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Evaluation of chemical composition of Lucerne Leaf meals prepared by different drying and processing methods

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Abstract: Attempts were made during present investigation to prepare leaf meals by drying green foliage of lucerne either in sun, shade or oven and then the leaf and stem portions were separated for chemical analysis. The dried samples of leaf (leaf meal), and stem (crop residue) were used for chemical analysis. The results obtained indicate that high quality and nutritious leaf meal can be prepared by drying lucerne foliage in shade and separating the leaf portion from stem part. This method yields a superior product with desirable nutritional properties.

Key words: Lucerne, leaf meal, drying methods

Introduction: The fodder crops raised in this region for cattle include maize (*Zea mays* L.), *Sorghum* (*Sorghum bicolor* L. Moench), bajra (*Pennisetum typhoideum* Rich.), oat (*Avena sativa* L.), hybrid Napier grass, and the leguminous species viz. cowpea (*Vigna unguiculata* L. Walp.), *Dolichos* (*Dolichos lablab* L.), berseem and lucerne (*Medicago sativa* L.); out of these lucerne is the most popular fodder crop. The advantages in growing lucerne crop include its wide range of adaptability, perennial habit, ability to fix nitrogen, to become ready for frequent harvesting and its high nutritive value due to adequate amounts of proteins, vitamins and minerals in the foliage (Joshi, 1971). Therefore Lucerne was selected for the present investigation. Attempts were made during present investigation to evaluate the chemical composition of Lucerne Leaf meals prepared by different drying and processing methods.

Material and methods: The green foliage of Lucerne was dried either in sun, shade or oven and then the leaf and stem portions were separated for chemical analysis. The dried samples of leaf (leaf meal), and stem (crop residue) were used for chemical analysis. The nitrogen content (N) was determined by microKjeldahl method (Bailey, 1967) and the crude protein (CP) was expressed as N x 6.25. A method described by Lees (1968) was employed for the estimation of crude fiber. The crude fat content was estimated using soxhlet extractor with chloroform: methanol (70:30) as a solvent. Cellulose content was estimated following Crampton and Maynard (1938). The dry samples were boiled in distilled water, filtered and amount of water soluble reducing sugars was determined in the filtrate by using Folin-wu tubes (Oser, 1979). Total ash and calcium contents were estimated following the A. O. A. C. (1970) methods. The amount of phosphorus was measured following Fiske and Subba Rau (1925) as described by Oser (1979). The chromic acid oxidation method described by O'shea and Maguire (1962) was followed to determine gross energy (GE).

Results and Discussion:

The lucerne foliage was dried either in oven at 60± 5^0c, sunlight or shade till constant weight. The leaf and stem portions were separated after drying of the foliage and taken for analysis. When the plant material was dried in either sun or oven, the dry matter content in the plant got distributed into stem and leaf portion in 1:0.88 ratio. Thus, indicating higher dry matter accumulation in the stem portion. However, when the plant material was dried in shade, it took more time for complete drying and most of the dry matter was retained in the leaves resulting in proportion of dry matter distribution is stem and leaf portions with 1:1.30 ratio. It has been reported by earlier workers that the nutrients in leaf are transported to the other parts of the plant during drying under considerable heat stress (Hewitt and Curtis, 1948; Swanson and Bohning, 1951). This was the probable reason for higher accumulation of dry matter in the stem portion when the foliage was dried in either oven or sun in comparison to the shade drying.

The dry matter content of whole lucerne foliage was 19.6 %, while the dry leaf and stem portion contained 18.5 and 20.6 % dry matter due to either sum or oven drying. However, the dry matter content in the leaf portion was 22.3%, while that in stem portion was 16.8 % when the foliage of lucerne was dried in shade.

Tables 1 gives an account of chemical composition of dry leaf and stem portions of lucerne when the crop was dried in either sun, shade or oven. The nitrogen content (N) in the leaf meal was highest (4.83 %) when shade drying was employed, followed by 4.58 and 4.25 % under the influence of sun and oven drying respectively. Thus the leaf meal prepared by drying lucerne was with higher values of crude protein content. The crude protein content in the dry stem portion ranged from 15.62 to 16.16 % under the influence of three drying methods. As experienced earlier, the leaf portion was with minimum crude fiber content which ranged from 6.6 to 8.5 % while the stem portion contained 30.2 to 35.9 % crude fiber. On an average, the crude fat content fluctuated between 12.80 to 20.25 %, always showing lower values in the stem portions. As expected and experienced earlier, the leaf meal was with minimum cellulose and slightly higher values for water soluble reducing sugars (WSRS). The sugar content in the leaf meal prepared by drying foliage in shade was high indicating that it was retained by the leaves. Very little difference was observed in the contents of ash, acid soluble ash, calcium and phosphorus due to the method of drying in both leaf meal and dry stem portion of the foliage. On an average, the ash content ranged from 11.8 to 13.8 in leaf meal while 6.8 to 8.5 in the stem portion. The values for acid soluble ash fluctuated between 5.2 to 7.1 in stem portion, while, 9.8 to 11.3 in the leaf meal. The leaf meal was with higher values for calcium content. The phosphorus content in both the parts was almost at par. Similarly very little variation in the values for gross energy was observed among all samples and it ranged from 3.41 to 3.73 Kcal/g.

Conclusion: The overall results presented in Table 1 indicate that high quality and nutritious leaf meal can be prepared by drying lucerne foliage in shade and separating the leaf portion from stem part. During shade drying most of the nutrients are retained by the leaves, which are otherwise trans located to stem portion during sun or oven drying due to sudden exposure to the high temperature (Devlin and Witham, 1986). Edwards *et al*. (1975) also pointed out that stripped lucerne leaves contain more protein (26.2 %) in comparison to whole lucerne (12.8 %). It is advocated that the leaf meal prepared from lucerne can be used in animal nutrition as a nutritious feed rather than whole crop plant.

Table 1: Chemical composition of leaf meals of Lucerne prepared by various methods

Drying method	Portion of the plant	% of Dry matter (DM)										
		Nitrogen (N)	Crude protein (CP)	Crude fiber	Crude fat	Cellulose	Water soluble reducing sugar	Total Ash	ASA	Ca	P	Gross energy Kcal/g DM
Sun	Leaves	4.58	28.64	6.6	17.30	4.41	1.49	13.8	11.3	2.29	0.17	3.67
	Stem	2.50	15.62	32.7	12.80	38.30	1.47	6.8	5.2	0.32	0.19	3.73
Shade	Leaves	4.83	30.20	6.8	16.65	2.95	1.86	11.8	9.8	1.94	0.17	3.55
	Stem	2.66	16.16	35.9	13.55	37.00	0.81	6.8	5.3	0.44	0.17	3.73
Oven	Leaves	4.25	26.56	8.5	20.25	3.84	1.35	11.8	9.9	1.97	0.17	3.41
	Stem	2.58	16.14	30.2	19.05	31.70	1.61	8.5	7.1	0.71	0.18	3.73

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