

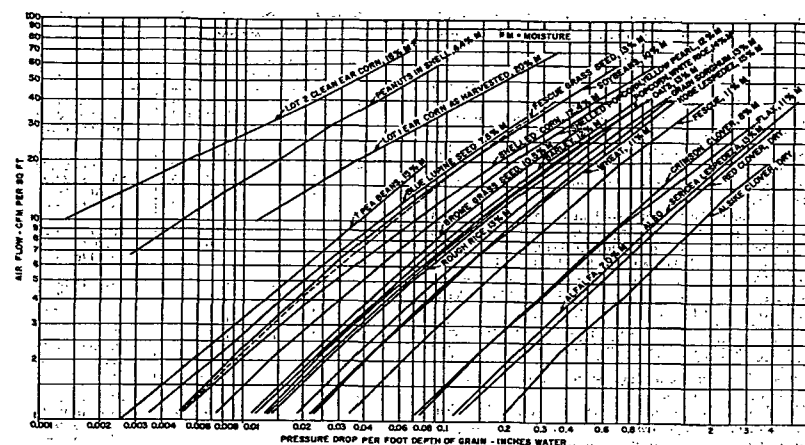


Fig. 4 Resistance of Grains and Seeds to Air Flow

rates for non-linear airflow systems has been developed by Ives *et al.*¹²

DRYING OF SPECIFIC CROPS

Hay

Forage crops may be harvested, dried, and stored as hay, or harvested and stored under anaerobic conditions as grass silage. Hay quality can be judged by its color, leafiness, and general appearance. Laboratory tests and feeding trials give a more detailed picture of hay quality. The traditional method of making hay is to mow the forage and allow it to field cure or dry in the swath and windrow, but, with the advent of

readily available electricity, mechanically operated blowers have been used to dry the hay in the barn or mow.

Because forages, principally alfalfa, have high vitamin content, dehydrated and ground alfalfa is of particular interest to feed manufacturers. Alfalfa meal supplies provitamin A (carotene), vitamin E, xanthophylls (poultry pigmentation factors), vitamin K, vitamin C, and B-vitamins.

Figs. 5 through 10 are the results of careful studies in the evaluation of the several methods of harvesting hay.¹³ The study was conducted at Beltsville, Maryland. As shown in Fig. 9, the rapid loss of carotene immediately after the forage is cut indicates the need for rapid transport to the dehydrator when alfalfa meal with high vitamin content is desired.

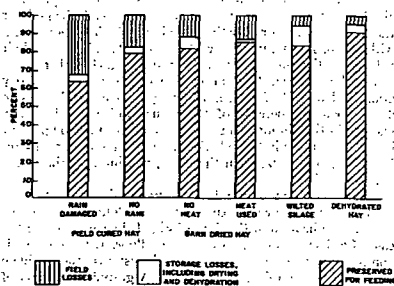


Fig. 5 Percentage of Dry Matter Lost in Field and During Storage and Percentage Preserved for Feeding

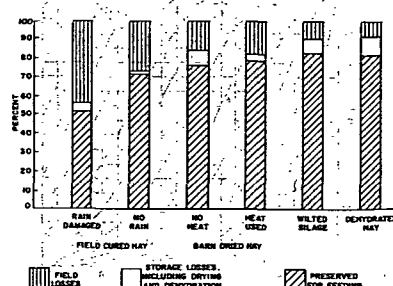


Fig. 6 Percentage of Protein Lost in Field and During Storage and Percentage Preserved for Feeding

Physiological Factors in Drying and Storing Farm Crops

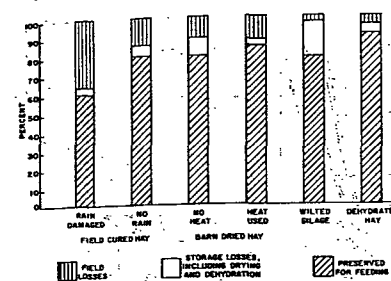


Fig. 7 Percentage of N-Free Extract Lost in Field and During Storage and Percentage Preserved for Feeding

Several factors may influence the retention of the vitamins during storage of dehydrated forages, such as the starting plant material, conditions of dehydration, addition of stabilizers, and conditions of storage. Low temperature reduces the rate of loss. Inert gas atmosphere in storage also reduces losses, as shown by Hoffman and others.¹⁴ According to Thompson *et al.*,¹⁵ blanching of fresh alfalfa before drying does not alter the storage stability of carotene. Table 4 shows the results of their tests on the effect of prolonged heating at 212 F. The alfalfa was dried after three quarters of an hour; heating beyond this time represented excessive exposure to this temperature. They considered carotene retention in the intact meal at 149 F storage temperature a measure of storage stability. Table 5 shows the effects of underdrying and overdrying on carotene stability, also determined by Thompson *et al.* They determined that: normal material is considered to be a product that contains from 8 to 9 percent moisture after grinding, underdried material contains from 10 to 12 percent, and overdried material contains less than 6 percent moisture.

Grain

The physiological factors involved in drying and storing grain are somewhat different from those applying to forages.

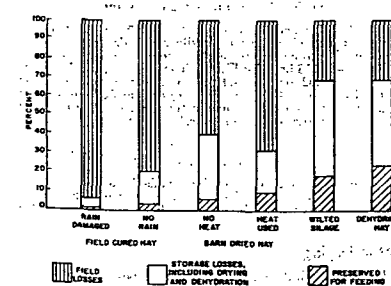


Fig. 8 Percentage of Carotene Lost in Field and During Storage and Percentage Preserved for Feeding

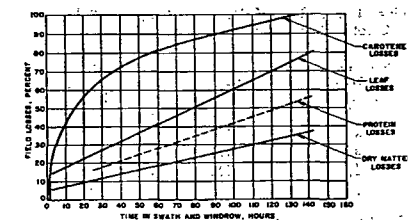


Fig. 9 Relation Between Time in Swath and Windrow and Field Losses of Leaves, Dry Matter, Protein, and Carotene

Grain is the end product of plant growth and most physiological activity within the grain or seed is approaching a low level. With forage, the biological activity within the plant is at or near its peak at time of harvest.

Grain must be stored dry, to prevent destruction by microorganisms. There are two major considerations in the storage of grain, (1) the time grain can be held at harvest moisture content before damage by microorganisms will take place, and (2) the upper temperature limits of the drying air which will dry the crop without causing physical damage to the grain in terms of its ultimate use.

Shelled Corn

Shelled field corn is used primarily as livestock feed. However, some of it is used by the milling or processing industries in the production of corn starch, corn oil, and other products. This corn can be severely damaged by mechanical drying if drying air temperatures exceed 150 F. The structure of the cell walls is changed by higher temperatures, making separation of gluten from the starch very difficult.

There is very little information on the relationship between the drying method and the feed value of corn. Market grade, as established by the Agricultural Marketing Service of the USDA, is the primary criterion for evaluating corn value. Some investigation has been made on the effect of drying air temperature on the nutritive value of corn as feed for rats.

According to Cabell *et al.*,¹⁶ it appears in these tests that 29 to 32 percent moisture shelled corn can be dried without loss of

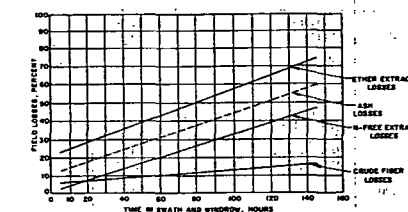


Fig. 10 Relation Between Time in Swath and Windrow and Field Losses of Ether Extract, Ash, N-Free Extract, and Crude Fiber