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Comparative Forage Values of California Oatgrass and Soft Chess

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Rangelands of Humboldt County in northwestern California are characterized by the presence of grasses of the California annual type growing in association with native perennial grasses. In preference and abundance, California oatgrass *(Danthonia californica)* is the most important perennial grass (Sampson and Parker, 1930; Hufaker and Kennett, 1959), whereas soft chess *(Bromus mollis)* is the most used annual grass. Their relative proportions vary with soil series and topographic situations, but management systems can favor either species (Cooper, 1960).

Although these rangelands have been grazed by domestic livestock for over 100 years, little information has been reported on the forage values of the species named or on the desirability of altering management systems to favor either or both of them. It was with this in mind that a study of species composition, relative growth patterns, grazing preferences, and chemical content of these two species was undertaken.

Methods

Data were collected in a 60-acre pasture on the Dwight May Ranch near Bridgeville. Forage sample collections were made on McMahon soil which is representative of large acreages of rangeland in Humboldt County. Species composition was determined on 1000 feet of permanent line intercept transect and 1000 feet of point step taken in June each year. Other data were determined at monthly intervals.

The growth stage was determined randomly throughout the pasture by ocular estimate and measurement of leaf height. Observations of grazing by 10 second-calf or older Hereford cows in excellent condition for 3 to 6 hours on the days of sampling were used as the basis of grazing preferences and for determining the proportion of old and new growth clipped for chemical analyses each month.

One pound green weight samples of each species were clipped in the part of the pasture that the cattle were using to approximate the manner of grazing and the proportions of old and new growth taken by the animals. California oatgrass was collected over a three-year period, 1959-1961, and soft chess for 24 months during 1960-1961. The chemical analysis was performed by the University of California Agricultural Extension Service Laboratories at Riverside, California. Standard American Organization Agricultural Chemist procedures were followed in making the chemical analyses for crude protein, phosphorus, crude fiber, ether extract, ash, calcium, and nitrogen free extract.

Results

Throughout the study, California oatgrass and soft chess made up approximately 88 percent of the available forage. California oatgrass contributed 18-21 percent and other perennials about ten percent. Soft chess contributed 67-70 percent and other annuals about three percent.

At no time during the three-year study was California oatgrass completely dormant (Table 1). New leaves appeared before November when the rainy season began, but did not elongate beyond three inches until April. Frost damage was present throughout this period, as indicated by dead tips on the leaves. The full length of the leaves, seven inches, was reached in June. The culms first appeared in April, spikelets were present in May, and the seed matured in July with fruiting stalks averaging about 18 inches in length. The flower stalks of this species detach at the base during July and August so more stems are included in the analyses during the growing season than later. Cleistogenes matured in Septem-

Table 1. Annual growth cycles and comparative grazing preference of California oatgrass and soft chess.

	California Oatgrass		Soft Chess	
Month	New Growth	Grazing Preference	New Growth	Grazing Preference
January	Leaves 3 inches	High	Leaves 2 inches	Very Low
February	Leaves 3½ inches	High	Leaves 3 inches	Very Low
March	Leaves 3½ inches	High	Leaves 3½ inches	Low
April	Leaves 5 inches Culms appearing	High	Leaves 6 inches Few spikelets	Moderate to High
May	Leaves 6 inches Spikelets emerging	Moderate to High	Leaves 7 inches 70% flowering at 14 inches	High
June	Leaves 7 inches 60% flowering at 14 inches	Moderate	Leaves 14 inches Seed forming at 18 inches	High
July	Seed maturing at 18 inches	Moderate to High	Beginning to dry	Moderate to High
August	Beginning to dry	High	Dry	Low to Moderate
September	Partly dry	High	Dry	Low
October	Green at base	High	Dry	Low
November	New leaves 2½ inches Old stems green at base	High	Leaves 1½ inches	Very Low
December	Leaves 3 inches	High	Leaves 2 inches	Very Low

ber. Green material was available for grazing even through the period of summer drought, from July to October.

Soft chess exhibited a different growth pattern from that of the perennial oatgrass. The seed germinated in November or earlier when rain was adequate, grew slowly during the winter, rapidly in April and May, and matured in June. During July the top growth became completely dry and the seeds were shattered by mid-August. Seed maturity of soft chess was about a month earlier than was the oatgrass. Only traces of old growth remained of either species as late as March.

Preference for California oatgrass was high from August to April and moderate in May, June, and July. In the latter period the oatgrass was grazed but utilization was not as heavy as in other times of the year. On the other hand, soft chess was selected to the greatest extent in May and June. There was little use of soft chess during the time it was dry. The terms "high", "moderate", and "low" as enumerated in Table 1, indicate the relative preference for the two species by cattle. Grazing pressure in the pasture was moderate to light at all times during the three years.

No significant difference between years for any chemical component, except possibly phosphorus in soft chess, was indicated by analyses of variance. Therefore, the data are presented as average monthly percentage chemical compositions (Figure 1).

Annual cyclic patterns, except during the winter part of the growing period, were similar to those found for other forage species (Hart, Guilbert and Goss, 1932; Sampson and McCarty, 1930). Crude protein and phosphorus for both species increased during the winter until the leaves were about three to four inches in length, reached the highest point at the time of culm initiation, and decreased as the plants matured. These components were lowest in the dry herbage. Crude fiber, however, reached a maximum in the dry forage of both species.

Of more importance were the large differences found between the two species. California oatgrass was always higher in crude protein and lower in crude fiber than soft chess. In oatgrass crude protein remained in the range of "suggested minimum requirements" for livestock (National Research Council, 1957, 1958) throughout the year. Soft chess, on the other hand, was below the "suggested minimum requirements" except during the March to June period of fast growth.

Phosphorus was higher in soft chess than in the oatgrass during the growing season and lower during the dry period. Phosphorus in both species was above the "suggested minimum" livestock requirement during the period of fast growth, and for oatgrass also when new growth was initiated in the fall. Ether extract was consistently higher in California oatgrass and uniform in both species throughout the year. Nitrogen free extract was lowest in soft chess during January and February, but was high in oatgrass throughout the study period. Nitrogen free extract is a high-energy source of food, and is an important component to consider in feeds, because of the long cool, wet winters. Otherwise there were no significant differences between species or time of year.

A relationship between chemical content and grazing preference is not clearcut. The grazing preference changed in late April or May from California oatgrass to soft chess. Later in July or early August, the animals again preferred the oatgrass. Crude protein and phosphorus content of both grasses were decreasing at the same rate during the spring change. However, the ob-

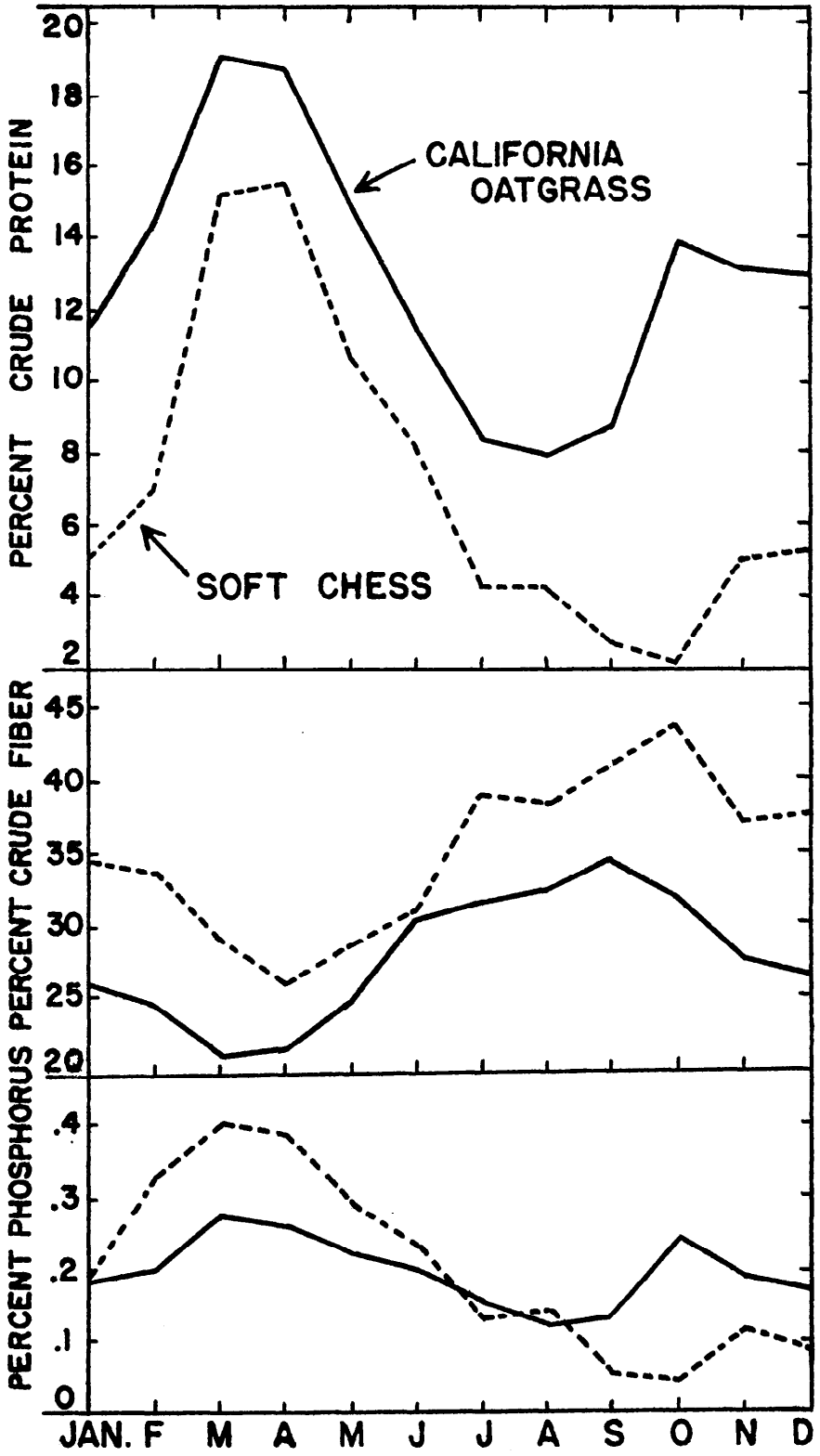

FIGURE 1. Annual cycles of percentage crude protein, crude fiber and phosphorus in California oatgrass and soft chess.

servations indicate that the change was due primarily to the selection of soft chess for the plump seed heads. The change in preference back to the oatgrass in July or August may be related to the shattering of soft chess seed heads and to an increasing differential in the crude protein and crude fiber contents of the two species. Soft chess was completely dry at this season and crude protein was at a low level. Oatgrass at this time still provided green forage which was more attractive to livestock than the dry soft chess.

Conclusions

1. California oatgrass, in all months, is higher in crude protein and lower in crude fiber than soft chess. Contents of phosphorus, calcium, ash, ether extract, and nitrogen free extract in oatgrass are less variable with seasons and usually higher than in soft chess.

2. Grazing preferences exhibited by second-calf or older Hereford cows indicate that California oatgrass, which provides green forage year-long, is preferred except for a brief period when the plump seeds of soft chess are maturing.

3. Chemical content and grazing preferences suggest that California oatgrass is a better forage species and that a management system should be designed to favor it over soft chess.

4. Observations by the authors indicate that under moderate grazing California oatgrass stools readily and forms a sod which produces large volumes of high quality forage. Less desirable perennials and annuals decrease in abundance as the sod forms. Observations also indicate that the change in preference in late spring, which lightens grazing pressure on oatgrass when it is flowering and setting seed, is a fortunate circumstance that has permitted maintenance of this desired species even under heavy grazing. Presumably a management system to favor this species should defer grazing until after its seed has set. The ecology and management considerations of California oatgrass are the subject of further study.

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