

Medusahead Palatability¹

W. C. LUSK, M. B. JONES, D. T. TORELL, AND
C. M. MCKELL

Farm Advisor, Lake County; Assistant Agronomist, and Associate Specialist in Animal Husbandry, Hopland Field Station, University of California, Hopland; and Plant Physiologist, Crops Research Division, A.R.S., U.S.D.A., Davis, California.

Thousands of acres of western rangelands have been invaded by medusahead (*Elymus caput-medusa* L.), an annual grass native to the Mediterranean area. Medusahead was first reported in America near Roseburg, Oregon, in the 1880's (Furbush, 1953). Since then it has spread to southwestern Oregon, the Palouse region of Oregon and Washington, southwestern Idaho, and through the north half of California.

In Idaho, Sharp and Tisdale (1952) reported that medusahead has a very low forage value, largely because of the nature of the seedhead and, Torell et al. (1961) reported it as Idaho's worst range weed. Stockmen reported that animals will not eat medusahead at any stage of growth (Robbins et al., 1951). Murphy and Turner (1959) said one reason classifying medusahead as a pest is that it has little or no feed value to livestock at any stage of growth. Major et al. (1960) called medusahead a menace to rangelands and reported that ranches invaded by

this weed have suffered 40 to 75 percent reduction in grazing capacity.

Even though the view is widely held that livestock do not eat medusahead, little direct evidence has been presented to support this belief. Therefore, a study was undertaken to confirm or reject the hypothesis that medusahead was not eaten at any stage of growth by sheep. The objectives of the study were: 1) To determine if sheep would eat medusahead by choice. 2) In the event that the sheep would not eat it by choice, could they be forced to eat it? 3) What effect would grazing have upon the medusahead stand. 4) To determine if the application of nitrogen fertilizer would improve the palatability of medusahead.

Methods

A grazing experiment was conducted on the Fritsche Brothers Ranch², located in rolling foothills at the edge of Potter Valley, near Ukiah, California. A uniformly dense stand of mature medusahead covered the area when the site, a northwest exposure, was selected in 1959. The soil at the site is about 3 feet deep, slightly acid, and classified as a Sutherlin loam.

The average annual rainfall for the area is 35 inches. Precipitation for the study year was 32 inches. The vegetation on the study area was mowed at 1½ inches September 21, 1959 and removed.

Twenty-four species of plants were identified in the grazing area, which was similar to the

annual rangeland type. The most abundant were medusahead, soft chess (*Bromus mollis*), and broadleaf filaree (*Erodium botrys*).

Twelve plots 10 by 40 feet were fenced for the grazing study. One-half of each plot was randomly selected for fertilization with 60 pounds of nitrogen and 75 pounds of phosphorus per acre applied as 16-20-0 on September 23, 1959. The three grazing treatments, replicated four times, were: (1) Plots grazed monthly after vegetation reached two-inch height, (2) plots grazed at four-inch height and again when medusahead was in full head, and (3) plots grazed once when medusahead reached the boot stage.

Herbage on three one-foot squares was clipped to ground level in both the fertilized and unfertilized areas before and after each grazing. Each sample was hand-separated into two categories: Medusahead and all other green herbage. Litter from previous years was excluded from either category. The separated plant material was oven-dried and weighed to obtain the yield of herbage before and after grazing and to determine the percentage of medusahead taken by the sheep. All samples and replications of each treatment clipped before grazing were consolidated and crude protein was determined.

After samples were clipped from the plots to be grazed, two sheep with esophageal fistulas (Torell 1954), were used to collect forage in the unfertilized plots and then in the fertilized plots (Figure 1). The forage dropped through the fistula into a plastic bag secured to the neck of the sheep by a canvas bag. For each collection the sheep were allowed to graze for 10 to 15 minutes or until approximately one-half pint of material was obtained. The fistula samples were preserved by freezing until laboratory observations

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FIGURE 1. Sheep with an esophageal fistula and bag to catch eaten forage.

could be made by the Lab Point method (Heady and Torell, 1959). To aid in identification, plant parts from species in the field were observed under the

microscope before observation of fistula samples. Medusahead in its vegetative stages was readily identified by fine hairs along the leaf margins. The fistula samples were prepared by washing with a 2 percent acetic acid solution to remove the saliva and then allowed to drain. Two-hundred points were taken in each sample and recorded either as a hit on medusahead or other green forage.

Immediately after grazing by fistulated sheep, the entire 10 by 40 foot plot was stocked with sheep. Two animals were used to graze each 10 by 40 foot enclosure for 6 hours during the February and March grazing, and 6 sheep were used in the April, May, and June grazing periods.

The Fritsche Brothers' sheep, which were intermittently grazing the 40 acre pasture surround-

ing the plot, were observed through the growing season. These sheep were kept in a nearby barn at night and fed hay to supplement the grazing during the winter and early spring. The pasture areas and plants that the sheep appeared to prefer were noted, as well as the effect the sheep had on the vegetation. In one area of the pasture, a 60 by 100 foot plot was mowed and fertilized on March 11, 1960, with 375 pounds per acre of 16-20-0 fertilizer. An unfertilized plot of equal size was also mowed to remove the litter. A step-point count (Evans and Love, 1957) was taken of both strips on June 16.

Palatability as Measured by the Esophageal Fistula Technique

Forage samples collected by the esophageal fistula method constitute direct evidence that

Table 1. Herbage production, percentage of medusahead in stand by weight, percentage of medusahead in feed consumed by weight, and percentage of points falling on medusahead in esophageal fistula samples on fertilized and unfertilized plots at various dates and growth stages.

Date and grazing Treatment	Growth stages of medusahead	Unfertilized Plots				Fertilized Plots			
		Forage yields before grazing (lbs/A)	Percent medusahead in: Stand by wt.	Feed consumed by wt.	Fistula sample by points	Forage yields before grazing (lbs/A)	Percent medusahead in: Stand by wt.	Feed consumed by wt.	Fistula sample by points
Grazed monthly:									
Feb. 24	Vegetative	110	74	100	52	330	78	100	52
Mar. 22	Vegetative	230	65	59	45	670	53	38	49
Apr. 16	Vegetative	650	49	66	37	1000	57	66	52
May 16	Vegetative	850	42	70	34	1140	32	44	30
June 16	Headed out but green. Other species dry	1420	45	29	24	1030	35	37	26
Grazed twice:									
Mar. 23	Vegetative	350	53	32	18	900	53	40	35
June 7	Headed out and turning brown. Fertilized more mature than unfertilized. Other species dry.	3030	41	41	0	3370	35	11	1
Grazed once:									
May 10	In the boot. Other species heading	2050	38	40	18	2560	45	50	15
L.S.D. (.05) between sampling dates. (plots grazed monthly)		70			18	70			18
L.S.D. (.05) between fertilizer treatments. (plots grazed monthly)		150			N.S.	150			N.S.

NOTE: Before grazing there were 29 and 73 pounds per acre of non-medusahead herbage in the unfertilized and fertilized plots respectively. Clipping after grazing indicated there was still about 29 and 73 pounds per acre of non-medusahead herbage in the respective plots.

sheep will eat medusahead at every growth stage, though palatability decreased at plant maturity (Table 1). In the unfertilized plots grazed monthly the percentage of plants positively identified as medusahead in the fistula samples decreased from 52 percent in February to 24 percent in June. There was no significant difference between the percentage of medusahead in samples from fertilized and unfertilized plots.

Medusahead plants on the plots grazed on June 7 were almost mature and had lost most of their green. The sheep ate mostly soft chess heads, and less than 1 percent medusahead could be found in the samples collected after 10 to 15 minutes of grazing.

Consumption with Forced Grazing

On the basis of clipped samples taken before and after grazing the sheep consumed medusahead during each of the months from February to June 1960, which is in general agreement with the evidence found by the esophageal fistula method. At every sampling except one (March 22, fertilized) the clippings before and after grazing indicated a higher percentage of medusahead in the feed consumed than did the esophageal fistula method. Direct agreement was not expected since one percentage was computed by weight differences, and the other by points. Even so, there were only two dates where disagreement between the two methods was large and consistent across both fertilizer treatments. The first occurred on February 24 when clipping before and after grazing indicated 100 percent of consumed forage was medusahead. The amount of clipped herbage was so small that a few pounds made a large difference in the percentage consumed. The second disagreement occurred on June 7 when the fistula sheep took practically no medusahead

but the sheep held in the plot for twelve hours consumed forage containing 41 and 11 percent medusahead from the unfertilized and fertilized plots respectively. Since the plots grazed June 7 had only been grazed once previously on March 23, considerably more herbage had grown during the spring months, thus using more moisture, and as a result the medusahead was more mature than on the plots grazed monthly. On June 7 the medusahead on the fertilized plot was dryer and more mature than the medusahead on the unfertilized plot. This difference between the unfertilized and fertilized plots was reflected in the proportion of medusahead consumed.

The last sampling date in this study occurred June 16, on the plots which had been grazed monthly. The medusahead was still green and was eaten even though it was in head.

On May 10, plots grazed only once during the season, medusahead was in the boot stage and soft chess was headed out. Sheep consumed medusahead in about the same proportion that it oc-

curred in the stand on the fertilized and unfertilized plots.

The percentage of medusahead in the stand decreased more on the fertilized than on the unfertilized plots under heavy grazing. On the plots grazed monthly, the yield and percent of medusahead on June 16 was less in fertilized than in unfertilized plots. The reduction indicated consumption of more feed, including medusahead, from the fertilized plots early in the season, and apparently medusahead made less recovery from grazing than did soft chess. Plots grazed only twice also showed a greater reduction of medusahead in the fertilized plots than in unfertilized plots at the last date of sampling. Since medusahead matures later than its associated species, it is possible that the indicated reduction of medusahead in the stand is principally a reflection of the proportionately faster growth of other species during the spring months. Also, many of the lower leaves died and dropped from the medusahead plants late in the season, reducing its contribution to total forage yield.



FIGURE 2. Grazed and ungrazed medusahead-infested annual range. Area had been burned on both sides of the fence at beginning of growing season to remove old litter.

Palatability with Free Grazing

Observations of the Fritsche Brothers' sheep confirmed the conclusions drawn from these experiments. Even though Fritsche's range was supplemented with hay during the winter and early spring and the sheep were well fed, medusahead was eaten where previous burning had removed the old litter. When the grazed pasture was compared to a fenced ungrazed area in the pasture, it appeared that grazing reduced the stand of medusahead (Figure 2).

The sheep in the large pasture preferred the fertilized strip and grazed it heavily. By the middle of June, 25 percent of the vegetation in the fertilized strip and 65 percent in the unfertilized area was medusahead. Twenty-three and 15 percent of the stand was soft chess in the fertilized and unfertilized strips, respectively, indicating the contrast between the two species.

The sheep generally avoided areas where old litter was heavy and concentrated where litter had been burned, clipped, or previously grazed. Removal of old medusahead litter helped make the current growth more available and palatable.

Discussion

The stage of plant development of medusahead may largely determine its palatability. After seedlings are established, the plants develop thin, narrow leaves from slender sheaths. Medusahead remains in a vegetative stage during the winter and through April. In dense vegetation, the lower leaves of medusahead often turn brown and die, leaving a few green upper leaves. Near the end of the growing season, in May, when soft chess has headed out, medusahead plants send up a slender

culm terminated by a bristly seedhead. Love (1953) reported that its growth habit is an exception to the general rule of the weedy annuals that mature early. Traditional opinion of many ranchers and range workers that medusahead is unpalatable at all growth stages could have resulted from the fact that medusahead at the early stages of growth was not identified as such or that young medusahead is protected from grazing during the winter and spring months by the seedheads of the preceding year.

While the results show that medusahead may be eaten by sheep at all of its vegetative stages, particularly before the formation of seedheads, further work is needed to determine the relative feed value of medusahead and its associated species at various growth stages. The nutritive value of forage is often associated with protein content (Maynard, 1947). The protein content of medusahead was higher than that of other species in February, but this difference did not exist at the later sampling dates. Thus, on the basis of protein there was little difference between medusahead and other species analyzed.

Summary and Conclusion

Numerous reports have indicated that the weedy annual grass, medusahead, is unpalatable and has lowered rangeland carrying capacity wherever it has invaded. A grazing test was conducted with sheep to investigate the palatability of medusahead on fertilized and unfertilized annual range. The results indicated that: (1) sheep, given a free choice, did eat medusahead as long as it was green, (2) sheep held in a small plot area ate some medusahead even when it had headed out and dried, (3)

heavy grazing in the spring resulted in a thinned stand of medusahead at maturity as compared to a dense stand of medusahead resulting from light or no grazing, and (4) fertilized medusahead was grazed more than unfertilized medusahead since a greater amount of medusahead was taken from the fertilized plots early in the season. This resulted in less medusahead on the grazed-fertilized areas late in the season as compared to grazed-unfertilized areas.

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