in to a 500mL round bottom flask and distilled. In a flask containing 100 mL 0.1 NH_4CL 150 mL of the distillate is collected. This is then titrated against 2.0 mol/ NaOH using methyl orange as indicator. The end point is specified by a colour change to yellow.The nitrogen content calculated by following method of Unuofin et al., (2017). (mL standard acid × N of acid) – (ml blank × N of base) – (ml std base × N of base) × 1:4007 Weight of sample in grams

Where, N = normality, percentage crude protein is obtained by multiplying the nitrogen value by a factor of 6.25% crude protein = Nitrogen in sample x 6.25.

Neutral detergent fiber (NDF)

The neutral detergent fiber of dried leaf was determined using the Van Soest and Wine (1967) method. Following that, a 500 mg dried leaf sample was weighed in a beaker of refluxing apparatus (in triplicate) with 100 mL neutral detergent solution. 2ml decahydronapthalein and 0.5g sodium sulphate was added. It was then brought to a boil. To prevent foaming, the heat was turned off as soon as the boiling started, and the mixture was left to reflux for 60 minutes. It is then filtered in a weighed Gooch crucible with a minimum of hot distilled water. The filtered liquid is reused before the washing cycle. The washing was also done with acetone and dried. In a hot air furnace, the crucible dried for 8 hours.

Acid detergent fiber (ADF)

Van Soest and Wine's (1967) acid detergent fiber (ADF) determination method was employed. A 500 mg dried powdered leaf sample (in triplicate) was weighed in a beaker of the refluxing equipment. 100 mL acid detergent solution and 2 mL decahydronapthalein were added to dilute it. The mixture was then heated to a boil and refluxed for an hour before being filtered through a filter manifold using a weighed Gooch crucible. Following that, the sample was rinsed in the crucible with as little hot water as possible (90 to 100° C). Finally, the residue was washed with acetone in the same manner until it was colorless. The aggregates are then separated, allowing the solvent to access every fiber particle. ADF was dried for 8 hours at 1000 degrees Celsius.

III. Results

Nutrient Composition

The nutrient was analyzed in 10 most used fodder species collected from Sainj valley District Mandi. In the current study, moisture content was found to be highest in Cyperus rotundus (68.29%)and lowest in *Bauhinia variegata* (45.36%) ; ash content was found highest in *Platago asiatica* (7.40%) and lowest in *Bauhinia variegata* (4.26%) ; crude fat was found highest in *Bambusa arundinacea* (2.34%) and lowest in *Phoenix sylvestris* (1.23%) ; crude fiber was highest in *Morus alba* (31.76%) and lowest in *Arundo donax* (19.85%) ; crude protein was reported highest *Sorghum halepense* (6.52%)and lowest in *Bauhinia variegata* (3.80%) ; NDF was found highest in *Ficus carica* (57.23%) and lowest in *Bauhinia variegata* (42.24%) ; ADF was highest in *Cyperus rotundus* (51.11%) and lowest in *Morus alba* (41.28%).

IV. Discussion

The selection of plant species for systematic classification, plant improvement initiatives, and nutraceutical relevance depends on the amount and quality of crude protein content discovered in plant samples. Protein was determined using the Kjeldahl method in previous studies by various researchers. Several studies have identified protein, fats, and fiber as essential nutrients. Fodder species have effective nutritional foundations.

Fodders are important for meeting the energy and nutritional needs of livestock.

Carbohydrates, proteins, and fats are plant nutrients that also play an important role in creating a healthier organ control system in animals .

The physicochemical parameters studied will be used to characterize and standardize the experimental plants. A higher moisture content in the leaves explains the higher degree of fodder spoilage. The ash content of a fodder determines its consistency, identifying it as carbon-free and displaying the sample's organic, inorganic, and impurity content. The total ash content predicts the soluble and insoluble minerals in the sample.

In earlier research, it was shown that leaf samples have significant levels of crude fiber, which aids in digestion, proteins, which are the building blocks of cells, and lipids, which offer energy and help with the absorption of fat-soluble vitamins.

V. Conclusion

All the fodder species had nutrient variations, and they are good sources of fodder for grazing animals. The livestock in the study area are fed these available fodder species.

Conflicts of interest

We declare that we have no conflicts of interest.

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