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Botanical Composition and Forage Quality as Swamp Buffalo (*Bubalus bubalis*) Feed In Jembrana Regency, Bali Province– Indonesia

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ABSTRACT: This study aimed to study the botanical composition and feed quality for swamp buffalo in Jembrana Regency, province of Bali - Indonesia. Research using the survey method use samples obtained by proportional stratified sampling for the five districts in Jembrana Regency. Measuring the production and botanical composition of forage was carried out by using the square in the "Actual Weight Estimate" method. Chemical analysis of the feed carried out at the Laboratory of Nutrition and Animal Feed Science, Faculty of Animal Husbandry, University of Udayana. The results showed that the botanical composition of forage for swamp buffalo consisted of *Brachiaria reptans, Panikum repen, Lercia Hexandra, Cynodon dactylon, Ischainum sp, Digitaria sp, Alysicarpus vaginalis,* and weed. Only *Alysicarpus vaginalis* as leguminous plants have been detected. The crude protein content of the ration was quite high, namely 12.94% with a digestibility of 66.73%. Based on the results of the study, it can be concluded that the botanical composition of forage for swamp buffalo in Jembrana Regency is quite diverse with good quality. Leguminous plant introduction needs to be done to improve feed quality.

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KEYWORDS: swamp buffalo, botanical composition, nutrient content, nutrient digestibility.

INTRODUCTION

Forage is the main feed of ruminant including swamp buffalo. The availability of forage must be sustainable so that the buffalo population and productivity increases. The population of swamp buffalo in Bali is 1449 head and the largest number is in Jembrana Regency, namely 1155 head (Directorate General of Animal Husbandry and Animal Health, Ministry of Agriculture, 2022). Apart from cultivating agricultural land and producing meat, in this area buffalo can also be used as a means of entertainment which has an attraction for tourists. (Oka *et al.,* 2014).

The development of buffalo farming in Bali is currently faced with various problems that greatly affect its productivity. One of the main problems faced is the limited availability of feed, both forage and concentrate. Meanwhile, the carrying capacity of a region's land for animal husbandry can be measured by the region's ability to provide feed originating from forage that can be utilized by livestock. In order to ensure the optimum health of the animals and the organized production of high-quality and safe animal products, a proper diet ratio arguably represents the easiest strategy that can be implemented by farmers at the farm level (Mohd Azmi *et al.*, 2021).

Botanical composition is an indicator of the productivity of a pasture, it can be determined by detecting the component composition of grasses, legumes and weeds. Pastures that are dominated by grass will reduce their quality (Hawolambani *et al.*, 2015). In addition, the low proportion of legumes indicates the low nutritional quality of forage in pasture, because legumes contain high levels of crude protein.

The research was carried out to study the botanical composition and analyze the quality of buffalo forage in Jembrana Regency.

RESEARCH METHOD

The research was carried out in Jembrana Regency, Bali Province in March – October 2022. Forage production was measured using the Actual Weight Estimate method (Ratliff and Frost, 1990). A square measuring 1 m x 1 m was placed diagonally at random at each selected paddock point and 5 measurement points were taken for each selected paddock. Sampling of forage from the first quadrat to the next quadrat was carried out by raking all the forage 3-5 cm from the ground surface. Next, forage samples are put

into bags that have been labeled and forage production (g/fresh weight/point) for each cutting is measured. Botanical composition is calculated by dividing the weight of each type of plant (manually separating the vegetation and giving it a scientific name) by the total weight of the sample and multiplying by 100%.

Nutrient content of forage and ration sampling were analyzed using the AOAC method (2005). Physical characteristics of forage and ration sampling consisting of density, absorption capacity and water solubility were carried out using the method of Lopez *et al.* (1996) while forage nutrient digestibility and ration sampling were carried out following the lignin indicator method ((Tillman *et al.*, 1991). The data obtained was analyzed descriptively.

RESULTS AND DISCUSSION

Botanical Composition

The botanical composition of forage in buffalo rearing areas in Jembrana Regency consisted of: *Alysicarpus vaginalis, Digitaria sp, Ischainum sp, Cynodon dactylon, Lercia hexandra, Panikum repen, Brachiaria reptans*, and weeds. *Bothriochloa ischainum* sp grass occupied the largest composition of 86%, followed by *Brachiaria reptans*, weed, *Cynodon* and *Paspalum conyugatum* respectively: 6%, 4%, 3% and 1% (Figure 1).

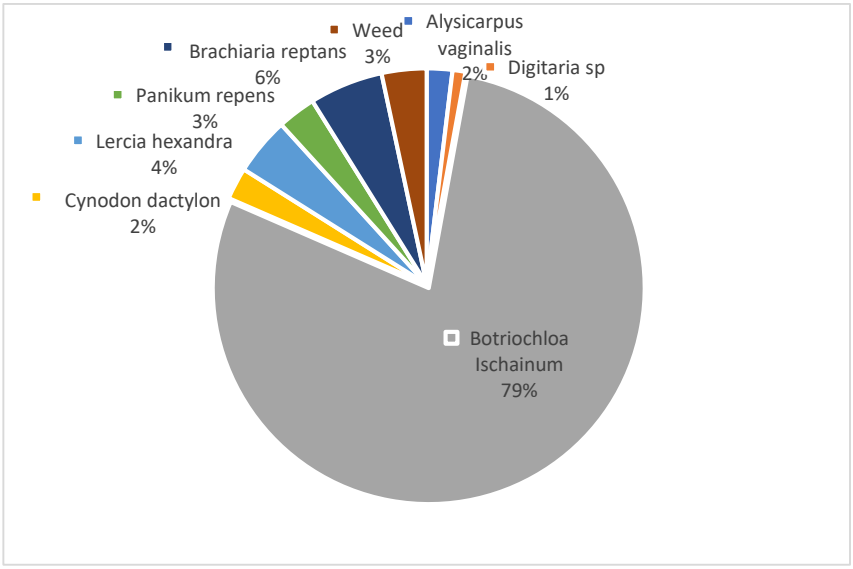

Figure 1. Botanical composition of forage in buffalo rearing areas in Jembrana Regency, Bali Province

Research conducted by Prihantoro *et al*. (2018) found that the botanical composition value of buffalo grazing areas varied with the main vegetation dominance being grass species (56.55 - 95.94%). Sudarman *et al*. (2019) found that the traditional feeding system applied by farmers for their buffaloes in the form of only rice straw and grass, although given *ad libitum*, could not increase the body weight of livestock. Buffaloes utilize feed more efficiently than cattle and are a greater source of labor, requiring greater energy recovery than cattle. Rohaeni *et al*. (2006) said that in buffalo pastures 24 types of vegetation were found, both useful for feed and weeds.

Nutrient Content of Forage

Forages fed for buffaloes in Jembrana Regency have similar nutrient content because they mostly consist of grass forage. Very few or almost no legumes were detected although occasionally *Alysicarpus vaginalis* was detected. However, weeds had the highest crude protein content among these forages at 12.45% (Table 1). *Bothriochloa ischainum* sp grass is the most common grass species (86%) found in buffalo pasture, but has the lowest crude protein content of 7.30% with a high crude fiber content of 30.08%.

Tabel 1. Nutrient Content of Forage Fed Buffalo in Jembrana Regency

Forage	Nutrient Content of Forage (%)							
	Dry Matter	Water	Ash	Organic Matter	Crude Protein	Crude Fiber	Crude Fat	GE Kcal/g

Alysicarpus vaginalis	93,45	6,55	6,70	93,30	8,54	31,73	2,58	3,6304
Digitaria sp	93,39	6,61	17,21	82,79	10,75	26,65	2,63	3,6851
Ischainum sp	92,11	7,88	12,65	87,35	7,30	31,08	2,81	3,7861
Cynodon dactylon	92,51	9,06	11,15	88,85	7,08	31,28	2,44	2,9135
Lercia hexandra	91,87	8,13	13,24	86,76	9,07	30,32	1,48	2,7915
Panikum repen	88,41	11,59	12,27	87,73	10,89	25,34	3,36	3,3158
Brachiaria reptans	86,22	13,78	11,18	88,82	8,88	25,53	2,83	3,4684
Weed	90,77	9,23	7,51	92,49	12,45	25,48	3,11	3,8715

Physical Properties of Forage

The physical properties of the ingredients that make up the ration are one indicator of the quality of the ingredients. Ration density indicates bulkiness. The lower the density of a feed, the bulkier the feed is. Physical properties of buffalo forage in Jembrana Regency are presented in Table 2.

The physical properties of plants can be viewed from the nature of the bulky or density, the nature of water absorption (water regain capacity), as well as the nature of solubility in water (water solubility). These physical properties are closely related to the level of degradability and fermentability in the rumen. This means that the lower the physical properties, the lower the quality because the lower the digestibility in the rumen (Sutardi, 1995). These physical properties are also influenced by the nutritional content of the feed. Suhartati *et al*. (2004) stated that the crude fiber content (CF) of field grass is higher than that of concentrates, namely (27.53%) vs (15.25%), but the crude protein (CP) and dry matter (DM) are lower, respectively CP = (5.09%) vs (12.89%); DM = (31.87%) vs (94.17%).

Tabel 2. Physical Properties of Forage

Forage	Physical Properties		
	BulkDensity (gram/L)	Water Absorbency (%)	WaterSolubility (%)
Alysicarpus vaginalis	263,3127	5,3315	15,5589
Digitaria sp	222,4980	6,0609	19,1458
Ischainum sp	249,0367	5,3897	15,9898
Cynodon dactylon	240,5143	5,6601	14,2437
Lercia Hexandra	247,7523	5,5296	14,8266
Panikum	246,3637	6,9485	19,6345
Brachiaria	227,0195	6,3233	18,0984
Weed	218,6621	7,5284	19,9725

Nutrient Content and Digestibility of Sample Rations

Several buffalo rations in the survey area were sampled to test the nutrient content and nutrient digestibility of the rations. The results are presented in Table 3. Buffalo rations are composed of grasses such as: *Cynodon dactylon, Panicum repens*, weeds and reeds. The crude protein content of the ration was 12.94% and crude fiber 29.33%. With such a ration composition, the results of the ration dry matter digestibility analysis were very low at 47.05%. The digestibility of organic matter is also low at 51.07%. However, crude protein digestibility is quite high at 66.73%. This low digestibility is because the ration is composed by forage derived from grass alone. As is known, grass is a forage that is rich in crude fiber but low in crude protein. Buffaloes that are given additional concentrate feed will produce higher organic matter digestibility compared to the results of this study, namely 68.30% (Kuswandi, 2007).

Tabel 3. Nutrient Content and Digestibility of Sample Rations

Buffalo Ration Nutrient Content (%)	Dry Matter	Ash	Organic Matter	Crude Protein	Crude Fiber	Crude Fat	GE Kcal/g	ADF	Cellulose
	93,13	13,37	86,63	12,94	29,33	1,08	3,63	38,57	24,69

Digestibility Buffalo Ration Nutriens (%)	Dry Matter	Ash	Organic Matter	Crude Protein	Crude Fiber	Crude Fat	GE Kcal/ Kg Dry Matter	ADF	Cellulose
	47,06	21,07	51,07	66,73	57,52	62,48	1707,12	33,40	52,18

Physical Properties of Sampling Rations

The physical properties of rations are also very closely related to ration digestibility. The physical properties of buffalo rations are also assessed in terms of bulkiness or density, water regain capacity, and water solubility. Based on the analysis, the physical properties of buffalo rations in Jembrana Regency are quite low (Table 4). Physical properties are closely related to digestibility, with factors affecting digestibility being the composition of the ration, the physical form of the ration, livestock factors and the nutritional value of the feed. Physical properties (density, water absorption and water solubility) are closely related to degradability and fermentability.

Density is opposite to bulkiness (bulky or voluminous), feed with high fiber content tends to be bulky. Conversely, feed with high density value means that the fiber content is low. Water absorption can be said to be the ability of feed particles to bind water. This causes the non-dissolved dry matter particles to become saturated, then the particles will expand and be easily degraded by microbes, increasing the rate of degradation and emptying of the rumen.

The physical properties of ration ingredients are an indicator of the quality of the ingredients. The density of a ration indicates its bulky. The lower the density of a feed, the bulkier the feed (Suryani *et al*., 2015).

Tabel 4. Physical Properties of Sample Rations

Buffalo Ration Composition	Physical Properties of Buffalo Rations		
	BulkDensity (gram/L)	Water Absorbency (%)	WaterSolubility (%)
Cynodon dactylon	236,2458	5,1108	13,5563
Panicum repens			
Gulma			
Alang-alang			

CONCLUSIONS AND SUGGESTIONS

Conclusion

The botanical composition of forage for swamp buffalo in Jembrana Regency is quite diverse and is dominated by grass with the largest composition being *Bothriochloa ischainum* sp, namely 86%. The rest are *Brachiaria reptans*, weed, *Cynodon and Paspalum conyugatum*. Only the legume *Alysicarpus vaginalis* is found in cultivated forages. The protein content of the ration is quite high, above 12% and protein digestibility is 66.73%.

Suggestions

It is necessary to cultivate legumes as a source of protein so that the nutrient content and digestibility of the ration increases so as to increase the productivity of buffalo livestock.

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