CHAIRS' SUMMARY PAPER: Post Harvest Management

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SUMMARY OF INVITED PAPERS

Two plenary presentations provided an overview of current knowledge and future needs for silage and hay conservation. Dr. Sinclair Mayne pointed out two main options to improve silage value: rapid acidification in the silo or rapid field wilting prior to ensiling. In climatic areas with considerable rainfall or continuously humid conditions, rapid acidification with the help of additives may be the more practical route. In areas with occasional or frequent good weather conditions for natural drying, field wilting can be practiced. New technologies that enhance wilting rate such as intensive mechanical conditioning may be helpful to reduce field respiration and proteolysis, and retain a high level of nutrients in the conserved silage. Near infrared reflectance technology should become more widespread in the future for rapid feed evaluation.

Dr. Karin Wittenberg illustrated the wide range of yeasts and fungi found in forages and the occasional benefit of a controlled presence of these microorganisms in high fiber hays. Rapid moisture removal to below 15-18% will generally ensure good hay conservation with minimal microbiological activity. The bale environment may be improved with the use of new drying technologies or additives that control fungal growth.

SUMMARY OF POSTER PAPERS

About 25 posters were related to harvest, storage and feeding conserved forages. Silage research was concerned with plastic wrapped round bales, small storage structures in developing countries, various additives and animal response. Silage quality was better preserved with rapid field wilting (maceration), during a short rather than a long storage period (90 vs 210 d) and with a variety of additives (molasses or sugar, Lactobacillus casei, previously fermented juice, cellulase, N-rich poultry litter, enzymes). Some of these research results would be applicable to local crops and environments and not necessarily transposable to other conditions.

Hay research was concerned with mechanical methods (maceration) for faster field wilting, field and storage losses, fungi in forages and ammoniation to increase nitrogen content. Bales stored outside are expected to be better preserved when covered, especially in a humid and rainy environment. Haymaking remains a challenging method to conserve high quality forage because of the variable climate that prevails in many areas and because of high losses incurred while handling a relatively dry material.

AREAS OF DISCUSSION AND CONTROVERSY

Some controversy occurred during discussion on whether or not forage nutritive value could be improved during conservation compared to the original crop. One view was that forage always loses energy during conservation and the aim is to minimize this loss. Another view was that forage feed value can actually be enhanced by mechanical, thermal or chemical treatments (or additives), and appropriate blending of feeds. The former view seems to apply to predominantly grass-pasture areas while the latter view is applicable to alfalfa-corn silage-harvested-grass areas. Another issue raised was the cost of harvest and storage. Cost should not be overlooked as some proposed techniques occasionally make conserved forages costlier than cereal grain.

Discussion covered a wide range of topics including the importance of water soluble carbohydrates to predict intake, accumulation of WSC during the daytime and its influence on silage, the fate of nitrogen fractions during conservation and feeding, drying agents such as potassium carbonate, epiphytic bacteria during wilting, the measurement of fermentation gases to predict degradation kinetics, the management of high DM (> 40%) silages and the comparative benefit of intensive mechanical conditioning under good drying climates relative to humid high rainfall climates.

One area which received little attention was processed forages (cubes, pellets) that can be produced in one region of the world and shipped to another. There was also little discussion about the potential economies of scale from small forage conservation units (round bale silage, small square bales of hay) to very large conservation systems (usually bunker silos). Environmental issues were barely mentioned, notably the problem of silage effluent control. Effluent is a problem mainly in very wet areas where direct-cut silage is produced. Solutions are probably already available, i.e. complete effluent catchment, the use of absorbents or methods to increase the dry matter prior to ensiling.

FUTURE OF POST-HARVEST MANAGEMENT RESEARCH

In parts of the world where pastures can be used all year round, forage conservation remains a minor issue. A minimal amount of conserved forage may be a useful complement during the dry or slow growing season to maintain a decent nutritional level for animals. In parts of the world with long winter or dry seasons, forage conservation is essential to maintain animal production throughout the year. Whether forage is conserved as hay or silage depends largely on the climatic regime during the harvest season and the scale of the operation.

The proportion of conserved forage in a ruminant's diet has to meet the minimum fibre requirement. The proportion can be higher than this minimum if forage quality is good enough to also meet some of the energy and protein requirements. As a source of energy and protein however, conserved forage is in competition with grain and high-protein meal. The optimal quantity of conserved forage is therefore a function of the cost of harvest, storage and feeding systems, the cost of competing sources of energy and protein, and the relative value of animal products.

Systems analysis remains an important approach to integrate the multiple aspects of conserved forages. However, farmers need practical innovations they can easily adopt on the farm. Therefore a new harvest machine, a new storage method or an innovative additive can possibly be adopted more quickly than an improved management technique. Of course, the benefit from the innovation has to be greater than the additional cost, and there should be a good technical and commercial support for successful adoption.

A wide variety of options are available to improve post-harvest management of forages. Some of these options start in the field, at mowing, during windrow manipulation or harvest. Increased mechanical treatment is likely to be integrated in future machines (mower-macerators, crop processors in forage harvesters) to improve field wilting and also fermentation characteristics. Animal performance may also be improved with forage that has been mechanically broken or shredded by facilitating fibre digestibility. Besides these mechanical treatments, one can envisage thermal, chemical and biological treatments to improve forage conservation.

Thermal treatments present the possibility of stopping proteolysis by inactivating enzymes and reducing moisture content rapidly by artificial drying. They are likely to be difficult to implement on a very wide scale because of the heavy, heat-resistant equipment required and the high energy consumption. Artificial drying may have a place for a limited quantity of conserved forage (cubes, pellets, baled hay) that is sold in niche, high value markets (race track forage for horses, densely populated countries with a high standard of living and a policy to maintain animal production under limited forage production areas).

In countries where forage and livestock are produced together, it is important to minimize the cost of forages. The least cost forage usually comes from pasture. Therefore conserved forage should be produced with techniques that preserve quality while limiting the cost of harvest and storage. Hay and silage research should continue to investigate new biological and microbiological means of preserving forage quality. The successful innovations will be those that can be adopted quickly and at a reasonable cost while providing a substantial benefit, either economically, environmentally or both.