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Assessing the suitability of meadows of Vagamon hill ranges of Kerala for grazing of dairy cattle#

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Abstract

In India, majority of the small-holder farmers are depending on semi-extensive farming system. The cost-effective method of semi-extensive farming is being practised in the hilly regions of Kerala, especially the Vagamon hill ranges of Idukki district. Scientific dairy farming in such semi-extensive farming systems requires evaluation of the quality of grasses in meadows, animal preference to flora and the soil quality. The study was conducted at the Base Farm, Kolahalamedu under Kerala Veterinary and Animal Sciences University where the animals are regularly left out for grazing. The most preferred grass species by the grazing animals was Congo signal in the meadows. Cultivated fodder (Setaria sp.) was also offered to the animals while at the shed. The dry matter content of grass species favoured to meet the dry matter requirement of animals to a major extent and hence the enrichment of soil quality of the meadows will increase the nutritive quality and biomass content of grasses. It is suggested that, proper management of meadows of Vagamon hill ranges with respect to type of grasses and soil quality will favour cost-effective dairy farming

Keywords: *Grazing meadows, Kerala, scientific farming*

Meadow is an area predominantly occupied by natural grasses with few trees and shrubs. It is an ecosystem supporting a wide biodiversity of fauna ranging from small insects to large herbivores. Across the world, livestock farming is depending on meadows to meet the nutrient requirements particularly for dairy cattle. Natural meadows benefit small holder dairy farmers for cost effective farming by providing forage inexpensively and in bulk. In Kerala, especially in the

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high ranges, grazing is being widely practised by dairy farmers wherever natural meadows are available (George *et al*., 2018; George, 2016).

The quality and quantity of biomass available to livestock vary considerably depending on the location, season and vegetation. It is necessary to understand the quality of the meadow to regulate grazing practice for effective dairy farming. Periodical assessment of grass and soil nutrients and implementing corrective measures are essential for the effective utilization of naturally available resources for sustainable dairy farming. This study was an attempt to assess the nutrient status of the grasslands of the Kolahalamedu region in Vagamon hills of Kerala.

Materials and methods

The study was conducted at the meadows of Base Farm, Kolahalamedu under Kerala Veterinary and Animal Sciences University in Vagamon hills of Kerala during the months of February and March of 2021. The farm had a stocking density of 140 crossbred and a few indigenous cattle and extended to 100 acres of open meadows. The farm is located at 9º 64' 92" N and 76º 93' 12" E, with an elevation of 1100m above mean sea level. Cultivated grasses (*Setaria sp.*) were also given to animals after the grazing in the shed.

Grazing pattern of dairy cattle

Regular grazing in hilly meadows was practised in the farm for six hours daily from 6:30 a.m. to 12:30 p.m. Major share of the roughage requirement was met from grazing and the required levels of concentrate were fed during the afternoon hours in the shed.

Grass collection and identification

Representative samples of grasses and shrubs consumed by the animals from the meadows were collected and identified. The selected grass samples from grazing meadows and fodder plots were analysed for proximate principles. The whole grass was uprooted, dusted out of the soil and weighed. Representative samples of 200g were analysed for proximate principles (AOAC, 2012).

Soil nutrient status

Representative samples of soil from the grazing meadows were collected for analysing the nutrient status. Nutrients such as nitrogen (Alkaline permanganometry), phosphorus (Bray No. 1 extraction and spectrometry), potassium (extraction with neutral normal ammonium acetate followed by flame photometry) and organic carbon (wet oxidation) were assessed through standard protocols (KAU, 2016). The collected soil samples were analysed at the Regional Soil Analytical Laboratory under the Department of Agriculture and Farmers Welfare at Thrissur.

Results and discussion

Types of grasses and shrubs

Based on the bite marks of the animals, the consumed grass and shrubs were identified. Among these plants (Table 1), animal preference was more for grasses than shrubs. The most preferred plant species by animals was the Congo signal (*Brachiaria ruziziensis*). Previously, George *et al.* (2018) also identified the grass species of Congo signal and Setaria in the hilly meadows of Base farm, Kolahalamedu. Mathew *et al.* (2014) reported that the biodiversity in the Vagamon hills was highly endemic and they identified 77 species of plants, out of which 18 were only seen in peninsular India. Presence of toxic plants viz. giant sensitive plant (*Mimosa invisa*) has been reported to cause renal toxicity (Borah *et al.,* 2020) and common lantana (*Lantana camara*) was reported to cause photosensitivity dermatitis (KVASU, 2016) which were noticed in the grazing meadows. These phytotoxic plants should be removed from the meadows for reducing the possibility of poisoning from plants during grazing.

Proximate composition of grass

The proximate analysis revealed that the dry matter content of grasses in the meadows was higher (25.67 ± 0.49%) than the cultivated fodder (*Setaria sp.*) whereas, the crude protein (14.80 ± 0.48%) and crude fibre (33.16 ± 0.47%) were more in Setaria sp. compared to the grass sample (Table 2).

Table 1. Plant species identified from meadows

Sl. No	Grass/shrub common name	Scientific name	Local name (Malayalam)
1	Congo signal	*Brachiaria ruziziensis*	Congo signal pullu
2	Goat weed	*Ageratum conyzoides*	Appa, Kattappa, Kumminnipacha
3	Hill glory bower	*Clerodendron infortunatum*	Peruku
4	Morning glory	*Ipomoea sp.*	Kolambipoo
5	Common lantana	*Lantana camara*	Arippoochedi, Arippu
6	Wild berry	*Maesa indica*	Kireethi, Kattuvizhal
7	Golden thimothy	*Setaria sp.*	Setariapullu
8	Giant sensitive plant	*Mimosa invisa*	Anathottavadi
9	Sleepy plant	*Mimosa pudica*	Thottavadi
10	Wall Osbeckia	*Osbeckia sp.*	Cherukulathi, Kunjathirani
11	Mission grass	*Pennisetum polystachion*	Nambeesan pullu
12	Blue snakeweed	*Stachytarpheta sp.*	Katapunnuttu

Table 2. Proximate principles of grass in grazing meadows and cultivated fodder

Grass Sample	Dry matter (%)	Per cent on dry matter basis				
		Crude protein	Ether extract	Crude fibre	Total ash	Nitrogen free extract
Meadow grass	25.67 ± 0.49	7.77 ± 0.49	2.46 ± 0.07	26.10 ± 0.70	5.62 ± 0.59	58.02 ± 0.46
Setaria sp. fodder	17.08 ± 0.435	14.80 ± 0.48	2.71 ± 0.07	33.16 ± 0.47	8.36 ± 0.02	40.97 ± 0.10

Animals were fed with a ration of two kilograms concentrate per animal and lactating cows were fed extra concentrate at the rate of 400g per litre of milk produced. The remaining dry matter requirements of animals were met by grazing on grasses with high dry matter content. According to ICAR (2012), the *Setaria sphacelata* grass species had the crude protein 11.50, crude fibre 28.90 and nitrogen free extract 45.35 per cent respectively which were lower than the present study. Both the high nutrient enriched cultivated Setaria sp. fodder and grass species in the meadows ensured the better availability of nutrients to the animals.

Soil nutrient status

The soil nutrient status of grazing meadows included the parameters such as pH, nitrogen (kg/ha), phosphorus (kg/ha), potassium (kg/ha) and organic carbon (%) which were analysed to understand the nutrient quality of the soil. The soil pH (Table 3) was extremely acidic in nature (4.16 ± 0.05) and it would not be favourable for fodder production.

Sreepriya and Balasubramanian (2020) also found similar results where the soil of the Idukki district was more acidic {86.25% were moderately acidic (pH=5.6-6.0) and 9.68% were strongly acidic (pH=5.1-5.5)} than the other districts in Kerala. The nitrogen (249.85 ± 9.71 Kg/ha) and phosphorus (6.5 ± 1.38Kg/ha) content in the study area were at a low level and soil management such as adding urea and rock phosphate could be beneficial for increasing the biomass yield of grasses and fodders (KAU, 2016). The very low potassium (69.66 ± 18.33Kg/ha) content in the grazing meadows could be corrected by adding muriate of potash. The soil carbon (1.23 ± 0.04%) content was favourable for increasing

Table 3. Proximate principles of soil in grazing meadows

Soil Sample	Parameters				
	pH	Organic carbon (%)	Nitrogen (kg/ha)	Phosphorus (kg/ha)	Potassium (kg/ha)
Meadow	4.16 ± 0.05	1.23 ± 0.04	249.85 ± 9.71	6.5 ± 1.38	69.66 ± 18.33

the yield of cultivated fodders. The proper soil management of the grazing meadows would be effective for fodder grass production which in turn supports cost effective and sustainable dairy farming.

Conclusion

The present study revealed that the availability of grasses and shrubs with moderate nutritive value in the grazing meadows of Vagamon hills of Idukki district served as an inexpensive source for dry matter and nutrient requirement and reduced the demand for cultivated fodder. The quality and quantity of the biomass yield from the meadows can be improved considerably by scientific soil management practices. Dairy farming with regular grazing practices and proper management of meadows can favour the increment of profit of small holder dairy farmers in high ranges of the Idukki district.

Conflict of interest

The authors declare that they have no conflict of interest.

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