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Evaluation of *Phalaris aquatica* grass as potential green forage and silage for Nilgiri hills of South India

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Abstract

The present study was carried out to evaluate the yield and nutritional value of *Phalaris aquatica* grass in the typical mountain environment of Nilgiri hills. The mean DM yield for *Phalaris aquatica* grass were recorded as 5.14 and 4.19 t/ha/cut for rain fed and irrigated conditions, respectively. Crude protein, crude fiber, ether extract and total ash content of Phalaris grass on DM basis were 17.04, 25.31, 3.38 and 10.90%, respectively. The corresponding values for Phalaris silage were 9.77, 24.84, 3.56 and 13.43%, respectively. The pH and lactic acid content in Phalaris silage was 4.96 and 11.88 %, respectively. Study revealed that *Phalaris aquatica* can be used for silage making.

Keywords: Dry matter yield, Nilgiri hills, Nutritional composition, Phalaris grass, Silage

Phalaris aquatica (syn. *P. tuberosa*) known by the common names bulbous canary grass or harding grass, is a species of grass in the genus *Phalaris* of the Poaceae Family. The grass is probably a native of the Mediterranean region of Europe (Crampton, 1974). It has been naturalised in South Africa, Australia, New Zealand, Northern Europe and Northern America (USDA, 2013) and has been extensively used as a nutritional fodder (Oram *et al.,* 1974). Tryptamine alkaloids present in Phalaris grass are known to cause toxicity in animals that can even lead to death (Edgar, 1994). However, such instances are rare and occur only on prolonged exposure to such pastures. The Sirolon variety of Phalaris has been selected for lower tryptamine levels and the problem can easily be managed by feeding Phalaris along with other grasses and in the form of silages. In India, the grass was introduced in the Nilgiri hills of Tamil Nadu from Australia. During winter, frost in the region causes acute fodder shortage for more than 4 months and results in severe economic losses for livestock farmers. Robertson (1995) recommended the 'Sirolon' cultivar of *Phalaris aquatica* as a frost resistant, erect grass suitable for green fodder as well as pasture development. The present study was carried out to evaluate the yield and nutritional value of *Phalaris aquatica* cv. Sirolan under the typical mountain environment of the Nilgiri hills. Since the yield of the grass during rainy season was high, the possibility of preservation through ensiling was also investigated.

The trial was conducted at Sheep Breeding Research Station, Sandynallah, the Nilgiris (11° 24' N, 76° 41' E). Soil was acidic (pH 5.8) and texture of soil was loamy to clay loamy. The organic carbon, phosphorus and potassium contents in the soil were 2.79 per cent, 121.03 kg/ha and 417.43 kg/ha respectively. Nitrogen, phosphorus and potassium were applied at the rate of 153.14, 271.7 and 59.28 kg/ha respectively. After every harvest, top dressing was done with 100 kg/hectare of urea. Based on the climatic conditions prevailing in the region, seasons were distinctly classified as winter (December to February), summer (March to May), south-west (SW) monsoon (June to August) and north-east (NE) monsoon (September to November).The green fodder yield was measured on the first appearance of inflorescence. The yield on dry matter basis and frequency of cut were recorded at each cut for 10 cuts over a period of 16 months. Cultivation during monsoon was under rainfed conditions while during winter and summer (dry seasons) it was under irrigated conditions. Irrigation was done once in 4-5 days during this period. The number of cuttings recorded for rainfed and irrigated crops were 6 and 4, respectively. The mean days to harvest and fodder yield of rainfed and irrigated conditions were compared using t-Test (Snedecor and Cochran, 1989).

Representative grass samples were analyzed for proximate composition as per AOAC (1995). Phalaris

grass was ensiled in a cylindrical barrel using common salt (1%) and jaggery (2%). Jaggery used in the study, commonly known as 'gul', contained 75% carbohydrate, 9% water, 0.25% protein, 385 calories/100g and 20 mg % vitamins. The barrels were opened after 138 days and samples were analysed for proximate composition (AOAC, 1995), pH and lactic acid (Madrid *et. al.* 1999).

The dry matter (DM) yield of *Phalaris aquatica* grass was recorded during the trial period (Table 1). The first yield was obtained at 79 days after planting of slips. The average number of days between cuts was 47.3. The average DM yield of *Phalaris aquatica* grass was found to be 4.75 t/ha/cut. The mean DM yield for rainfed and irrigated conditions were recorded as 5.14 and 4.19 t/ha/cut, respectively and the values were significantly different from each other. The yield from *Phalaris aquatica* in the present study was higher than that of Kikuyu grass. The additional advantage is its frost resistance and drought hardiness. The total yield of Phalaris grass obtained in 10 cuts was recorded as 47.52 t/DM/ha and number of possible cuts in a year was 7 to 8. The crude protein values obtained in this study (Table 2) were well within the range and comparable with the values found by Lilley *et al.* (2001). Moore *et al.* (2006) recorded that the crude protein content of the grass ranged from 5.7 to 26.8 % and metabolisable energy between 1770 and 2823 kcal/g. However, lower values were obtained for Phalaris grass from pasture by Clements (1971). The crude protein level was comparable with that found for Kikuyu grass (Forde *et al.,* 1976). The higher values of total ash and ether extract in Phalaris silage as compared to grass could be due to the addition of jaggery.

Table 1. Yield and frequency of cut for *Phalaris aquatica* in the Nilgiris

Cut number	Month	Irrigation	Cutting (days)	Yield (t DM /ha/cut)
1	August	Rainfed	79	5.29
2	October	Rainfed	48	5.11
3	December	Irrigated	55	4.59
4	February	Irrigated	76	3.80
5	April	Irrigated	49	4.55
6	June	Rainfed	42	5.56
7	August	Rainfed	41	4.72
8	September	Rainfed	36	5.11
9	October	Rainfed	40	4.99
10	December	Irrigated	39	3.80

T – tones, DM – dry matter, ha- hectare

The decrease in values of crude protein content could probably be due to the loss of protein due to leaching and denaturation of protein during ensiling. Silage obtained from Phalaris grass was greenish yellow in colour with fruity odour.

The pH value (4.96) of Phalaris silage was comparable to those obtained for rye grass and alfalfa silages (Broderick *et al.,* 2002). However, lower value of pH (3.96) was observed in maize silage prepared in a similar fashion using 2 per cent jaggery (Venkataramanan *et al.,* 2010). Maize being a cereal fodder is a better choice for silage preparation as the excess soluble carbohydrate helps in optimal fermentation. Nevertheless, considering the cost of production of maize and the excess Phalaris grass available during rainy season, silage production using Phalaris grass would be more profitable. The lactic acid content in Phalaris silage was comparable with that of maize silage (Venkataramanan *et al.,* 2010). The lower pH and higher lactic acid content indicated that Phalaris grass could be used for silage making in the region.

Table 2. Proximate composition of *Phalaris aquatica* grass and silage

Proximate composition	*Phalaris aquatica* (% DM)	
	Grass	Silage
Crude protein	17.04	9.77
Crude fiber	25.31	24.84
Ether extract	3.38	3.56
Total ash	10.90	13.43
Nitrogen free extract	43.37	48.41
Metabolisable energy (kcal)	2235	-

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