
PALATABILITY OF PASTURE PLANTS

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Palatability is a relative term. When applied to vegetation with respect to animals, the cataloging of palatability of plant species is extremely difficult. If it were possible to isolate certain variables and subject each factor to analysis with relation to palatability, the problem would be greatly simplified.

Methods of analysis are contingent upon animals, vegetation, environment and climate. During no period in the grazing season, whether it be a month, a week, or day, do any of the above factors function in the same manner. The most static, if they can be termed as such with respect to palatability, are the animals. Vegetation changes from day to day at a surprising rate of speed, animals more slowly. A large group of animals on a given area tend to balance among themselves small changes due to environment. The converse is true with vegetation. Different species have dissimilar requirements of moisture, light, and temperature; their maturity differs. An ideal environment for one species

may not be best for another. Pasturing a single species of forage as Kentucky bluegrass (*Poa pratensis*) would obviously provide a measure of palatability as related to maturity of this plant, but would not be a criterion of the palatability of this grass as compared to some other species. Animals with no alternative or choice must necessarily derive their nourishment from what is at hand, whereas a mixture or series of mixtures would provide a choice which would be conditioned by species, maturity, and a number of factors so closely linked as to be inseparable.

This paper presents briefly some results of palatability studies inaugurated in 1938.

Methods of Approach.—In attempting to place palatability value on a plant species, the best approach is through the use of grazing animals and parallel botanical analyses of vegetation. Yield data will also indicate the relationship between palatability and available vegetation; however, the values assigned to a

particular species or mixture of species do not distinguish definitely between qualitative and quantitative results.

In attempting to assess the palatability value of pasture plants, they should all be offered to the animals at a stage of growth where the majority of species are at a stage of maturity most acceptable to the animal. Undoubtedly, this stage is during the early part of the grazing season. It is difficult, if not impossible, to project an experiment in which all species would be pastured at the same stage of maturity. If this were possible the variable of animal changes is introduced.

A second factor indicates that the animals should be of similar age and breed. Obviously, different aged animals may well have different tastes with respect to vegetation. For example, aged animals (sheep) may have greater requirements for body maintenance, particularly during gestation periods, and therefore might easily be less selective than an immature animal. Certain breeds of sheep are larger or smaller than others and introduce a variable into the picture difficult to analyze. Acclimatization has not been mentioned. However, a band of sheep just arrived from a western range and placed on a palatability test would probably be less selective than the same band following an acclimatization period.

Botanical analyses are considered as an essential adjunct in palatability studies. The method of analysis is of course arbitrary; but when a large number of species plots are used, the matter of time becomes most important. Hence, that method affording the most rapid analysis is used. The results obtained are qualitative, but the application is remotely quantitative.

Grazing animals, particularly sheep, are selective and it can be assumed that they will consume the more palatable species whether it be weed, grass, or clover. This is unquestionably one of the fundamental bases for assessing palatability values to plant species.

That sheep are fairly constant in their grazing habits can be seen by close observation. When forage is plentiful—no long period of time is necessary to satisfy their appetites—the daily grazing periods are short. Usually this does not exceed an hour's time. If the experi-

mental plots are large, they need not graze all plots before obtaining their fill. Under the above conditions, periods of grazing seem to follow a time schedule; i.e., beginning at 4 a. m. to 5 a. m.; 7 a. m. to 8 a. m.; 10 a. m. to 11 a. m.; 1 p. m. to 2 p. m.; etc., until dusk. Certain external conditions may change the direction of grazing—a strong wind tends to cause them to rest on the lee side of the field or plot, and when grazing, to travel into the wind. When available forage is short (literally), a much longer period of time is required for the animals to obtain sufficient to satisfy their needs.

Methods of Determining Palatability.—Seventy-two plots in duplicate, each 1x2 rods in area, were seeded in the fall of 1936 and the spring of 1937 with pure seedings and mixtures. Some 20 species were seeded in various combinations and in most cases alone. The position of an individual plot in the series was predetermined, and a comparison between certain species and mixture plots was expedited by using a single species on one plot and mixtures of this species in combination with other species on adjacent plots. An example of this was a mixture containing red clover, Kentucky bluegrass and redbud on one plot, and three adjacent plots containing the same grasses, but with alfalfa, alsike clover and white clover as the legumes.

If the entire series of plots were used in this paper the mass of data would be unwieldy and confusing; therefore, the writers have deemed it best to use a group of six plots to illustrate the procedure and results.

Botanical analyses by means of a point quadrat were made in the fall of 1937 and in the summers of 1938, 1939, and 1940. Results were expressed in terms of percentages for purposes of comparison. The point quadrat method in practice does not provide a measure of actual weight of the component vegetation on a plot, but does indicate the relative incidence of a particular species. The relationship between point quadrat analyses, occurrence, and actual quantity of any species in a plot becomes more directly comparable as the season advances and as the vegetation is consumed by animals.

Yields of dry matter were obtained in the spring of 1938 and again in the fall from each plot for purposes of comparison.

In May of 1938, seventy even-aged sheep were turned on the plots. From a platform or tower located in the center of the series of plots, observations were made of the number of sheep on each plot at intervals of 15 to 30 minutes over

a period of three days and the data recorded. These observations coupled with the botanical analyses, forage weights, and observations form the basis for the determination of palatability as recorded in the results.

TABLE 1.—RELATIVE PERCENTAGES OF SPECIES IN PLOTS ON SEPTEMBER 29, 1937, MAY 3, 1938, AND JUNE 13, 1940.

Species	Plots																	
	1			2			3			4			5			6		
	9/37	5/38	6/40	9/37	5/38	6/40	9/37	5/38	6/40	9/37	5/38	6/40	9/37	5/38	6/40	9/37	5/38	6/40
Ladino clover	86	68	14															
Brome grass				21	13	36	1											5
Orchard grass							1											
Tall oat grass				6														
Timothy	4	16		52	76					29	47	54						6
Redtop			3			4			2	9	4	4				5	87	83
Kentucky bluegrass	1	11	43		6	9	3	2	35	2	10	89	77	87	7	6	18	
Alfalfa									86	98	47	40	49	14				
Reed canary grass																		
White clover			6							2				6				
Weeds	9	5	34	21	5	51	9		14	20		18	4	2	8	6		15

Results and Discussion.—The six plots included in this discussion were seeded with the following species: 1. Ladino clover; 2. Timothy; 3. Reed canary grass; 4. Alfalfa, timothy, reedtop; 5. Kentucky bluegrass; 6. Redtop.

Preliminary point quadrat readings were made on September 29, 1937. The results, as well as readings made on May 3, 1938 and June 13, 1940, are shown in table 1. Percentages are not an expression of dry weight, but indicate the relative percentage of each species.

The absence of grazing animals on the plots in 1937 and a single clipping of the plots in June allowed the taller growing species to recover by September 29, and in some cases suppressed the incidence of white clover, *Trifolium repens*.

Another factor which may result in the presence or absence of white clover is that of root interaction with the subsequent elimination or entrance of certain species from plots.

Table 1 illustrates the changes in botanical composition over the period of four years. A measure of relative palatability is found in the percentage of a species remaining on the last analysis date, June 13, 1940. In Plot 1, Ladino clover decreased from 86 percent in 1937 to 14 percent in 1940. On the same plot Kentucky bluegrass constituted 41 percent of the cover in the latter year. These

percentages at once illustrate the high palatability of the clover and the aggressiveness of the bluegrass. Plot 2 contained 76 percent timothy in 1938 and none in 1940. Plot 3 was seeded to reed canary grass. This grass has been considered unpalatable. The figures in the table bear out this statement, for in 1940 47 percent of the vegetation was reed canary grass and Kentucky bluegrass occupied 35 percent of the remaining space. Similar relationships are illustrated in Plots 4, 5, and 6.

Tables 2 and 4 are particularly interesting in that they provide a direct measure of comparative palatability. Yields of dry matter were obtained on May 3, 1938, previous to turning in sheep, and again on June 9 at the end of the grazing period. Similar data are shown for the period May 15 to June 29, 1939. The amount of forage remaining or residual yield, expressed in percentages, indicates the relative palatability of the various species and mixtures. The factor of growth occurring during the grazing period is applicable to all species; i.e., the grand period of growth for all of the species considered is encompassed by the dates May 3-June 29. It is also a period when these plants are most succulent and therefore if a difference in palatability occurs it is borne out in the differences in consumed forage.

TABLE 2.—YIELDS OF DRY MATTER IN POUNDS PER ACRE. MAY 3 AND JUNE 9, 1938.

Plot	Seedings	Yield pounds per acre May 3	Yield pounds per acre June 9	Forage remaining %
1...	Ladino clover...	2,424	684	28.0
2...	Timothy...	1,332	324	24.3
3...	Reed canary grass.	5,280	2,832	56.4
4...	Alfalfa, Timothy, Redtop...	2,136	372	17.4
5...	Kentucky bluegrass	852	1,020	119.7
6...	Redtop....	1,548	1,200	77.5

TABLE 3.—TOTAL NUMBER OF SHEEP RECORDED AS GRAZING ON EACH PLOT OVER A PERIOD OF FOUR DAYS, MAY 4 TO MAY 7, 1938. A TOTAL OF 70 SHEEP WAS ON THE PLOTS, AND THE OBSERVATIONS MADE AT REGULAR INTERVALS WERE 70.

Plot	Number of sheep on plots
1	44
2	26
3	0
4	30
5	5
6	5

Plot 5 gave a larger yield at the end of the period than on the first sampling date. Kentucky bluegrass, *Poa pratensis*, was the dominant species. Redtop, *Agrostis alba*, and reed canary grass, *Phalaris arundinacea*, can be placed in a second group of palatability. Alfalfa, *Medicago sativa*, Ladino clover, *trifolium repens Latum*, and timothy, *Phleum pratense*, can all be placed in a group as species of relatively high palatability. Some species of the latter groups are

TABLE 4.—YIELD DATA FOR 1939. PLOTS GRAZED IN INTERIM BY SHEEP

Plot	Yield pounds per acre May 15, 1939	Yield pounds per acre June 29, 1939	Forage remaining %
1.....	564	Trace	0.0
2.....	756	372	49.2
3.....	864	916	106.0
4.....	1,836	240	13.0
5.....	432	360	83.3
6.....	480	132	27.5

distinguished as being more palatable than others.

Sheep Data.—The number of sheep grazing a plot at a single specified time is not an indication of palatability of the species, but when a number of observations are made and the number of animals totaled it is safe to assume that the figure obtained is an indication of palatability. Certain factors other than palatability may prevent the animals from grazing some plots and must be considered. The location of a plot is an example. If located near a farm road, the traffic may cause sheep to avoid it. Table 3 shows the total number of sheep on each plot—the total of 70 observations.

Palatability of Kentucky Bluegrass and Redtop.—In 1939 two plots—one seeded to Kentucky bluegrass, *Poa pratensis*, the other to redtop, *Agrostis alba*—were used to test the palatability of these species. The palatability of both species is considered as low during their mature stage of growth. An enclosure was placed on the plots, encompassing one-half of each species. Two sheep were placed within the enclosure for a period of eight days. Yields were obtained at the beginning and at the end of the period. The results are shown in table 5. It is interesting to note that the apparent palatability of Kentucky bluegrass, as indicated by the percent of forage remaining, was much higher than that of redtop. The effect of maturity on palatability is illustrated in this table.

TABLE 5.—COMPARISON OF REDTOP (*Agrostis alba*) AND KENTUCKY BLUEGRASS (*Poa pratensis*) IN MATURE STAGES OF GROWTH. PERIOD JULY 1 TO JULY 8, 1939.

Plot	Yield pounds per acre July 1	Yield pounds per acre July 8	Number of sheep	Forage remaining %
Kentucky bluegrass	1,608	432	2	26.8
Redtop..	1,464	1,152	2	78.7

SUMMARY

Data are presented to support statements regarding the palatability of pasture plants. The increase or decrease of species in a sward is dependent upon competition, environment, and maturity; these in turn condition palatability and therefore the relationship of this latter factor to the animals themselves. Competition eliminates some species, but this is speeded if one species is more palatable than another. Maturity connotes more fiber in a plant and therefore makes for lowered palatability. Environment in general was similar for all species and hence the effect was considered equal.