STUDIES ON CEREAL STARCHES AS CARBOHYDRATE SOURCES IN A UREA-CONTAINING LIQUID SUPPLEMENT

by

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INTRODUCTION

In many areas, the only available feeds for a winter type beef ration are low quality roughages and pasture. The protein and energy contents of these forages are low and result in a loss of weight and condition throughout the wintering period. The increasing cost of grains has caused dairy rations with lower plant protein content. The economic feasibility of using plant protein as the total nitrogen source to supplement wintering cattle and dairy animals is rapidly declining. This, in turn, is increasing the use of non-protein nitrogen in supplements to replace some of the protein supplied by plants.

Liquid supplements are increasing in popularity in the livestock industry to aid against animal weight loss and high cost of plant protein. Liquid feeds, for ruminants, generally contain urea for a nitrogen source and molasses for a carbohydrate source. A new liquid supplement, however, incorporates a hydrothermally processed starch-urea mixture.

The objectives of these studies were to examine the effects and characterists of this starch-urea liquid supplement during storage and to examine the effects of processing technique on the liquid supplement.

LITERATURE REVIEW

Grain Composition

The most widely used cereal grains as livestock feed in the United States today are corn and grain sorghum. Corn is composed of 82% endosperm, 12% germ, 5% pericarp and 1% tip cap (29). Table 1 shows the proximate analysis of yellow dent corn.

The main source of energy in corn is supplied by the endosperm, which is composed of two regions. The regions are the hard or horny endosperm, which contains relatively small starch granules embedded in a thick protein matrix; and the soft or floury endosperm, which is composed of large starch granules embedded in a thin, weak protein matrix (76). It has been hypothesized that upon drying, the cytoplasmic protein ruptures leaving void areas. This causes opaqueness in the soft endosperm due to light refraction. The hard or translucent endosperm is believed to be absent of void spaces, preventing light refraction (16). Results from a scanning electron microscope study have shown that starch granules in hard endosperm of corn are tightly packed, polygonal shaped and contained in a continuous protein matrix. It was also found that the soft endosperm, in contrast to hard endosperm, contains nearly round starch granules, which are not tightly packed, resulting in intergranular air spaces (55).

Approximately 10% of the whole corn kernel is composed of protein. Classes of proteins and their relative amounts found in the endosperm of corn are: 3.2% albumins, 1.5% globulins, 47.2% prolamines and 35.1% glutelin (29).

TABLE 1. PROXIMATE ANALYSIS OF YELLOW DENT CORN[a]

Component	Mean %	Range %
Dry matter	89.0	87-91
Protein (N% X 6.25) (W.B.)	10.0	9.3-10.7
Ether extract (W.B.)	4.4	4.0-4.8
Crude fiber (W.B.)	2.2	2.1-2.3
Ash (W.B.)	1.2	0.9-1.5
Starch (D.B.)	72.0	64-78

[a]Inglett, G. E. (29).