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Science for Better Livelihoods in Dry Areas

BRIEFING

Enhancing sheep reproduction through cactus-based feed diets

In central Tunisia, cactus cladodes are sliced and commonly fed to sheep, providing a sustainable and cost-effective source of nutrients and energy

Recurrent fodder scarcity across West Asia and North Africa poses a major threat to the fertility and performance of livestock herds, a mainstay of the region's agricultural production systems. Cactus plants present a sustainable and cost-effective solution for the region's pastoralists, providing a stable source of nutrients capable of maintaining healthy reproductive cycles.

The benefits of cactus production

Securing a stable supply of nutrients, mainly nitrogen and energy, is essential to ensure healthy and fertile reproduction in sheep. Animals require appropriate levels of feed intake to sustain the accelerated growth of the fetus, aid the development of mammary glands, produce milk, and ultimately support the survival and growth rates of lambs.

The benefits of cactus:

High water content: between 850 and 900 g/kg

High energy content: up to 700 g carbohydrate/kg dry matter, with a high proportion of readily available sugars to sustain metabolism

High mucilage levels which can prevent the onset of acidosis

High intake achieved without adaptation to novel feed

Nutrients are also required at mating time to enhance conception rates, thereby improving fertility and raising ovulation – the main determinant of prolificacy. Rams, both before and during mating, respond positively to nutritional inputs by fully expressing their behavior and producing higher quantity and quality of sperm.

Unfortunately, in many West Asian and North African countries, recurrent droughts, irregular rainfall, and feed scarcity often coincide with these crucial physiological stages when nutrient demands are very high. Providing a sufficient amount of food at this critical time is the key guarantee of maintaining flock performance at profitable levels.

Relying on conserved forage - straw or hay - may not represent a secure option, however, and using concentrates, may be beyond the economic means of most smallholder farmers.

A sustainable and cost-effective alternative

A sustainable and cost-effective alternative for sheep producers in many arid and semi-arid countries is the native spineless cactus or nopal – *Opuntia ficus-indica f. inermis* – which is abundant in dryland regions.

Farmers can achieve a high intake of cactus cladodes – over 3.5 kg of freshly sliced-cladodes per day for a sheep weighing 40 kg – without any adaptation. Compared to concentrate, the integration of cactus cladodes could potentially reduce the costs of feeding sheep by up to 40%.

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Furthermore, with 850-900 grams of water per kilogram (g/kg), consumption reduces pressure on already-scarce water supplies. Intake also provides a good source of energy, supplying up to 700 g/kg dry matter. Spineless cactus cladodes originating from central Tunisia, for instance, have a high soluble sugar content - over 60 g/kg dry matter, of which over 90% is represented by fructose, a sugar capable of significantly improving rumen fermentation.

These nutritional characteristics ensure the safe provision and intake of energy boosts over a short period of time – energy levels are best valorized if small quantities of nitrogen are added to the diet. Crucially, this supply of energy prevents acidosis – a condition that causes a decrease in ruminal pH, an accumulation of acid in blood and body tissues, and brings economic losses for farmers due to increased mortality and a marked reduction in weight gain. The consumption of cactus prevents acidosis by enhancing mucilage levels and insalivation, and preventing a sharp decrease in pH.

Enhancing sheep reproduction

Work undertaken by national research teams in Central Tunisia investigated the inclusion of cactus in the diet of sheep at different reproductive stages, yielding insights that could help to effectively introduce cactus at distinct stages of the sheep feeding calendar for maximum effect. Key findings included:

- The conception rate of 18-month old maiden ewes reached 90% when supplemented with 3.5 kg of cactus/head/day. Their counterparts, receiving only 0.45 kg of a commercial concentrate, yielded a conception rate of merely 73%

- In adult sheep, supplementing feed with spineless cactus pads prior to and during mating improved the number of large ovulatory follicles (+30%) and ovulation rates (+18%) – the main determinants of prolificacy

Policy recommendations:

- **Invest** in the establishment of shrub-like cactus plants to achieve sustainable animal food sovereignty
- **Divert funding** from direct food compensation to extend cactus cultivation and intensify research looking at appropriate accessions
- **Encourage** extension programs to consider cactus as an integral part of feeding calendars, and not only as a rescue feed during droughts.

- During the last four weeks of pregnancy and the first four weeks postpartum, when female feed requirements are highest and nutritional inputs most critical, the total substitution of barley grains by cactus preserved mammary secretions and boosted lamb growth

- At the end of a 90-day supplementation period, daily sperm output and testosterone secretion rates tended to be higher for cactus-supplemented rams in comparison to rams that were fed a barley-based supplement.

Further Reading

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Rekik, M.; Gonzalez-Bulnes, A.; Lassoued, N.; Ben Salem, H.; Tounsi, A.; Ben Salem, I., 2012: The cactus effect: an alternative to the lupin effect for increasing ovulation rate in sheep reared in semi-arid regions. Journal of Animal Physiology and Animal Nutrition 96, 242–249.

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Cactusnet is an international technical cooperation network on cactus created in 1993 by FAO and ICARDA. It aims to collect and disseminate information related to cactus production, facilitate the collection and utilization of germplasm, and promote the ecological and social benefits of cactus pear. It also works with national partners to improve technical capability.