Relationships between

Sprouting in Chamise

and the physiological condition of the plant

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Chamise—*Adenostoma fasciculatum*—is the major component of about seven million acres of chaparral in California and occurs in almost solid stands in some areas.

Chamise often sprouts vigorously after fire and may do so after chemical or mechanical treatment applied for brush removal. Management of the species, either to encourage new sprouts for use as browse or to remove the brush and replace it with grass, requires an understanding of its sprouting behavior.

A study was initiated to discover if there are seasonal trends in the chemical constituents of chamise which may be used at the time of treatment as indicators of sprouting potential.

The study area at the Hopland Field Station—elevation about 3,000′—had been subject to deer browsing for 10 years, following an old burn. For the sprouting measurements, an area was protected from browsing by a deer fence 8′ high. Chamise predominated, and every plot contained at least 12 vigorous plants. Although plant spacings in a native stand are irregular and competitive stress from neighboring plants varies, it was deemed more desirable to study the plants in natural stands than to establish plantings in the manner used for cultivated species.

On January 24, top growth was cut 1″ above ground level from duplicate plots randomly located. Two other plots were clipped every two months until November 19. For all clipped plots, the average sprout height above ground level was measured at two-month intervals after cutting, through the second year.

Plant Constituents

At each cutting date six chamise plants—unclipped but subject to moderate browsing—were uprooted. Stem, root, and crown samples were taken for analysis, and parts from three plants were pooled to give duplicate samples of each fraction for each date.

The root fractions analyzed were consistent in revealing seasonal trends in composition. For the content of starch, sugars, protein, and potassium, root samples gave the same seasonal trend as crown or stem samples. One advantage of using root samples was the greater certainty of including only living tissue in the sample, because dead regions were frequently interspersed among the living tissues in chamise stems and particularly in the crowns and could be removed only with difficulty.

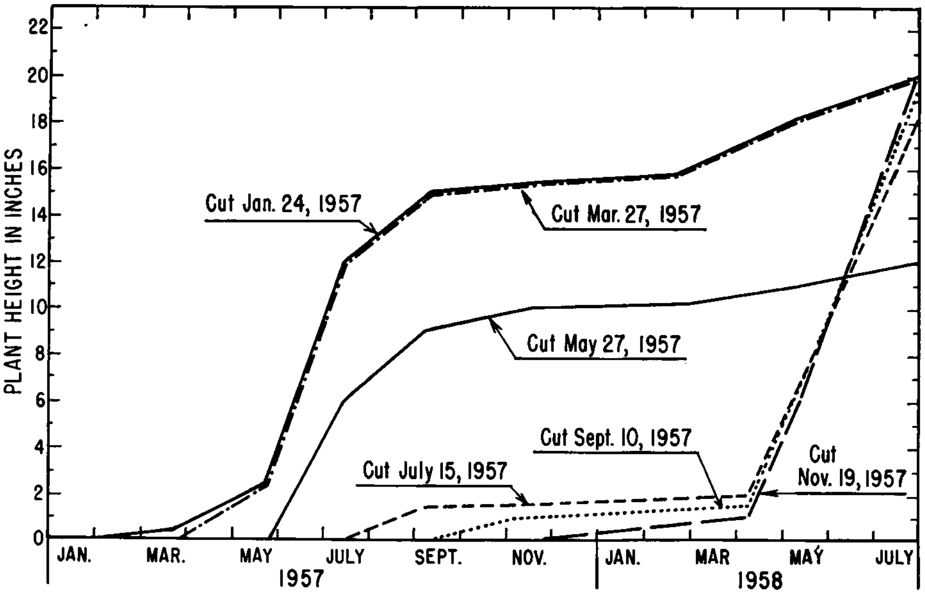
The content of selected materials found in the roots is presented in the table on this page. Starch—the storage carbohydrate—revealed the most pronounced seasonal trend. Root samples contained more starch than the crowns, which in turn contained more than the stems. These differences were highly significant, but the same seasonal trend was revealed in all three fractions. The simpler carbohydrates exhibited smaller seasonal differences. The protein values appear low, probably because the tissues sampled were mature tissues. Seasonal differences in calcium, potassium, and

Percent on Dry Weight Basis of Selected Components in Chamise Roots

Component	Percent, when sampled on date indicated						Statistical significance
	Jan. 24	Mar. 27	May 27	July 15	Sept. 10	Nov. 19	
Starch	13.6	14.8	14.8	6.1	8.1	11.1	**
Total mono- and disaccharides	7.0	5.7	1.7	2.3	1.9	0.8	**
Glucose	0.1	0.7	0.9	1.3	0.8	0.1	**
Protein	1.8	1.4	1.3	1.7	2.2	1.7	**
Calcium	0.28	0.15	0.15	0.13	0.28	0.17	**
Potassium	0.20	0.24	0.21	0.23	0.25	0.22	*
Phosphorus	0.08	0.11	0.08	0.07	0.06	0.10	**
Sodium	0.02	0.02	0.02	0.02	0.02	0.02	N.S.

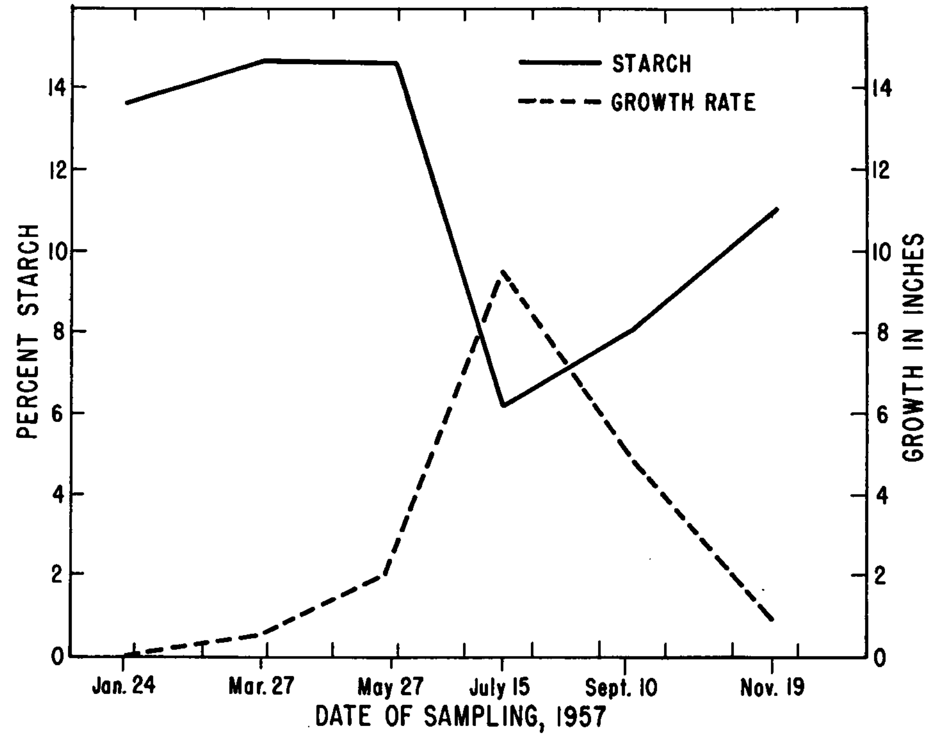
N.S.—No statistical difference
* —Significant at the 5% level
**—Significant at the 1% level
The plant part-date sampled interaction was not significant except for calcium and phosphorus.

Growth Curves of Chamise Sprouts Following Cutting Treatments



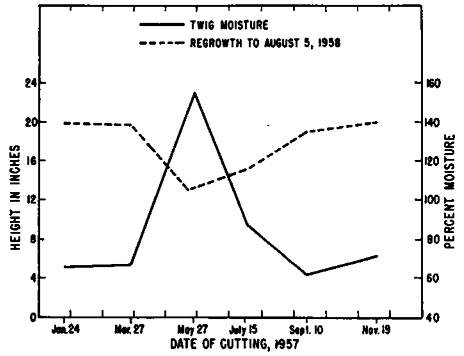
phosphorus were significant, but the amounts were not large enough to suggest that those constituents would be useful indicators of sprouting potential. No significant differences in sodium content were obtained.

The growth in height of chamise sprouts in plots cut on the several dates is shown in the graph in this column. Low temperatures until late March restricted regrowth following the January cutting, so that the January and March plots entered periods of rapid growth at approximately the same time. The May cutting was made at the beginning of the period of greatest growth rate—from late May to mid-July. Although the sprout height was reduced by the cutting, the rapid rate of growth followed much the same pattern as the earlier cuttings. By July 15, the soil moisture was nearly depleted to a depth of 4′. Although moisture was again available in September and October, and the temperature range was similar to that of May and June, when growth was rapid, there was very little growth of chamise from September until the following spring, regardless of the date of cutting. It appears that some factor other than temperature and moisture is involved in the growth curtailment at the fall season.



Relationship Between Growth Rate and Starch Reserves in Chamise

The growth rate curve for the first season—shown in the upper graph on this page—was obtained by plotting growth increments for the several periods between cutting dates. The period of most rapid growth coincided with the rapid depletion of starch. The reduced growth during the autumn, in spite of favorable moisture and temperature, may be related initially to the low level of stored carbohydrate. Although starch levels rose as the autumn progressed, low temperatures then kept down the growth rate. By the time growth became vigorous the following spring, carbohydrate reserves had been replenished and moisture and temperature conditions were again favorable.



Relationship Between Twig Moisture at Time of Cutting and Sprout Regrowth in Chamise

Starch level in the roots is apparently a reliable indicator of sprouting potential of chamise. Studies are in progress to pursue this relationship further.

The amount of moisture in the twigs of chamise reflected a pronounced seasonal change, when the measurement was made on the most recent growth of moderately browsed plants near the plots. Twig moisture increased rapidly from March to May, during the early period of growth rate acceleration, and declined from May to July, at the time of rapid starch depletion, when growth rate was highest.

The best evaluation of the effect of date of cutting on regrowth was obtained the second year, after the plots cut in September and November had passed through a spring interval favorable for regrowth. By August 5 of the second year, growth of sprouts in the September and November plots had equalled that in the January and March plots, but reduced growth showed that the May and July plots were weakened. The relationship between twig moisture and regrowth suggested that treatments to reduce vigor of sprouting might be timed at the peak of twig moisture—an easily usable indicator for the scheduling of treatments. Although twig moisture parallels the growth rate curve, it may not be considered to control that curve as carbohydrate reserves may do.

It is probable that the date of most rapid growth rate—indicated by starch depletion and twig moisture increase—varies from year to year, depending on weather conditions. Observations are to be made over several years, to learn the yearly variation in growth rate.

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Insecticide resistance by

Grape Leafhoppers

Grape leafhopper resistance to several organophosphorus insecticides and to the carbamate insecticide, Sevin, occurred in 1959 in vineyards, particularly in the Orange Cove area of Fresno and Tulare counties. In 1960, combinations of insecticides, most frequently Sevin and Trithion, gave fair control in the Orange Cove area. However, control was generally costly because of the higher price of combinations of insecticides and, frequently, repeated treatments.

Work on the development of better methods of control, by chemicals and by other means is continuing.—*E. M. Stafford, Dept. of Entomology, Davis.*