FORAGE QUALITY OF CEREAL AFTERMATH

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The purpose of this study was to evaluate nutritive variability of cereal residues used for forage and determine some of the important parameters affecting nutrient quality. Despite its widespread use, little research has been conducted on factors affecting cereal residue forage quality. Various researchers have reported considerable variability in straw quality. Additionally, many Northwest farmers have observed increased residue use by livestock on the harsher sites. Also, although grazing animals are quite selective in plant materials they consume, only limited work has been done to analyze nutrient quality in the various components of cereal residues.

The objectives of this study were to: (1) determine the percent crude protein and digestibility of leaves, culms, and chaff of bearded soft white winter wheat, club wheat, and barley; (2) determine stubble yield and proportion of leaves to culms of these three cereal types; and (3) determine the effect of site potential (based on grain production), and season on nutrient. quality and yield of culms, leaves, and chaff.

STUDY AREA AND PROCEDURES

The study area was in Sherman County in north central Oregon. Annual precipitation occurs from October to March and averages 10 inches. The more productive cereal-producing sites are on Walla Walla silt loams averaging 47 inches or more in depth. The lower potential grain-producing sites generally are found on Condon silt loam ranging from 30 to 47 inches in depth. The tall bearded wheats are grown on the more productive areas while the club wheats are grown on less productive sites. Since precipitation is limited, cereal growers use the summer fallow system. Wheat production varies throughout the county from 16 bushels on the shallow soils to 60 bushels on the deeper soils.

Cereal stubble is used by livestock (primarily dry pregnant cows) from October or November until February or March. Cattle stay on the stubble from one to four months depending on availability and cost of other feed, calving, and other factors. Cattle usually are given a liquid protein supplement while grazing stubble, though alfalfa or other protein sources sometimes are used.

The study was conducted from August 1977 to March 1979. The three cereals studied -- tall bearded wheat, club wheat, and barley -- were sampled three times each year corresponding to the beginning, middle, and end of the stubble grazing season. For each cereal, a high and low production site was sampled. After sampling, all materials were separated into leaves, culms and chaff. Percent crude protein and *in vitro* dry matter digestibility were measured to evaluate forage quality.

Site potential and date effects on percent crude protein and *in vitro* dry matter digestibility for each plant part of each variety for each year were examined with a 2-way analysis of variance. A split-plot design was used with site potential nested within dates.

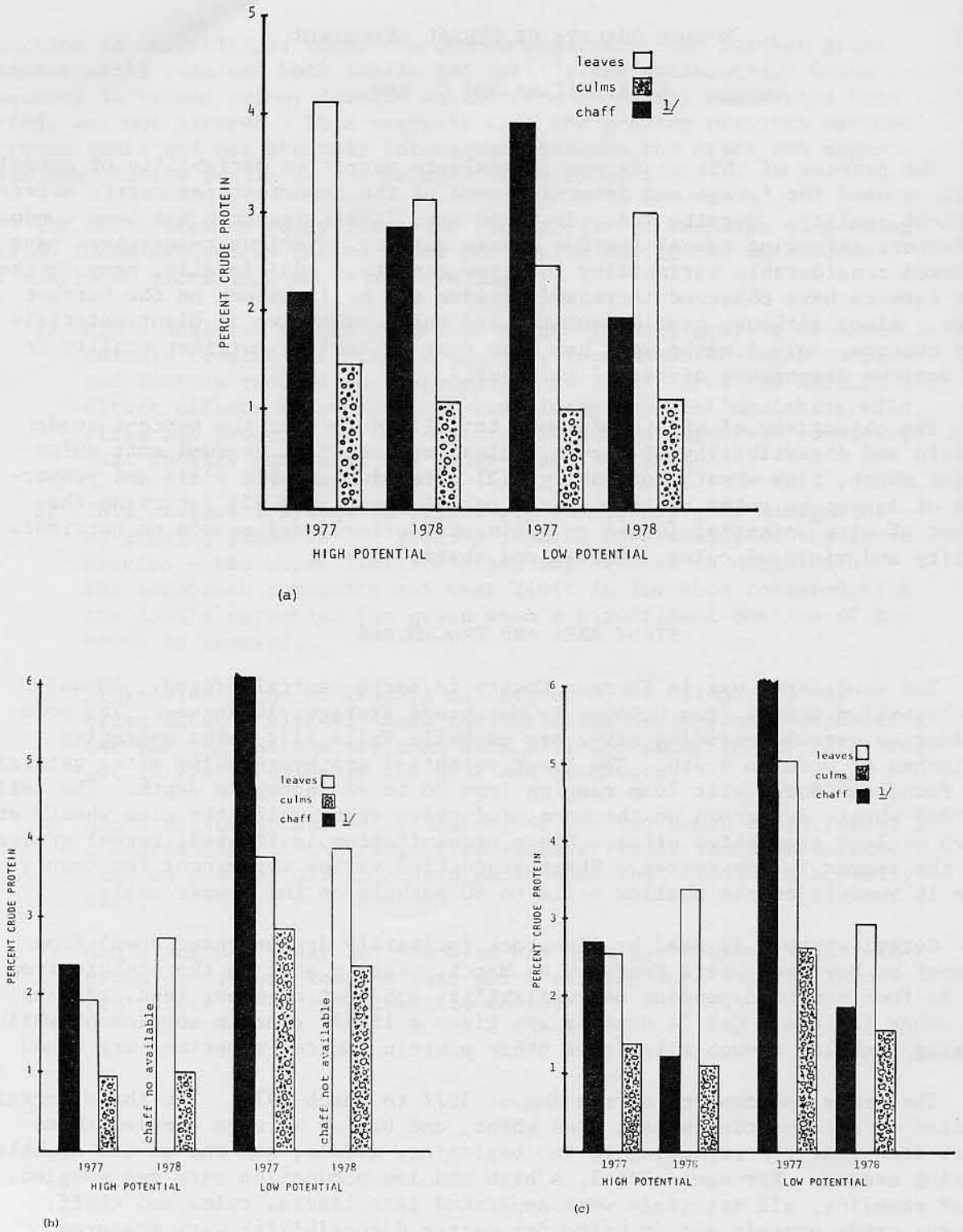

Figure 1. Percent crude protein in leaves, culms, and chaff on high and low producing sites in 1977 and 1978 for; (a) white winter wheat, (b) club wheat, and (c) barley.

1/ Crude protein in chaff is for first sampling date only.

RESULTS AND DISCUSSION

Levels of crude protein were influenced by site potential and fertilization (Figure 1 a, b, and c). When fertilizer treatments were held constant for both high and low potential sites, crude protein levels in all three cereal types were significantly higher on the low potential sites. However, in the case of barley in 1978 and white wheat in 1977 and 1978 where only the high potential sites were fertilized, this relationship did not hold true. Application of nitrogen fertilizers to the higher producing sites increased crude protein concentrations in residues to comparable levels to the low potential sites. The only exception was the crude protein content in white wheat leaves in 1977 which was significantly greater on the high potential site. The same pattern of crude protein content as affected by site potential and fertilization was found for chaff.

Crude protein levels were consistently higher in leaves and chaff as compared to culms in all three cereal types on high and low potential sites. Averaging across site and season, crude protein levels ranged from 1.2 to 2.1 percent in culms, 3.0 to 4.1 percent in leaves, and 2.0 to 4.6 percent in chaff. Before fall rains, crude protein content in the leaves of club wheat and barley on the low potential sites ranged as high as 8 and 9 percent, respectively.

The role of season as it related to crude protein content in cereal residues was important in affecting leaf availability and when crude protein levels occurred in various components of the aftermath. After the first rains, a large portion of the leaf biomass was altered from standing crop residue to litter. Also, crude protein levels exceeding 6 percent (chaff and leaves of club wheat and barley on the low potential sites) decreased rapidly with the onset of winter weather conditions. Season had little effect on crude protein levels (ranging from 1.0 to 3.8 percent) in the remaining residue materials.

Digestibility averaged across sites and season ranged from 20 to 30 percent for the three cereal types. These values are comparable to other values reported in the literature which vary from 23 percent to 48 percent. As in this study, low digestibility values were reported with only one day of digestion (*in vitro* technique). Higher values are reported with 2, 3, and in some cases up to 6 days of digestion. The values reported in this paper probably are somewhat conservative since passage of cereal residue takes approximately two days.

The parameters measured did not appear to have any significant effects on the percent digestibility of cereal residue. The greatest difference occurred between years. However, values of digestibility varied little between cereal types, site potential, season, and plant parts.

Another important consideration relating to forage quality of cereal residues is leaf/culm ratios. Yields of standing cereal stubble on high production sites averaged 625 pounds per acre more than on low producing sites. However, a smaller proportion of this was leaves. Leaf/culm

ratios were consistently higher on low producing sites. Leaf production made up from 15 to 29 percent and 26 to 36 percent of the total stubble production on high and low producing sites, respectively.

Crude protein content was found to be significantly related to site potential and fertilization practices. Cereal aftermath on low producing sites will contain higher levels of crude protein unless nitrogen fertilizer is applied to the high producing sites. Although less stubble is produced on the low sites, a higher proportion of leaf material is available for animal use. Leaf and chaff were consistently higher in crude protein than culms. Digestibility was not affected by any of the parameters measured.

SEDIMENT POTENTIALS AND HIGH INTENSITY STORMS ON RANGELANDS

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A number of rangeland ecosystems are found distributed across eastern Oregon and the Great Basin states of the western United States. In this paper we intend to use central Oregon's Bear Creek Watershed as an example of the kinds of sediment production one might expect under a number of these ecosystems.

DESCRIPTION OF THE AREA

The Bear Creek Watershed, in central Oregon 40 miles east of Bend, covers approximately 131,000 acres in the southwestern corner of Crook County. Bear Creek is a tributary of the Upper Crooked River drainage, with runoff storage in the Prineville Reservoir. The area has a semiarid climate with most precipitation occurring during winter and spring. High intensity summer convectional storms also occur. The mean annual precipitation is approximately 10 inches.

The vegetation types are dominated by various combinations of western juniper, big sagebrush and the bunchgrasses, Idaho fescue, bluebunch wheatgrass, and Sandberg bluegrass. A mixed forest managed for ponderosa pine is found in the higher elevations. Bare ground often comprises more than 40 percent of the ground cover in the nonforested areas. Sheet, rill, and gully erosion are extensive in several locations and streambank erosion occurs along nearly 75 percent of Bear Creek's main channel.

The soils in this watershed reflect a volcanic origin, either basalt or associated proclastic materials. Marine sedimentary clays from the Clarno and John Day formations occur scattered throughout the area.

The majority of the watershed is in public ownership, with the Forest Service managing the mixed forest in the eastern sector and the Bureau of