line with N/10 sodium hydroxide. They include ammonia and its substituted derivatives, the ethyl and methyl amines, all expressed as ammonia equivalent. The amines when present in excess impart an objectionable, pervasive, and persistent fishy odor to silage.

Filling Period
The filling period is the time it takes to fill a silo. It should be as short as possible consistent with practice. If at all possible, intervals of more than 24 hours between periods of filling are to be avoided because of spoilage of top layers exposed to air.

Fermentation Period
The fermentation period is the time during which the fermentation process continues. It is generally about three weeks.

Length of Cut
Length of cut is the length to which forage is chopped for ensiling. A short-cut forage is preferable because the material packs better than long-cut or uncut forage. One-quarter to one-half inch length is generally acceptable. Sharp knives are very important since much material that a sharp knife would sever slides by a dull knife uncut.

Hay Equivalent
Hay equivalent is the amount of hay which is equivalent to a given weight of silage. Hay usually contains 85 to 90% dry matter. Conventional silages average 28 to 30% dry matter. On this basis 3 pounds of silage are considered the rough equivalent of 1 pound of hay. Low moisture silage (haylage) averages 45 to 55% dry matter. On this basis 2 pounds of silage are considered the rough equivalent of 1 pound of hay.

Temperature
Temperature refers to the temperature of the silage mass rather than that of the ambient air. It should not rise much above 100°F. Excessive heating results in "tobacco" brown silage (see under Spoiled Silage) with high dry matter losses. On the other hand, so-called "cold" fermentation sometimes produces undesirable amounts of butyric acid which results when the forage is very wet (75 to 80% water or more). Temperature in this type of fermentation may run as low as 75°F.

Compaction
Compaction is the degree to which the forage is compressed in the silo. It should be sufficient to exclude all air but not so great as to threaten collapse of side walls. Collapse occurs only in upright silos insufficiently reinforced with hoops and where forage is stored very wet.

Permeability, Side-Wall
Permeability refers to rate and extent of the passage of plant juices and gases through the lateral barriers of a silage storage structure. Passage of plant juices is frequently seen where forage is stored very wet with no conditioner and in silos where joints of the staves and doors are not tight. Gases escape along with the

plant juices under these conditions. Gases may escape through porous wood, concrete, or plastic film.

Time Element
Time element is the time elapsed between ensiling, i.e., the time cut forage lies in the field. It may be termed "s cure time." With direct-cut field choppers this is nearly so. With other methods of harvesting depending on efficiency of labor and machinery practiced, length of exposure time is more or less and varies from 1 to 5 hours or longer, depending on weather.

Bacteria in Silage (Classified according to oxygen requirements)

Aerobes are organisms which can multiply in the presence of oxygen. These include certain bacilli, yeasts, and molds, two classes of course are not bacteria.

Anaerobes are those which can multiply in the absence of oxygen. In this class are the spore formers (Clostridia) and some non-spore formers. These multiply only in the presence of sufficient acid (at pH 5.0 or higher), either acetic or lactic acid fermentation.

Facultative Anaerobes are those organisms which multiply equally well in the presence or complete absence of oxygen. They include Flavobacterium, coliform, and lactic acid bacteria. These usually die out after a few hours, leaving the material which, although they vary some in their oxygen requirements, generally grow better under restricted oxygen tension.

Microaerophilic organisms can live in the absence of oxygen but are not so equally well off. In the presence of very low oxygen tensions, they usually inhibit their growth. Few of these are found in stored forage.

Classification of Silages (Based on content)
Corn—whole—stalks, leaves, and ears
Corn—stalk—stalks after the ears are removed
Corn—ear—high-moisture (22 to 32% moisture content)
Corn—shelled—high-moisture (22 to 32% moisture content)
Corn mixtures—e.g.,: Corn and sorghum, corn and Sudangrass
Sorghum
Sudangrass
Legume-grass—60% or more forage legumes, 40% or less grass
Grass-legume—60% or more forage grass, 40% or less legumes
Grass—including all the common perennials or annuals
Legume—alfalfa, the clovers, soybeans, lespediza, etc.
Cereal—oats, wheat, rye, etc.
Cereal heads—when the spikes or panicles are hard and dry
Miscellaneous—soybean-sorghum, sugar beet trash, sweet potato, wine, lima bean vine, potato, apple pomace, nongrain waste

In reporting results of research on ensiled forage it is desirable to report the percentage of each kind of crop if possible.—Report of Committee on Silage Nomenclature, held at the Second Silage Conference at University of Maryland, March 9-10, 1939. RODNEY A. BRIGGS, C. W. LANGSTON, and JOHN G. ARCHIBALD, Chairman.

Book Reviews

THE CHEMISTRY AND TECHNOLOGY OF FERTILIZERS.

The subject is treated in 24 chapters—in some cases from mineral deposits to finished products with pertinent references at the close of each chapter.

Some 5% of the book deals with the occurrence, refining of potash materials, and 5% with selenium elements.

About 40% of the book is devoted to the processing of nongranular, granular and liquids. Consideration is given to plant practices, to materials of construction, to materials handling equipment, to caking, drying and cooling of mixtures, and to treatment of gaseous effluents from manufacturing operations.