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Voluntary Intake and Liveweight Changes of Awassi Sheep fed Barley Straw and Cottonseed Meal.

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Barley straw is an important feed for sheep in west Asia but its low protein contient limits intake. Cottonseed meal is abundant in Syria and could be used as a source of protein. A trial was therfore conducted to study the liveweight change and feed intake of Awassi sheep receiving barley straw alone or with cottonseed meal.

Two groups of four individually fed Awassi wither sheep received either chopped barley straw alone or the same straw supplemented with cottonseed meal. Intake of straw, digestibility of feeds and livewight changes were measured during the 122 day trial.

Adding cottonseed meal to the straw diet increased average straw dry matter intake from 625.8 to 904.7 g/day ($P < 0.01$), and changed daily liveweight losses of 82 g into gains of 35 g ($P < 0.01$).

Estimated intake of metabilzable energy increased from below maintenance (198.5 KJ/Kg $W^{0.75}$) when the straw diet was fed alone to the maintenance level (348 KJ/Kg $W^{0.75}$) when cottonseed meal was added to the basal diet. Actual maintenance requirements of Awassi sheep offered a straw diet for long periods may be below those for temperate breeds.

Key words : Sheep, Awassi Feed intake Live weight.

Cereal straws are frequently considered inferior feedstuffs but in semi-arid countries of west Asia they represent a major component of the winter diet of sheep and goats (Jaubert and Oglah, 1985: Thomson, unpublished data). Furthermore, cereal stubbles and residual straw are the only feed available to flocks in summer and autumn, the grain being kept for winter use. It is therefore important to maximize the nutritional benefit from these straws. This can be achieved either by chemical treatment of the straw or by adding protein-rich feedstuffs to the diet (preston and Leng, 1984). The latter approach is favoured when suitable feedstuffs are cheap and readily available. Cottonseed meal (CSM) is widely available in Syria and it is fed in winter. However, it is not used in summer when it could have beneficial effects on ewe liveweight and fertility (ICARDA, 1986).

This paper describes a trial which compared the long-term voluntary intake and liveweight changes of penned Awassi sheep offered barley straw alone or when supplemented with CSM. The trial also indicated the ability of the Awassi breed to subsist on a straw diet for a long period.

Material and Methods

The trial was conducted at Tel Hadya, ICARDA's main experimental station 30 km south of Aleppo in north-western Syria. Purchased straw from the widely used barley landrace Arabi Abiad was chopped to about 2.5 cm lengths. Eight, two-year-old Awassi withers were divided between two treatments according to liveweight and offered straw at 20% above the previous three day's mean intake. Four withers received straw alone and the other four received straw with a daily feed of 2.85 g CSM/kg liveweight. This amount, which was adjusted according to liveweight recorded every 28 days, which was crude protein in the diet from a sub-maintenance level of about 3.5% of the dry matter to a level generally considered necessary for optimal rumen microbial activity. The barley straw and semi-decorticated CSM contained 38 ± 0.6 and 362 ± 43.7 g crude protein, 187 ± 19.8 and 59 ± 1.6 g ash, and 404 ± 1.1 and 256 — 33.4 g acid-detergent — fiber per kg dry matter respectively (mean and standard deviation). Sheep were kept in digestibility crates and individual voluntary intake was recorded daily. Digestibility of diets was measured using 10 day total faecal collections starting on day 46, 74 and 102 of the trial. Detailed procedures are reported by Capper et al. (1986). Sheep were weighed at the start of the trial then at 28 day intervals. The results were analyzed statistically for treatment effects, with the repeated measurements being considered as replication within animals over time.

Results and Discussion

Results

The sheep offered only straw maintained a fairly constant intake for the first 30 days of the trial (Fig. 1a), but they lost weight rapidly (Fig. 1b). Thereafter intake also declined, although it started to recover about day 50. After day 50, weight remained fairly constant. Sheep receiving straw and the CSM supplement followed a similar course of intake reduction and reco-

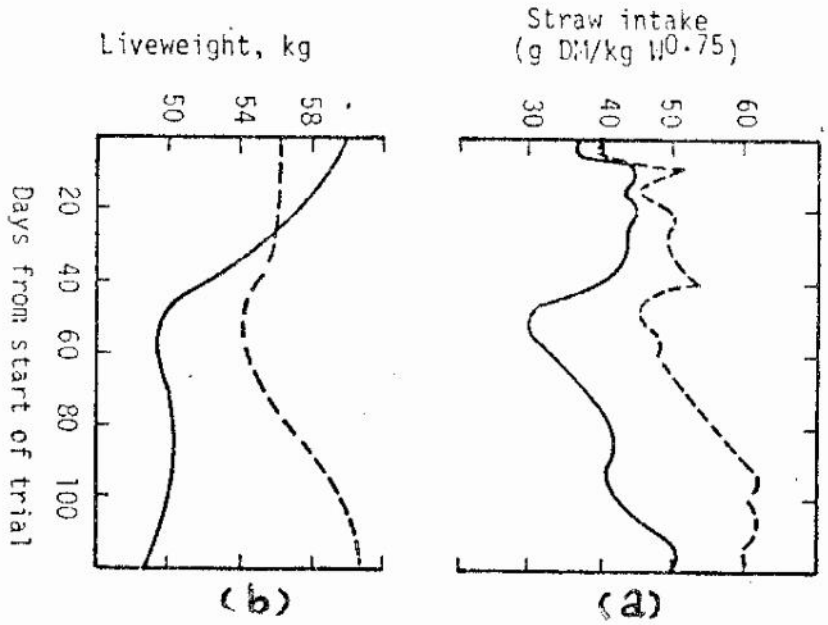

Fig. 1 : Straw intake (la) and liveweight (lb) of sheep offered barley straw alone (continuous line) or barley straw with cottonseed meal (broken line).

very, but recovery, but intake of straw was always higher. The sheep on supplemented straw lost 40 g/day up to day 5» but gained 98 g/day for the rest of the receiving only straw lost 82 g/day whereas those receiving straw and CSM gained 35 g/day ($P<0.01$, **Table 1).**

Adding CSM clearly increased straw dry matter, organic matter and crude protein intake ($P < 0.01$, Table 1. It also increased the crude protein content in the total dietary dry matter from 3.7 to 8.3 %, and the intake of digestible organic matter from 13.4 to 23.3 g/$W^{°.75}$ and metabolizable energy from 198.5 to 348.0 KJ/$W^{°.75}$.

The presence of CSM led to a small increase in the overall digestibility of the total diet, but retrospective calculation using a CSM digestibility of 67.0% (ICARDA, 1986) showed that straw digestibility was unchanged by adding the supplement.

TABLE 1 : Daily liveweight changes of Awassi sheep, and voluntary intake, digestibility and estimated content of metabolizable energy of barley straw, and barley straw supplemented with cottonseed meal (CSM) : averages over 122 days.

	Treatment		SED[1]	Signi-ficance
	Straw	Straw+CSM		
Liveweight change (g)	-82	35	22.8	**
Dry matter intake (g)				
Straw	625.8	904.7	103.63	***
Cottonseed meal	—	150.2	—	—
Organic matter intake (g)				
Straw	527.6	820.4	101.27	***
Cottonseed meal	—	135.1	—	—
Crude protein intake (g)				
Straw	23.3	35.5	4.88	***
Cottonseed meal	—	52.0	—	—
Intake per kg $W^{0.75}$				
Dig. organic matter (g)	13.4	23.3	1.67	***
Met. energy (KJ)	198.5	348.0	54.60	***
Digestibilites (%)				
Dry matter	90.9	43.8	1.67	***
Organic matter	48.3	50.6	1.79	*
Acid-detergent-fibre	38.3	36.8	2.59	ns

[1]Standard error of difference,

[2]Significance level : ns = $p < 0.05$; **$p < 0.01$; ***$p < 0.001$;

[3]Metabolizable energy estimated from 0.15 times digestibility of the organic matter in the dry matter (Ministry of Agriculture, Fisheries and Food, 1984).

Discussion

The initial liveweight fall in sheep offered straw alone was high, even though intake remained fairly constant up to day 30 of the triat. Part of this decrease was Probably due to gut-fill changed, to a submaintenance crude protein intake (23.3 g/animal/d) or to both. It has been reported that the maintenance level of crude protein of a 60 kg sheep was 98 g/day (NRC. 1976) Many workers Soliman et al., 1985; Orskov, 1982; Van Soest, 1964) have shown that low nitrogen content, low energy density along with high fibre content of poor quality roughages are main constraints limiting their use as solediets. However, the fall of intake between day 30 and 50, followed by a recovery, cannot be

satisfactorily explained. It may have been associated with the metabolic adaptation mentioned below. The overall daily decrease of liveweight is similar to the 80 to 90 g/day losses of Chios sheep offered only chopped or long straw and a mineral supplement for 91 days (Hadjiapanyiotou et al., 1975).

Fat-tailed Rahmani sheep fed straw a lone for 12 weeks last on the average, 53 53 9/animal/day Soliman, *et al.*, (1985), while supplementing the straw with urea or undercorticated cotton seed meal increased ADG by 67 and 76 g, respectively.

The mean straw intake and digestibility in this trial were similar to those reported by Capper *et al.*, (1986), but in other trials higher values were measured (ICARDA, 1988). However. Dryden and Kempton (1983) found that Border Leicester withers offered barley straw consumed daily only 8.8 g digestible organic matter/kg $W^{\circ.75}$. Such differences in the intake of straws from the same cereal species could be due to the effects of variety. growing conditions and harvesting method (Capper et al., 1985). Alternatively the two breeds of sheep, one from a semi-arid and one from a temperate region, may have different capacities to utilize poor quality diets.

The estimated metabolizable energy intake of sheep offered straw alone was about half the amount needed to cover maintenance requirements (Agricultural Research Council, 1980) Not surprisingly they lost weight. However, although losses were large at first, they were small during the last nine weeks of the trial. This suggests that the sheep may have been approaching energy balance. If this was the case, then their maintenance requirements may have been substantially lower than estimated from published data, even after allowing for a fall in metabolic activity due to a period of under-nutrition (Guingins et al., 1980), Lower maintenance requirements in the Awassi breed would save feed during periods of scarcity which occur frequently in semi-arid countries.

.The clear effect of CSM supplements on straw intake is well known and can be explained by the increased rate of digestion of the basal diet following enhanced microbial activity (Cheeson and Orskov, 1984). Because of the low rumen degradability of CSM, however, much of the protein would have been digested post-rum-

inally (Preston and Leng, 1984). The liveweight gains of sheep receiving supplements indicates that their nutrient intake was above the maintenance level.

Conclusion

The straw from the barley landrace Arabic Abiad can support Awassi sheep for up to four months without large reductions in liveweight. However, adding small amounts of CSM to the diet allows moderate liveweight gains. If breeding ewes grazing cereal stubbles made similar gains when offered CSM, their body condition and fertility could be substantially improved. This would have a significant effect on flock profitability.

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الغذاء المأكول والتغيرات فى وزن الجسم لأغنـــام العواسى التى تغذى على تبن الشـــعير وكسب بذرة القطن .

توماســون وتـــيرماني

مركز بحوث الزراعة فى المناطق الجافة ، سوريا حلب ص.ب ٥٤٦٦

يشكل تبن الشعير مصدرا غذائيا هاما للاغنام فى غرب آسيا الا أن انخفاض محتواه من البروتين يحد من الكميات المأكولة منه.ويتوافر كسب بذرةالقطن فى سوريا ويمكن استخدامه كمصدرا للبروتين . وقد أجريت التجربة بهدف دراسة التغيرات فى وزن الجسم وكمية المأكول من تبن الشعير وحـــده أو بالاضافة الى كسب القطن وذلك فى أغنـــام العواسى .

تضمنت التجربة مجموعتين من ذكور العواسى كل منها تضم ٤ حيوانات وغذيت المجموعة الاولى على تبن الشعير فقط بينما غذيت الثانية على تبن بالاضافة لكسب القطن وتم تقدير كل من المأكول من التبن ، القيمة الهضمية لمواد المعلف والتغيرات فى وزن الجسم أثناء فترة التجربة التى استمرت ١٢٢ يوما .
وقد أظهرت النتائج أن اضافة كسب القطن الى تبن الشعير قد أدت الى زيادة متوسط المأكول من التبن على أســـاس المـــادة الجـــافة من ٦٢٥ر٨ الى ٩٠٤ر٧ جرام / يوم وكانت الزيادة معنوية على مستوى ١٠ر كما تغير الفقد اليومى فى وزن الجسم من ٨٢ جرام / يوميـــا الى زيادة يومية مقدارها ٣٥ جرام / يوميا وكانت الزيادة معنوية على مستوى ١٠ر .

وقد زاد مقدار الطاقة الممثلة المأكولة من أقل من المستوى الحافظ (١٩٨ر٥) كيلو جول لكل كيلو جرام من الحيز التمثيلى) عندما ثبت التغذية على تبن الشعير فقط وزادت حتى المستوى الحافظ (٣٤٨ كيلو جول لكل كجم من الحيز التمثيلى) عندما أضيف كسب بذرة القطن . ومن المحتمل أن الاحتياجات الحافظة لأغنام العواسى المغذاه على التبن لفترات طويلة تكون أقل من مثيلاتها فى سلالات المناطق المعتدلة .