SUNFLOWER SEED MEAL CHARACTERIZATION FOR ANIMAL FEEDING

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SUMMARY - The chemical composition and fatty acid content of sunflower seed meal and extraction meal from the same seeds (Licia variety) were determined.

These two feeds were given to rams together with alfalfa hay of known digestibility in order to evaluate their digestibility.

The values measured confirmed the high protein content of both feeds as well as the high energy value of sunflower seed meal.

The ratio of unsaturated/saturated fatty acids was identical in both feeds.

Both meals reduced dry matter intake and the nutritive level of the ration, while digestibility of the organic matter was lower only with extraction meal.

INTRODUCTION - The use of oleaginous seeds as protein integrators for ruminant diets, particularly for lactating cows, has been studied.

Results indicate that as well as influencing certain aspects of livestock metabolism, these feeds affect ration intake and digestibility, depending on the type and percentage content of oleaginous feed used (Anderson et al., 1984; Brosh et al., 1989; Drackley & Schingoethe, 1986; Moore et al., 1986; Park et al., 1983; Rafalowski & Park, 1982; Richardson et al., 1981; Steen, 1989).

This note reports on data concerning the intake and digestibility characteristics of sunflower seed meal in comparison with a normal sunflower extraction meal.

MATERIALS AND METHODS - The feeds used in these trials were sunflower seed meal and sunflower extraction meal from the same stock of feed (Licia variety), characterized by a high linoleic acid content.

There two simple feeds first underwent chemical analysis (Weende and Van Soest) for chemical and nutritional characterization; gross energy was determined by adiabatic bomb calorimeter and acid composition of the lipidic extract was determined by the oils and fats method (Lotti & Galoppini, 1980).

Following this, "in vivo" intake and digestibility trials were carried out on these feeds according to ASPA methods (1982), using 5 Sardinian breed rams.

As it was not feasable, for obvious reasons, to give the two feeds in question as the only food, they were offered to the animals at the same time as alfalfa hay with digestibility and intake known from previous "in vivo" trials.

The two rations used were as follows:

RATION A = Alfalfa hay "ad libitum" + 0.5 kg sunflower seed meal
RATION B = Alfalfa hay "ad libitum" + 0.5 kg sunflower extraction meal.

The two feeds in these rations were placed in separate sections of the manger so that the left over hay and meal could be weighed and the intake quantities of each ram calculated.

At the end of these trials feed samples and faecal residues were collected according to Demarquilly's scheme (1983) and chemically analyzed.

The nutritive value and various digestibility coefficients of these two experimental feeds (A and B) were calculated in comparison to those of alfalfa hay alone.

This enabled us to measure the extent to which the addition of sunflower seed meal and its extraction meal influenced dry matter intake and digestibility of the basic ration (alfalfa hay).

Furthermore, since the percentage of each feed in the two basic experimental rations was known, it was possible to calculate the various digestibility coefficients of sunflower seed meal and extraction meal using the values relative to alfalfa hay digestibility coefficients and their nutritive value (INRA, 1988).

Finally, values concerning dry matter intake (g/kg $l.w.^{0.75}$) and the various digestibility coefficients of the rations [alfalfa hay; hay plus sunflower seed meal (A); hay plus sunflower extraction meal (B)] were analyzed by one way variance analysis. Fisher's PLSD (Steel & Torrie, 1986) was used to compare averages.

RESULTS - Chemical analysis of extraction meal confirmed its already widely known characteristics (high content of crude proteins and N-free extracts and low values of ether extract). Sunflower seed meal has a good level of crude protein, a low percentage of N-free extracts and a very high value of ether extract. This last component determines a high gross energy of sunflower seed meal in comparison to extraction meal.

The two feeds did not appear to differ much in fibre or its fractions.

The alfalfa hay used as reference for intake and digestibility showed the normal chemical composition of alfa forage (Tab. 1).

Fatty acid composition was similar in the two feeds, both of which showed high levels of linoleic and oleic acids. As a consequence the unsaturated/saturated fatty acid ratio was decidedly in favour of the former both in sunflower seed meal (6.87) and in extraction meal (5.93) (Tab. 2).

Intake of seed and extraction meals in mixed rations was slightly less than 30% of total dry matter intake during the trials with livestock. The addition of meal to alfalfa hay always induced a statistically significative reduction in intake level in comparison to alfalfa hay given as a single feed. This was particularly true for ration A where a statistically lower value than for ration B was seen, possibly linked to both the depressing effect of the concentrates which was not compensated for by the intake of seed meal and to its high lipid content. This may have contributed to slowing the passage of the food bolus as well as to changes caused by the unsaturated and polyunsaturated fatty acids to microbial flora activity in the ram's rumen (Cappa, 1984).

As a consequence of the intake values the Nutritive level of rations including both feeds was statistically lower than that of hay alone. No differences were seen between Nutritive level of the meals, althoug dry matter intake was significatively higher in ration B than in ration A since the lower intake of the latter was compensated for by its better digestion, as seen in the values of the organic matter digestibility coefficient (Tab. 3).

Digestibility of dry matter and organic matter were in fact statistically lower in the ration of hay plus extraction meal (B) than in the hay alone and hay plus sunflower seed meal (A).

The digestibility coefficient of alfalfa hay nutritive principles were affected in different ways by the addition of sunflower seed meal and extraction meal.

Tab. 1 - Chemical composition and nutritive value of feeds (data on d.m. basis)

	Alfalfa hay	Sunflower seed meal	Sunflower extraction meal
Dry matter (%)	84.10	94.00	95.00
Crude protein (%)	16.10	16.28	29.49
Ether extract (%)	1.49	48.44	3.11
Crude fibre (%)	32.02	23.99	26.84
Ash (%)	7.89	3.35	6.57
N-free extracts (%)	42.50	7.94	33.99
NDF (%)	51.62	39.95	47.98
ADF (%)	39.70	29.07	30.91
Hemicelluloses (%)	11.92	10.88	17.07
Cellulose (%)	29.99	18.73	19.82
ADL (%)	9.36	10.28	10.91
AIA (%)	0.35	0.06	0.18
Gross energy (MJ/kg d.m.)	18.17	26.20	19.18
Milk F.U./kg d.m.	0.63	1.43	0.75

Tab. 2 - Fatty acid composition (%) of sunflower seed meal and sunflower extraction meal.

Fatty acids		Sunflower seed meal	Sunflower extraction meal
$C_{14:0}$	MYRISTIC	0.10	0.14
$C_{16:0}$	PALMITIC	7.07	8.25
$C_{18:0}$	STEARIC	4.75	5.23
$C_{18:1}$	OLEIC	26.42	26.64
$C_{18:2}$	LINOLEIC	60.32	57.06
$C_{18:3}$	LINOLENIC	0.40	1.42
$C_{20:1}$	EICOSENOIC	0.15	0.13
$C_{22:0}$	BEHENIC	0.79	0.75
Unsaturated/Saturated		6.87	5.93

Tab. 3 - Intake level and apparent digestibility coefficients of rations.

	Hay	Hay + Sunflower	Hay + Sunflower extraction meal
Dry matter intake g/kg $l.w.^{0.75}$	77.69^{a}	63.56^{b}	69.42^{c}
Nutritive level	1.68^{a}	1.44^{b}	1.40^{b}
APPARENT DIGESTIBILITY COEFF.			
Dry matter (%)	59.80^{a}	61.54^{a}	55.45^{b}
Organic matter (%)	61.19^{a}	62.77^{a}	56.44^{b}
Crude protein (%)	73.48^{a}	69.32^{b}	71.53^{ab}
Ether extract (%)	24.46^{a}	80.16^{b}	48.84^{c}
Crude fibre (%)	48.61^{a}	50.23^{a}	41.67^{b}
N-free extracts (%)	67.29^{a}	59.83^{b}	61.68^{b}
NDF (%)	50.31^{a}	55.45^{b}	47.20^{a}
ADF (%)	48.75^{a}	44.52^{a}	36.64^{b}
Hemicelluloses (%)	68.20^{a}	85.45^{b}	73.87^{c}
Cellulose (%)	59.97^{a}	53.96^{b}	50.54^{b}
Energy (%)	58.07	61.37	58.30

Value on the same line with different letters are significantly different for $P \leq 0.05$

Tab. 4 - Digestibility coefficients valued for sunflower seed meal and for sunflower extraction meal.

	Dry matter (%)	Organic matter (%)	Crude Protein (%)	Crude Fibre (%)	Energy (%)
Sunflower seed meal	62.41	66.55	62.03	55.92	67.09
Sunflower extractive meal	43.97	46.16	69.81	20.60	58.84

The addition of the two meals examined here caused a reduction, found to be statistically significative, in the digestibility of proteins in ration A and of crude fibre and ADF in ration B.

An increase in digestibility through the addition of these two feeds was seen for ether extracts and hemicellulose, statistically higher in ration A than in ration B and the hay only ration.

The addition of sunflower seed meal furthermore, gave statistically higher values of digestibility of hay NDF.

Finally, no appreciable differences in energy digestibility were seem among the three rations.

The digestibility of the two feeds was calculated using the data from the above trials.

Sunflower seed meal was seen to have satisfactory digestibility in all its nutritive principles and energy, with values similar to those of the INRA tables (1988).

There was greater variability among digestibility coefficients of extraction meal found to be quite high for only proteins (Tab. 4).

The better utilization of organic matter and energy seen in sunflower seed meal determined a high nutritive value (MFU 1.43/kg d.m.), in comparison to that for extractive meal (MFU 0.75/kg d.m.).

DISCUSSION AND CONCLUSION - Sunflower meals confirm their depressing effect on total intake level of the ration (Anderson et al., 1984; Park et al., 1983).

This is seen in particular with seed meal, although it has favourable digestibility coefficients and a high nutritive value.

Our results indicate that its use as animal feed needs further investigation both as to its quantitative and qualitative presence in compound rations and in its consequences on animal metabolism as well the product quality obtained with their use.

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●● *Research supported by MURST, Italy (special grant 40%) and CEE (ECLAIR program)*