

Seasonal Variation In The Chemical Composition Of Our Range Plants

The grasslands in Humboldt County exist in a mediterranean climate with an average annual precipitation of more than 35 inches. The summers are dry but the dry period is occasionally moderated by fog and cool temperatures.

Under proper grazing, perennial grasses are the most important, and the principal one is California oatgrass (*Danthonia californica*.) The annual of major importance is Soft Chess (*Bromus mollis*.) Alternatives in grazing management should be to favor one or the other of these grasses or to use both of them efficiently.

Over a three-year period, ungrazed plants of both species were clipped to ground level at monthly intervals and the material analyzed for crude protein, ash, ether extract, crude fiber, nitrogen-free extract, calcium, and phosphorus. Collecting of new growth began in March when most of the preceding year's growth was disintegrated. Through the fall and winter the clippings included the material on the ground which was a mixture of new and old growth.

At the time of clipping, the growth stage of each species and estimates of degree of grazing were recorded. Even though these are ocular appraisals, they give relevant points for comparing the species in terms of nutritive components, growth patterns, and grazing preferences by cattle.

At no time during the three-year study was California Oatgrass completely dormant. New leaves appeared before November when the rainy season began, but they did not elongate beyond three inches until April. Frost damage, indicated by dead tips on the leaves, was present throughout the period. The full length of the leaves (7 inches) was reached in June. The culms or seed stalks first appeared in April, spikelets were present in May, and the seeds 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 analysis during the growing season than after it. Cleistogenes matured in September. Through August, September, and October, at least a little green material was present at the base of the plants.

Soft Chess, being an annual, exhibited quite a different growth pattern. It germinated in November or earlier, grew slowly during the winter, rapidly in April and May, and matured in June. During July, it became completely dry and the seed heads were shattered by September. Seed maturity was about a month earlier than the oatgrass. Only traces of old growth remained of either species as late as March.

Preference of California Oatgrass was high for nine months and moderate in May, June, and July. At the time, the species was still 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. This is the period when both

species were growing rapidly and maturing. There was very little use of Soft Chess during the time it was dry. The terms high, moderate, and low, indicate the relative preference for the species by cattle. Grazing pressure in the pasture was moderate to light at all times during the three years.

The observation and preference suggest that annual ranges in this region should be used while maturing. Presumably, a rest period for California Oatgrass in May, June, and July would favor it and provide better forage from late summer to the following spring. Stands of California Oatgrass have improved under careful management where stocking rates as well as season of use have been controlled.

The annual cyclic pattern, except during the winter parts of the growing period, was similar to that found by many other workers for numerous forage species (Hart, Guilbert & Goss - 1932... Samson & McCarty - 1930.) Crude protein and phosphorus contents increased during the winter until the leaves were about three to four inches in length. They reached a high at the time of culm initiation and decreased as the plant matured. These components were lowest in dry material. Crude fiber, on the other hand, reached a maximum in the dry forage of both species. The decrease in crude fiber and increase in crude protein from October to March was unexpected. Old and new growth were taken in the samples and during that period there was a gradually-decreasing proportion of old growth. This was done in an attempt to analyze the material an animal might graze.

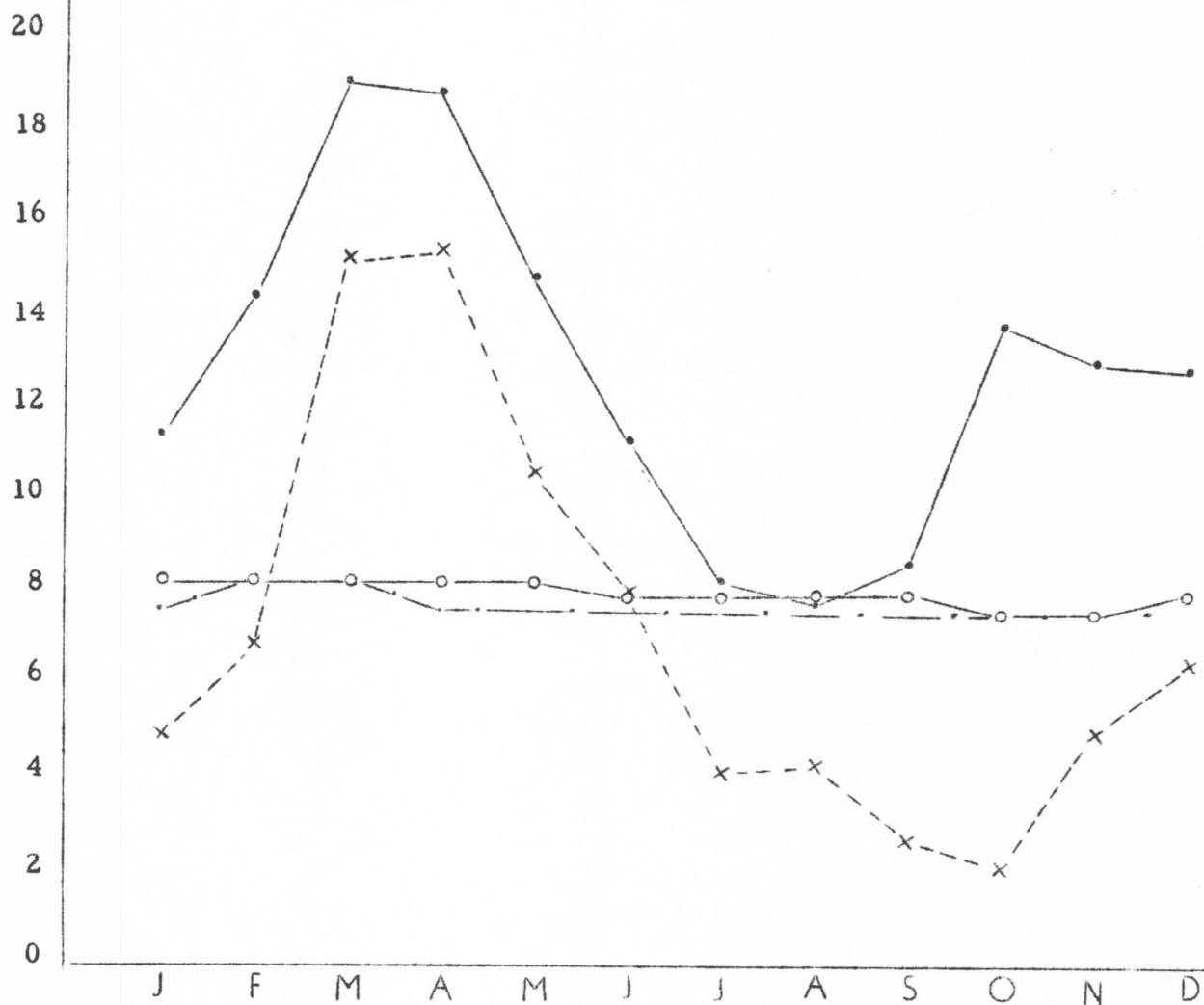
Large and important differences were found between the two species. California Oatgrass was always higher in crude protein and lower in crude fiber than Soft Chess. As indicated by the chemical analysis, protein remained above the minimum requirements for livestock (National Research Council... 1957 - '58) throughout most of the year in the California Oatgrass. Soft Chess was below the minimum requirements for crude protein except during the March to June period of fast growth. Phosphorus was higher in Soft Chess than in California Oatgrass during the growing season and lower during the dry period. The content in both species was above the minimum livestock requirements only during the high part of the cycle. Ether extract was consistently highest in California Oatgrass and uniform in both species through the study.

Calcium was varied without significant monthly decrease. It was above the minimum livestock requirements for both species throughout the year.

Grazing preference changed in late April or May from California Oatgrass to Soft Chess. Later--in July or late August--the animals again preferred the oatgrass. A relationship between grazing preference and chemical composition is not clear-cut. Crude protein and phosphorus content of both grasses was decreasing at the same rate during the spring change. The preference for oatgrass again in July or August may be related to an increasing differential in the crude protein and crude fiber content of the two species. Soft Chess was completely dry at that time and the crude protein content was at a low level. However, the oatgrass maintained small amounts of green material in the base of the stems which was more attractive to livestock than the dry Soft Chess forage.

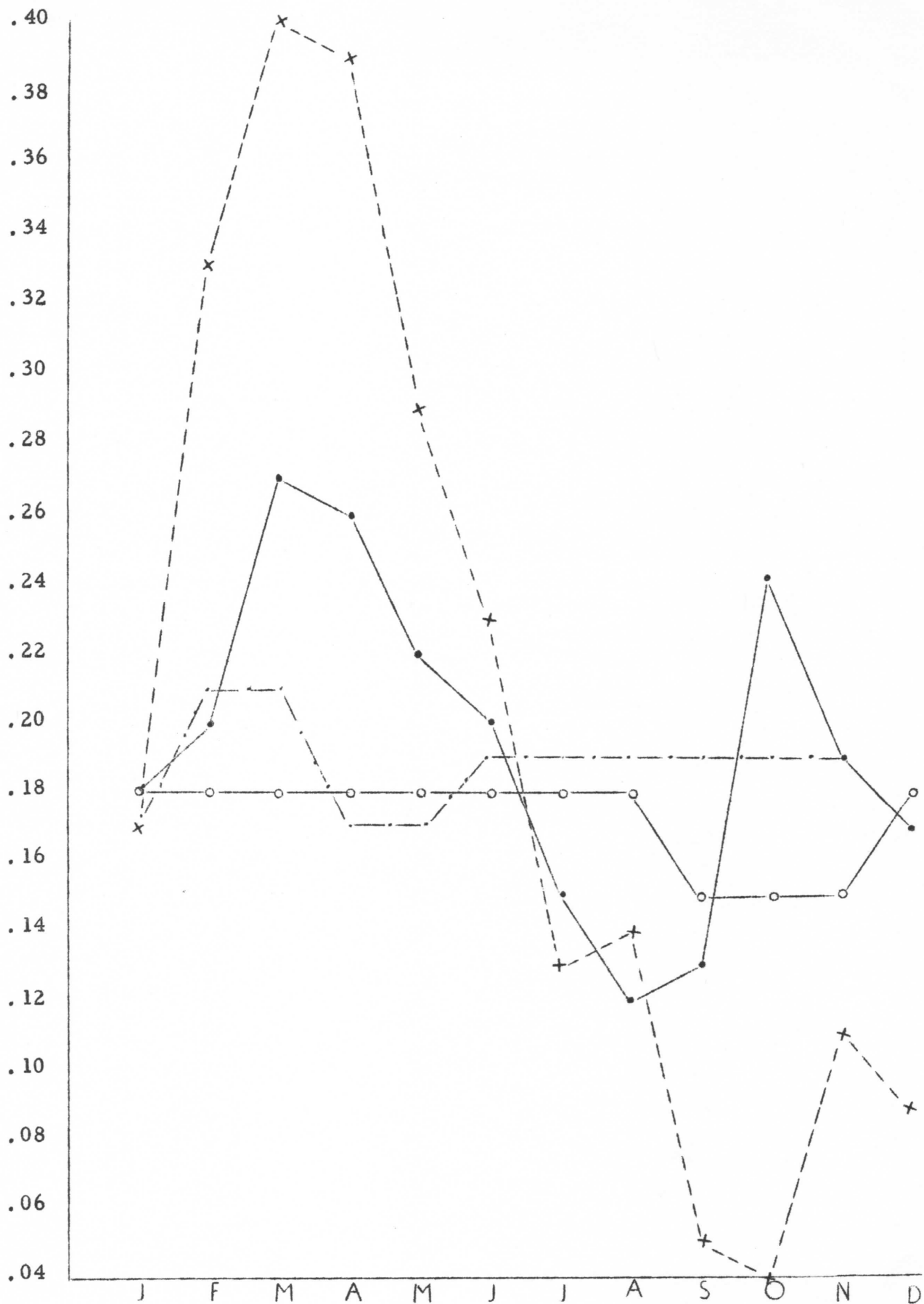
Well-known cycles of high and low contents of crude protein, phosphorus, and crude fiber that have been shown in many forage species were found. Of more importance, California Oatgrass was always higher than Soft Chess in crude protein content. It did not fall below 7.9 per cent during the three years, and was not without green herbage at least at the base of the stems. It also showed more favorable phosphorus and crude fiber content. Soft Chess herbage was below 7.9 per cent crude protein for an average of eight months of each year. These data suggest that grazing practices should favor the oatgrass.

Observations of cattle preference between the two species indicate that California Oatgrass was selected from mid-summer to late spring and Soft Chess was preferred during the time when it was growing rapidly and maturing. The change in preference relieves the grazing pressure on oatgrass at the time when it is flowering and setting seed. Clear-cut reasons for the change are not found in the data on chemical composition. However, it is a fortunate circumstance that permits maintenance of California Oatgrass and better year-long grazing.



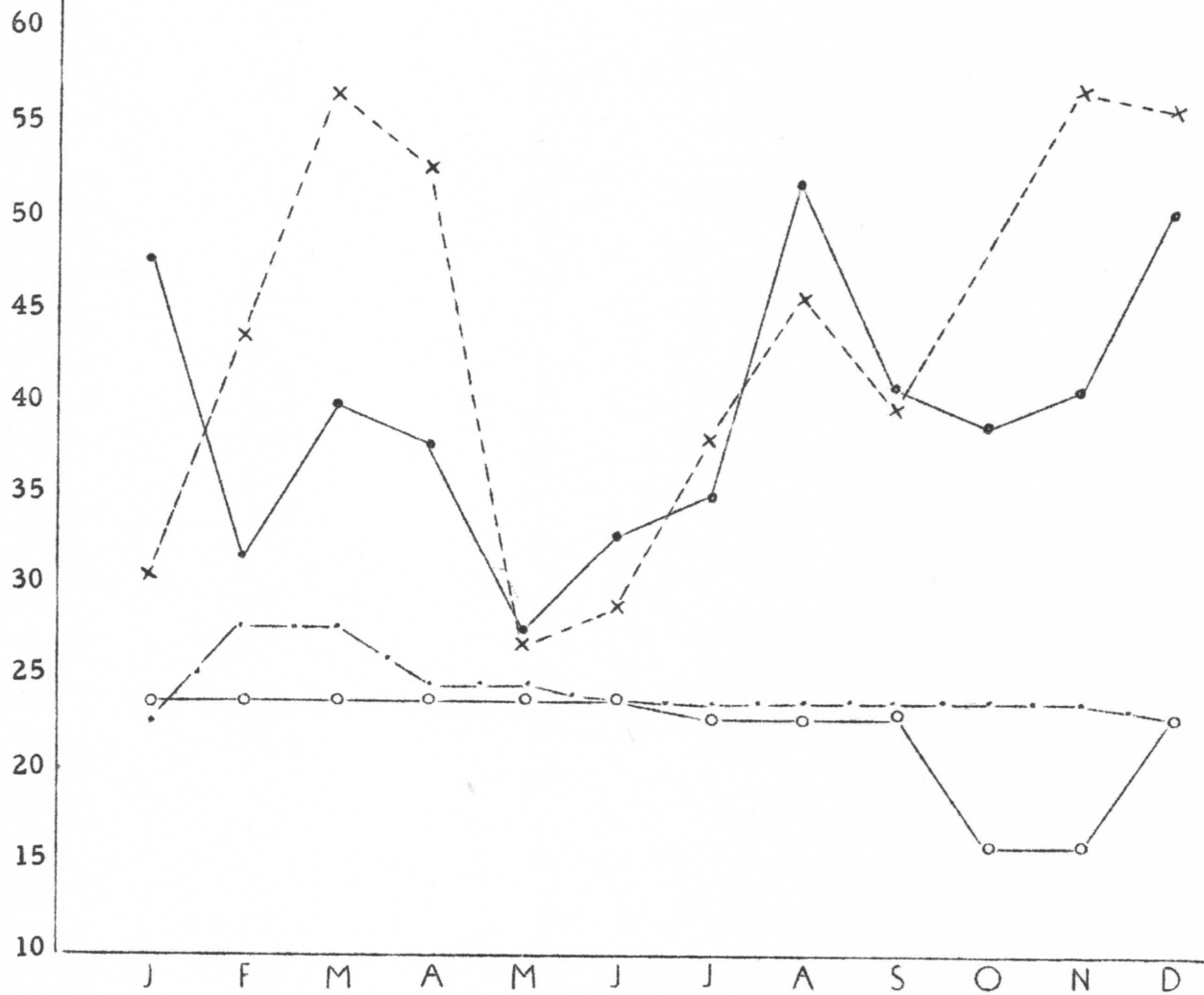
Percent Protein By Month

- California Oatgrass (*Danthonia californica*)
- x - - - - Soft Chess (*Bromus mollis*)
- — Protein requirements for 1000# pregnant cow---Ref. # 1
- Protein requirements for 120# ewe---Ref. # 2



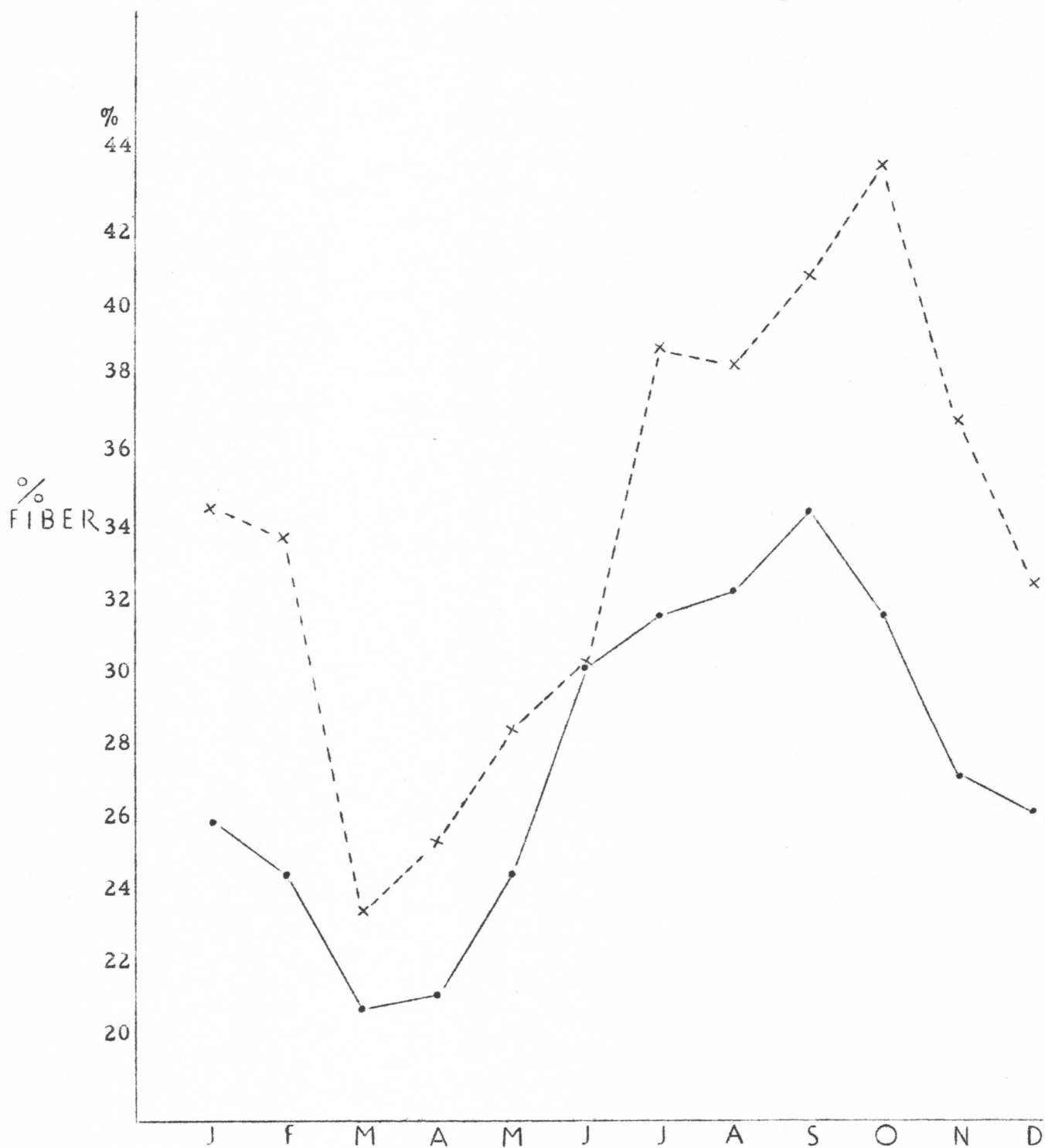
Percent Phosphorus By Month -

- California Oatgrass (*Danthonia Californica*)
- × — Soft Chess (*Bromus Mollis*)
- — Requirements for 1000# pregnant cow
- Requirements for 120 # pregnant ewe



Percent Calcium By Month

- California Oatgrass (*Danthonia californica*)
- x - - - Soft Chess (*Bromus mollis*)
- o — Requirements for 1000# pregnant cow
- . . . Requirements for 120# pregnant ewe



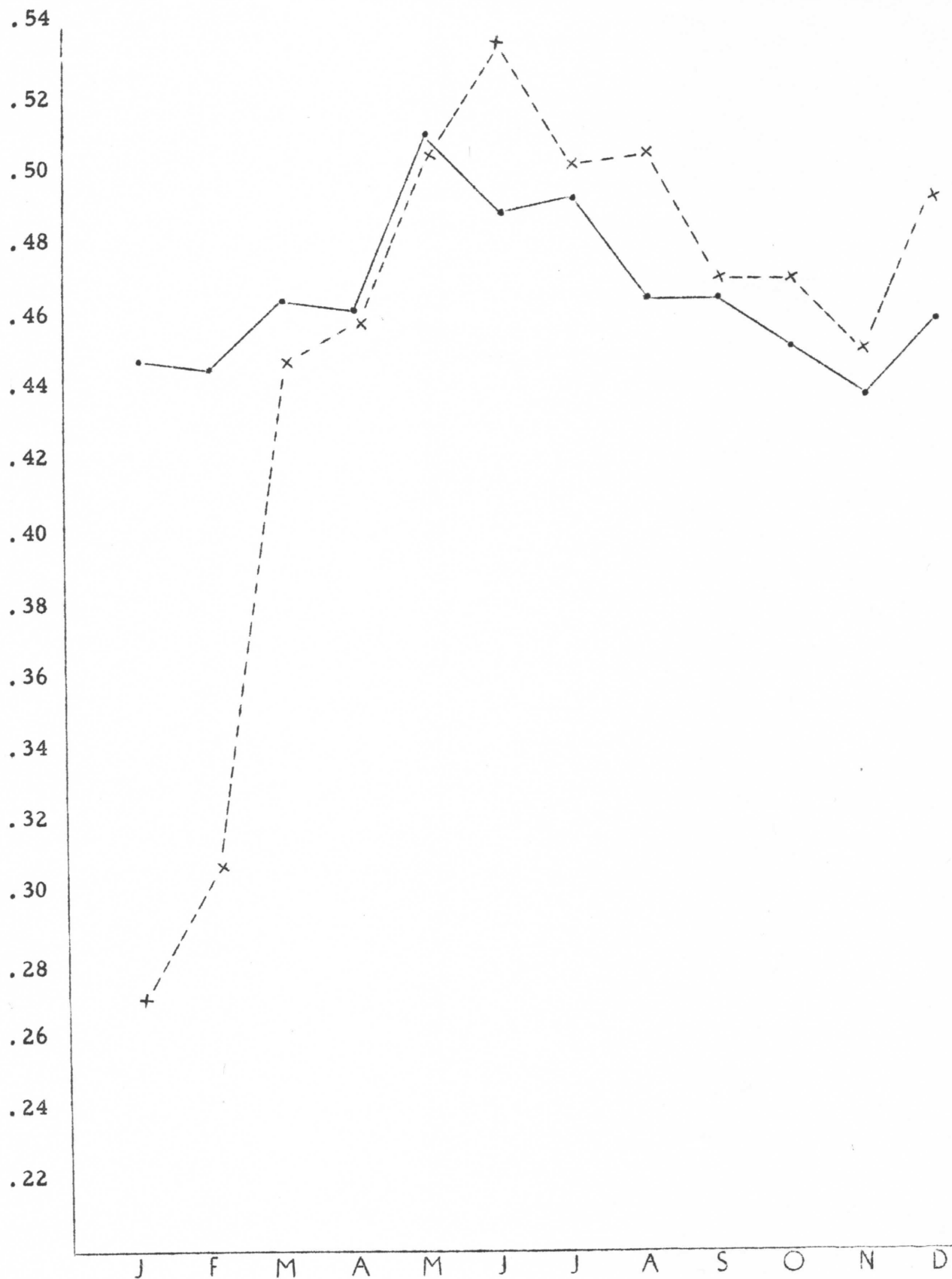
PERCENT FIBER BY MONTH

•—— CALIF. OATGRASS

x----- SOFT CHESS

Annual Growth Cycles and Grazing Preference
of California Oatgrass and Soft Chess

Month	California Oatgrass		Soft Chess	
	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	Mod- erate to High	Leaves 7 inches 70% flowering at 14 inches	High
June	Leaves 7 inches 60% flowering at 14 inches	Moder- ate	Leaves 14 inches Seed forming at 18 inches	High
July	Seed maturing at 18 inches	Moder- ate to High	Beginning to dry	Moderate to High
August	Beginning to dry	High	Dry	Low to Moderate
Sept.	Partly dry	High	Dry	Low
October	Green at base	High	Dry	Low
Nov.	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



Percent Nitrogen-Free Extract By Month

..... California Oatgrass (*Danthonia californica*)

x----- Soft Chess (*Bromus mollis*)