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Analysis of Lucern, Berseem & Oats at Different Stages of Growth for Essential Nutrients

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ABSTRACT: *Green foddering systems for farm animals vary from one country to another, and the resources / system practiced in developed countries differ considerably from those practiced in Pakistan. The present study was undertaken for the evaluation of nutritional values of lucern (Medicago sativa), berseem (Trifolium alexandrinum) and oats (Avena sativa). These fodder crops are grown in winter and harvested in summer season. The understudy parameters included the evaluation of moisture, crude protein, crude fiber, crude fat and ash. Standard techniques were used for evaluation using Dessicator, Kjelhdal apparatus, Soxhlet's apparatus and Muffle furnace available in Biotechnology Lab of Lahore Garrison University. The proximate analysis of Lucerne showed to have moisture 80.2%, crude protein 21.4%, crude fat 1.5%, crude fiber 25.2 % and ash 9.2 %. The proximate analysis of Berseem revealed moisture 85.4 %, crude protein 18.2%, crude fat 2.0 %, crude fiber 17.1 % and ash 8.9 %. The proximate analysis of Oats showed to have moisture 81.3%, crude protein 12.2%, crude fat 1.9 %, crude fiber 24.2 % and ash 8.2 %. No significant difference in nutritive values at 6, 9 and 12 weeks of growth in all understudy fodder crops was observed. Lucern was found having best nutritive values followed by Berseem whereas oats contained least nutritive values. Lucerne may be more suited for draught animals like polo / race horses /mules and other equines because of high protein and ash contents whereas Berseem and Oats may be more suited for milking animals and small ruminants due to laxative, staple and high fiber contents.*

Key words: *Fodder crops, Livestock, Animal Nutrition*

INTRODUCTION

Food is the basic necessity of all living creatures in the world. Major expansion in this field took place in the last 50 years and the living creatures need today we know over 40 different nutrients. Much of the knowledge is the result of nutritional and health problems, basic study of functioning of animals/ organism, physiological and biochemical changes involved and effect of various dietary variables. Physiologists and biochemists worked as a team for long time. Interest of organic chemists led to isolation and synthesis

of various vitamins. Microbiologists helped in discovering the role of bacteria in rumen and intestines of farm animals. Modern research draws our attention towards “trace elements” and their study takes us to soil character.

Desirable characteristics of ration and their effect on growth of dairy animals has been studied (Henderson and Reaves, 1974) and it has been found that the green fodder for a growing calf should contain a liberal supply of net energy or total digestible nutrients, sufficient fat and adequate supply of minerals / vitamins. Lucerne biomass can be used in many techniques, not only as dry grass but can also be used as silage and cakes. The last cuttings can be used as grazing field. The quality of alfalfa to fix nitrogen makes it ecologically important and it turns into an economical fodder. Therefore this fodder is not only the queen of forages but also plays very important role in workable organic production and agriculture. (Radovick et al., 2009). The stage of plant growth had a significant effect on the chemical composition, but differences due to strains were not significant. Nitrates and other organic compounds which are resistant to acid digestion are included in total nitrogen values assessed by Dumas N compared with values obtained through Kjeldahl method. These differences have been observed in a number of biological matrices like fish, fruits, cereals and vegetables. Kjeldahl-N : Dumas-N ratios may be as low as 0.15 (Hedqvist et al., 2000). Variations in nutritional value of Guinea grass and Dichanthium aristarum cultivars have been explored Monthly grass samples were taken from the grazed area. They reported that mean CP contents ranged from 6.35% to 8.19 %. Deviation in results is the outcome of used protocol of fiber determination (Nielsen, 1998). Method of determining crude ash includes heating at 600^{o} C for two hours or 500-550^{o} C for twelve to sixteen hours. For calculating traces of Cu in green fodder samples flameless atomic absorption spectrometry is an exciting development.

However, sample size at present is restricted to 2-4 mg. (Zhang et al., 2016) studied the changes in the crude protein and dry matter of two Lucerne cultivars with advancing maturity. It was reported that dry matter content increased linearly with advancing maturity. During rhizobial invasion in nodulated lucerene an increase in lignin content has been established. Commercially prepared concentrate fodders are economical for milk producing cows (Habib, 2009). Soyabean meal has been found having more energy values compared with cotton seed cakes. In proximate analysis the required food sample is divided into six parts that include moisture, nitrogen free extractives, ether extract, ash, crude fibre and crude protein. Nutritive value of sorghum bicolour and S-bicolour x S. Sudanese harvested at pre-flowering stage has been studied. Herbage contained 17.4 and 20.4 dry matter and 8.9 and 8.01 per cent crude protein respectively (Nielsen et al., 2004)

(Aslam et al., 1999) reported that a complete lack of response was observed to both macro minerals (Ca, P, Na, Mg, K, S) and micro minerals (I, Co, Cu, Mn, Fe, Zn) supplementation in the compound green fodder of Sahiwal male calves. This demonstrates that in cases where animals are kept on adequately balanced compound green fodder, requirements of the animals seem to be met by minerals coming from green fodder ingredients

and as such supplement minerals are not required. However, animals kept exclusively on grazing / browsing on range and may suffer from mineral deficiency. Weende proximate analysis system has been compared with Van Soest system (Mueller, 1991). Use of crude fiber, nitrogen free extractives and ether extract in green fodder estimation do not adequately distinct digestible from non-digestible elements. The Van Soest system is preferred these days as it provides useful measurements for structural carbohydrates also. Studies on the effect of type of CP source and the partial substitution of CP source by urea on total and essential AA flow. Results indicated that supplemented CP sources could alter total and essential AA flows to the duodenum. The crude fibre ranged from 4.79 to 5.69 and crude protein from 15.86 to 18.63 for six categories of rations for the calves (Bashir et al., 2002). The contents of crude protein and crude fibre are specific to each other in different food stuffs. Various fields of science have contributed to modern knowledge of nutrition and lot is to be done yet. This field will continue to expand for benefit of livestock and humans. Much of the literature published on the subject is not relevant to the prevailing situation in Pakistan.

MATERIALS AND METHODS

Sample Collection

Each green fodder sample of 500 gm at 6, 9 and 12 weeks growth (Lucern, Berseem and Oats) was collected from Military Farm Remount Depot Sargodha. The samples were labelled as A, B and C respectively.

Experimental Design

Moisture including any volatile acid / base was determined using air dried system at less than 100° C under vacuum.

Crude protein including protein, amino acids, amines, nitrogenous, glycosides, glycolipids, B-vitamins and nitrates was determined using Kjelhdal apparatus.

Crude Fibre including insoluble cellulose, hemi cellulose and lignin was determined with the help of muffle furnace using 1-2% H2 SO4, 1.25 NaOH and distilled water.

Crude Fat including fats, oils, waxes, organic acids, pigments, sterols and the fat-soluble vitamins was determined with the help of Soxhlet's apparatus.

Ash including essential and non-essential mineral elements using muffle furnace at red heat.

RESULTS

DISCUSSION

Table 1: Nutritive values at 6,9 &12 weeks of growth for Lucern (A), Berseem (B) and Oats (C)

Crop	Moisture			CP			CFat			CF			Ash		
	6	9	12	6	9	12	6	9	12	6	9	12	6	9	12
A	80.2	80.5	80.2	21.4	21.3	21.4	1.4	1.4	1.5	24.8	25.0	25.2	9.0	9.2	9.2
B	85.4	85.3	85.4	18.1	18.2	18.2	2.0	1.9	2.0	17.1	17.2	17.1	8.9	9	8.9
C	81.3	81.2	81.3	12.0	12.0	12.2	1.9	1.8	1.9	23.9	24.0	24.2	8.4	8.3	8.2

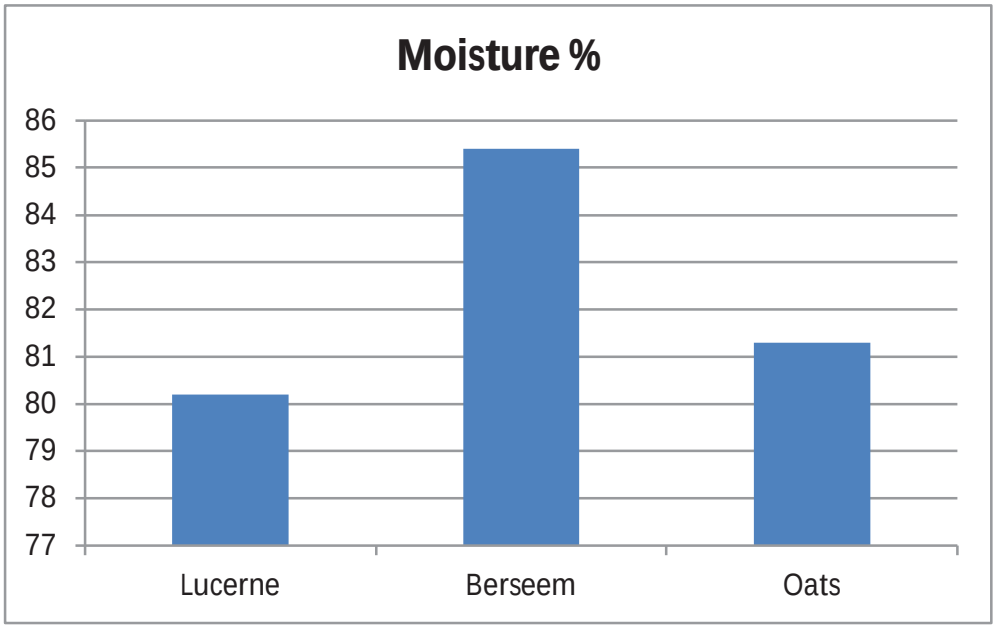

Fig. 1: Comparison of moisture at 12 weeks of growth

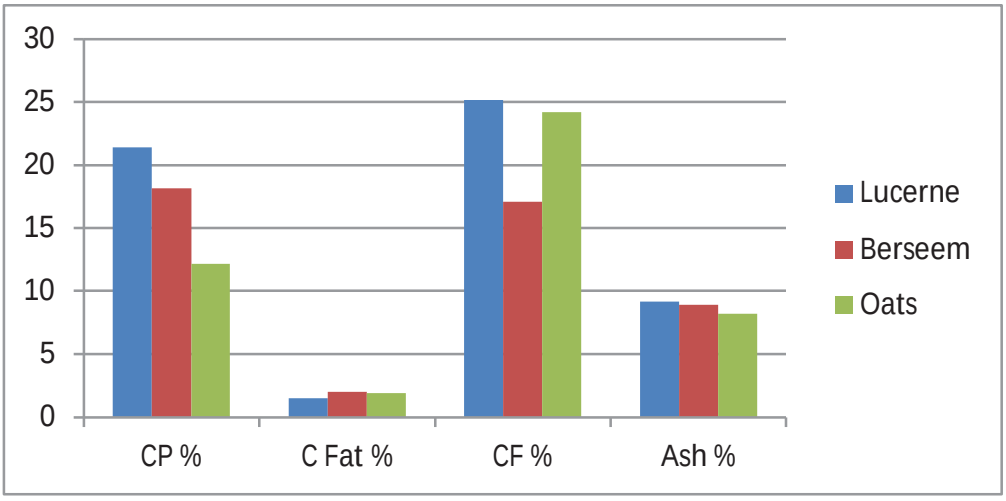

Fig. 2: Comparison of CP, C Fat, CF & Ash at 12 weeks of growth

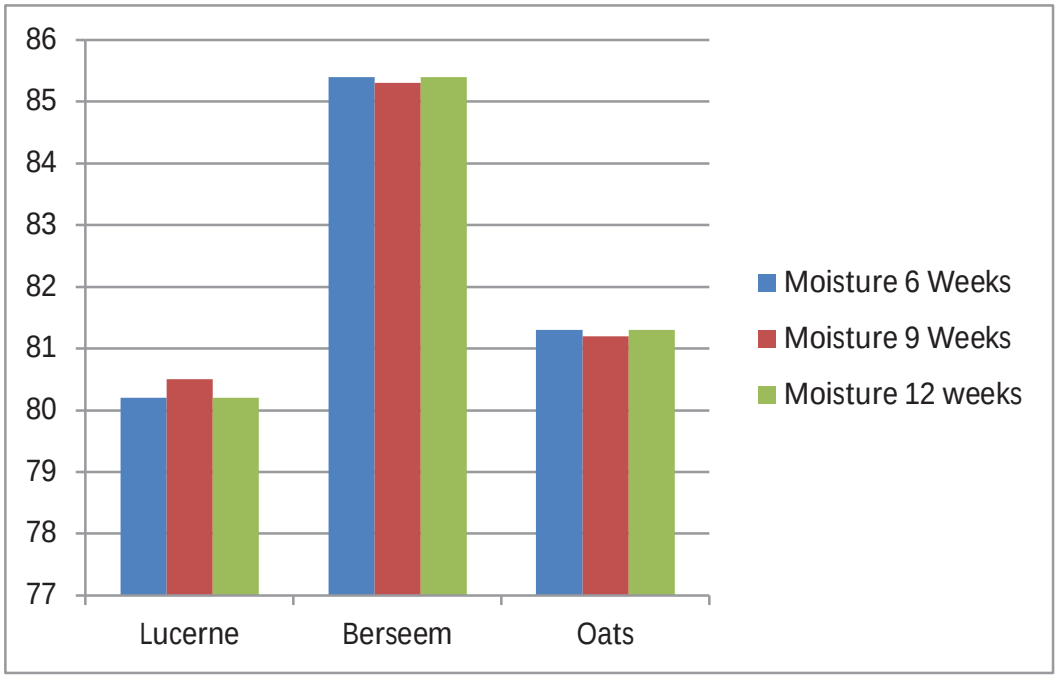

Fig. 3: Comparison of moisture at three stages of growth

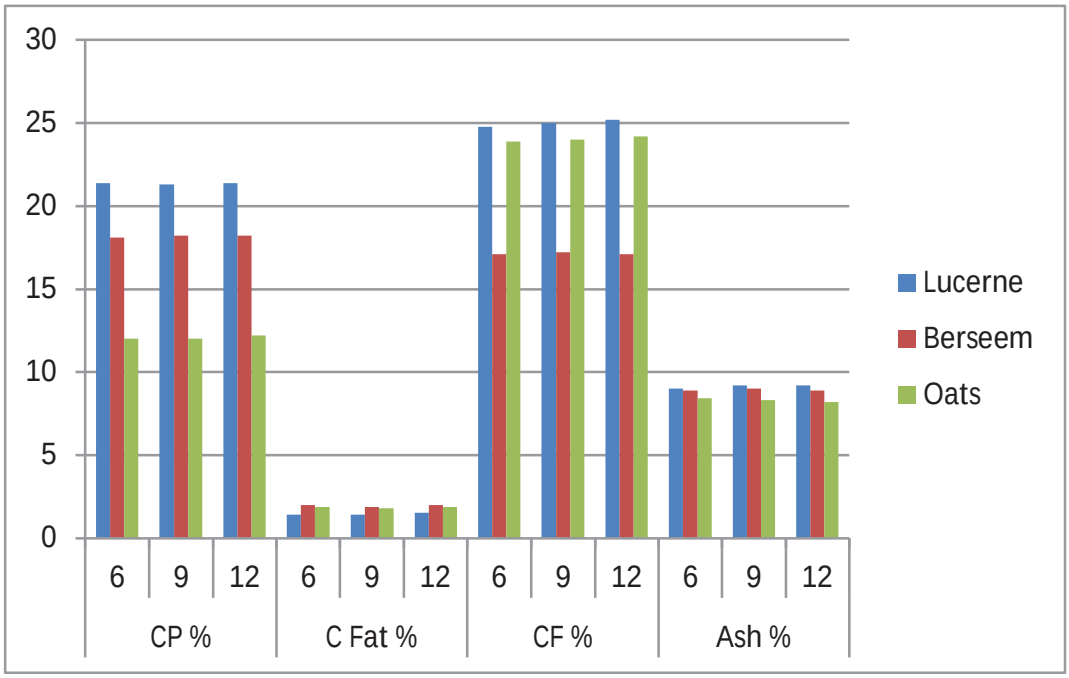

Fig. 4: Comparison of CP, C Fat, CF & Ash at three stages of growth

The aim of this project was to evaluate the nutritive value of three Rabi Green fodder crops namely Lucern, Berseem and Oas. Proximate analysis of Lucern as shown in table 1 revealed moisture content as 80.2 % compared with Berseem and Oats as 85.4 % and 81.3 % respectively. This shows that the sample was lower in moisture contents compared with other fodders. Crude protein proved to be 21.4 % compared with Berseem and Oats as 18.2 % and 12.2 % respectively. This shows that the sample was higher in crude protein contents compared with other understudy fodders. In case of crude fat the value was 1.5 % and proved to be lower as compared to Berseem and oats. Crude fiber and ash contents were found maximum in Lucern compared with other understudy fodders. Zhang et al. (2016) conducted study on alfaalfa (Lucerene) quality and lignin levels after rhizobia symbiosis. They observed an increase in lignin content i.e monolignol G / S and a decrease in digestibility of nodulated alfaalfa compared with non nodulated alfaalfa. The stem was found more lignified tissue with upregulation by many lignin synthesis genes. This can be attributed as self protective reaction towards rhizobial attack. In our study we noticed maximum crude protein contents in lucern which supports the results of both studies.

Martínez et al. (2016) carried out study on *Medicago sativa* plants as useful nutrition to release hypertension. The used rats and induced spontaneous hypertension and metabolic disorders. They concluded that *Medicago sativa* protects animals suffering from hypertension by reducing liver oxidative damage. An overall rich fiber and protein content in Lucern crop coupled with ash contents revealed in our study might be a reason for protection of liver oxidative damage. In agreement to our study Aganga et al. (2003) studied lucerne and found it an excellent fodder for livestock production. Doyle and Thomson 1985 found lucerne as the most economical forage in British agriculture Hashem et al. (2016) studied the effect of feeding the heifers with Berseem and found it an excellent phyto estrogenic roughage having positive effect on the fertility. No significant difference in nutritional values was observed at 6^{th}, 9^{th} and 12^{th} weeks of growth among all three fodders. Berseem was found to be more laxative having 85.4 % moisture content and 1.9 % crude fat.

In conclusion Lucern was found having best nutritive values followed by Berseem whereas Oats contained least nutritive values. We determine that Lucerne is more suited for draught animals like polo / race horses /mules and other equines because of high protein and ash contents. It will prove an economical fodder as its use will reduce the concentrates rations quantity. It is equally good for rearing of meat animals where rich protein diet is required. Berseem and Oats are more suited for milking animals and small ruminants due to laxative, staple and high fiber contents.

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