

## PASTURES AT THE LIVESTOCK RESEARCH STATION, HOSUR \*

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The area of the Livestock Research Station, Hosur, is over 1600 acres of which nearly 1215 acres are laid under grass. The Station was under the Remount Depot for hundred years till 1924 when the farm was transferred to the Madras Agricultural Department. From the records available it is clear that the paddocks were ploughed and laid down to grass and the grass management was similar to that in England. The records of the Remount Depot unfortunately do not mention the types of seeds sown, but some of the old hands who worked on the farm state that they were often detailed to transplant slips of *Cynodon dactylon*. The testimonial analysis of the paddocks bear out their statements. The apparently wild species that are found here have become indigenous and they are harvested, the seeds collected, stored and sown whenever required. The general appearance of the pastures existing at Hosur is comparable to that in Europe despite the differences in species, and very often visitors who are acquainted with European pastures have been struck by the resemblance.

**Type of Pastures.** The pastures in the farm may be classified as follows:— Permanent, tank bed, tank bund, channel banks, temporary and irrigated. These pastures except in the case of irrigated pastures are periodic in that the growth is governed by the monsoons.

The permanent pastures may be sub-divided into upland and lowland pastures. In the uplands in addition to *Andropogon contortus* and *Cynodon dactylon* the following are some of the common species noted:—

*Andropogon pertusus*, *Digitaria sanguinale*, *Sporobolus diander*, *Eragrostis bifaria*, *Eragrostis pilosa*, *Eragrostis ciliata*, *Chloris barbata*, *Desmodium triflorum* and *Indigofera enneaphylla*.

In the lowland pastures similar species including *Panicum javanicum* are found, but in the portions which are likely to be damp *Cyperus rotundus*, *Andropogon annulatus*, *Andropogon caricosus*, *Panicum repens* and *Andropogon halepensis* and also a great number of *Desmodium triflorum* may be seen.

Under the shade of trees and buildings in the uplands and lowlands the following species are likely to predominate:—

*Panicum javanicum*, *Digitaria sanguinale* var. *ciliare*, *Digitaria sanguinale* var. *extensum*, *Apluda varia*, *Eleusine aegyptiaca*, *Setaria intermedia* &c.

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\* Adapted from a paper on 'The Study of Pastures and Meadows at Hosur' read by the author before the Indian Science Congress, January 1932

These in addition to *Chloris barbata*, *Andropogon pertusus* and *Cynodon dactylon* may also be noticed by the roadsides and under shade where there is certain amount of grazing.

Meadows, as such, are not known to this country. Some of the areas in parks of some of the cities may be classed as meadows. The grass may be mown or cut with sickle, but except under garden conditions no watering or flooding is ever done. When opportunity presents itself they are grazed as well. These are not periodic in that they do not directly depend on the monsoons. As long as there is water in the tanks the growth could be kept fresh and continuous. In the *Panicum maximum* and *Pennisetum purpureum* pastures mainly owing to intercultivation with ridge plough the number of other species that may present themselves are eliminated quite effectively. While the above are more or less pure crops, *Medicago sativa* generally has a mixture of other species like *Panicum repens* and *Cyperus rotundus* among others depending on the seeds brought into the area through irrigation mainly. *Panicum maximum* and *Pennisetum purpureum* areas may be classed as permanent irrigated pastures and *Medicago Sativa* and *Trifolium Alexandrium* when grown as temporary irrigated pastures

There are two large tank-beds which give an appreciable amount of grazing. Some of the species noted are *Eriochloa polystachya*, *Panicum repens*, *Panicum interruptum*, *Panicum trypheron*, *Panicum colonum*, *Cyperus rotundus* &c.

On the tank bunds and channel sides, *Panicum maximum* has been largely planted and it seems to thrive quite well; more over, the grass is quite useful for minimising erosion. In addition to *Panicum maximum* the following species grow in places luxuriantly:—

*Andropogon annulatus*, *Andropogon Schoenanthus*, *Andropogon halepensis*, *Imperata arundinacea*, *Leersia hexandra*, *Eragrostis major*, *Panicum fluitans* &c.

Temporary leys are not included in the rotation in this country. At Hosur *Chloris Gayana* and *Pennisetum cenchroides* were introduced with a view to lay down paddocks to permanent pastures. Experience however shows that these grasses are more useful for temporary leys rather than permanent. When the paddocks are sown with either *Chloris Gayana* or *Pennisetum cenchroides*, at first the pasture is pure but in time other species appear and later dominate the situation.

**Quantity and quality of pastures.** Quantity and quality of pastures are dependent on several factors like season, moisture content of soil, the stage of growth and the flora of the population, the type of pastures and the chemical composition of the herbage. The average yield per acre on this farm for each year is given below. This does

not include grazing which is done prior to the rains and the aftermath which is also grazed

Year.	Rainfall.	Yield per acre.	Remarks.
1924-25	30.03 inches	1546 lb.	
1925-26	29.37 "	1024 "	
1926-27	15.60 "	717 "	
1927-28	33.81 "	1781 "	
1928-29	27.95 "	726 "	
1929-30	33.89 "	573 "	Crop attacked by army caterpillar
1930-31	33.10 "	668 "	

When the author worked on the nutritive value of pastures in Oxfordshire in 1925-26 he came to the following conclusions:—

(1) That in general, chemical composition and nutritive value of pastures do not depend on the chemical and mechanical composition of soils alone.

(2) The stage of growth of the herbage is the determining factor in composition and feeding value and in this respect each particular set of conditions produce a specific effect. This effect is shown in the establishment of a zenith period whose onset is early and prolonged on the good pastures and late and short on the poor pastures.

(3) Confirmation of high quality from the practical standpoint with phosphorus and calcium has been obtained.

(4) That manurial content of pastures show certain variation which can be related to its reputed quality.

(a) good pastures show high content of phosphorus pentoxide

(b) pastures with high lime contents usually have a large amount of crude protein.

(5) That splashing (sand) has a profuse effect on the nutritive value of pastures from the point of view of the grazing animal.

So far as it has been possible to study under local conditions, some of the conclusions mentioned above seem to hold good in this country as well, but with certain modifications. It is noticed that a particular set of conditions produce a flora suited to those conditions. Even here there is a zenith period for each type of conditions but it is governed directly by monsoons. If there is no rainfall there will be no growth despite the season of the year. It is noticed that cattle will graze the tank bed satisfactorily when there is a fairly good growth but before the grasses have begun to seed. With spear grass (*Andropogon contortus*) the mature awns are a disadvantage and the zenith period for this grass is before the awns are properly formed. It must however be added that the spear grass has only one growing period between September and November while a number of other grasses

like *Cynodon dactylon*, *Pennisetum cenchroides*, *Chloris Gayana* etc. grow right through the year whenever sufficient moisture in the soil is available. While *Andropogon contortus* has one zenith period the grasses which can grow right through the year will have either a series of zenith periods or by judicious cutting, grazing and irrigation the period could be kept continuously throughout the year.

The soil analysis indicated calcium deficiency and calves thrown on the farm, especially among the Ongoles, were not of normal weight. From the animal husbandry point of view it would seem that the pastures are likely to be deficient in minerals. This is being counter-acted by the inclusion of bone and lime mixture in the ration.

When examining the highly reputed pastures in England it was noticed that these pastures had a very dense population in any given area. In one or two pastures the clovers were not prominent. Under Indian conditions the same conclusion is applicable. In pastures where there is dense herbage the browsing animal has very little distance to travel before having its fill. The truth of the statement will be brought home if the condition of animals grazing on the so-called common grazing is compared with that of animals grazing on this farm.

In addition to the density of the population the preponderance of certain species will have direct effect on the quality of pastures. While in Europe *Rhinanthus cristajalli* L., *Bellis perennis* L., *Chrysanthemum leucanthemum* L. and *Ranunculus bulbosus* like *Souchus oleraceus* L. affect the quality of pastures, in this country weeds like *Tribulus terrestris*, *Alternanthera echinata*, *Amaranthus viridis*, *Achyranthes aspera*, *Oxalis corniculata*, *Mimosa pudica*, *Argemone mexicana* etc. have the same effect. In the management of pastures the control of weeds is essential especially under tropical and semi-tropical conditions where growth is possible throughout the year.

The species that have been mentioned under different types at Hosur are fairly appreciated by cattle. The pastures here were thought to be devoid of legumes by Littlewood and Narahari Rao (1930), but on careful examination of pastures two useful legumes *Desmodium triflorum* and *Indigofera enneaphylla* can be noticed in abundance in certain paddocks. The former seems to thrive in the lowlands and the latter in the highlands. These are very much appreciated by cattle and their presence will greatly add to the nutritive value of pastures.

**Temporary and permanent pastures.** Experience here shows that *Cynodon dactylon* and other 'bottom' grasses mentioned above are well suited for a permanent pasture. Among 'top' grasses *Andropogon contortus* is to be preferred to others for drought resistance.

*Pennisetum cenchroides* and *Chloris Gayana* are well suited for temporary pastures of three years in the case of the former and five the latter. It is noticed that in all pastures there is keen competition between the species. To begin with, the weeds already mentioned above will kill out the fine grasses like *Pennisetum cenchroides*. Among grasses *Cynodon dactylon* and *Andropogon pertusus*, *Panicum repens*, *Paspalum scrobiculatum* and *Digitaria sanguinale* seem to kill out *Pennisetum cenchroides*. The latter is very quick growing and it seems to do very well giving a bulky crop the first year but later it begins to grow shorter and eventually gives way to other species. *Chloris Gayana*, however, does not become shorter but within three years it will be noticed that grasses like *Cynodon dactylon*, *Andropogon pertusus*, *Digitaria sanguinale* and others begin to preponderate. In order to study competition between species, counts were made by the mesh method. The usual quadrats were not used. A circular ring of 4 feet diameter was thrown at random in the paddocks and the species within the ring noted on the spot. The results given below show that competition between species is very real.

No.	Species of grasses found.	No. of grass plants for the 12 countings.	Average per counting.	Percentage grass to plants.	Species of weeds found.	No. of weeds for 12 countings.	Average per counting.	Percentage weeds to plants.
5	<i>Eragrostis</i> spp.	18	1.5	13	<i>Alternanthera echinata</i> (fully spread)	28	2.3	21.00
	<i>Chloris barbata</i> ;	21	1.75	16	<i>Desmodium triflorum</i>	5	0.4	3.50
	<i>Chloris gayana</i>	24	2.0	16	<i>Lagascea mollis</i>	2	0.24	1.50
	<i>Pennisetum cenchroides</i>	30	2.5	22				
	<i>Panicum flavidum</i> .	8	0.6	6				
26	<i>Panicum distachyium</i>	150	12.5	13.6	<i>Oxalis corniculata</i>	30	2.5	2.7
	<i>Andropogon pertusus</i>	81	6.75	7.0	<i>Aristolochia indica</i>	1	...	...
	<i>Pennisetum cenchroides</i>	300	25.0	27.2	<i>Calotropis gigantea</i>	1	...	...
	<i>Cynodon dactylon</i>	210	17.5	19.0	<i>Alternanthera echinata</i>	7	0.6	0.6
	<i>Panicum flavidum</i>	25	2.0	2.2	<i>Lagascea mollis</i>	8	0.6	0.7
	<i>Andropogon contortus</i>	250	20.8	22.7	<i>Vinca</i> sp.	11	0.9	1.0
					<i>Vicoa indica</i>	2	0.1	...
					<i>Eclipta alba</i>	3	0.2	...
					other weeds	37	...	3.0
24	<i>Pennisetum cenchroides</i>	136	11.3	22.6	<i>Argemone mexicana</i>	10	0.8	1.6

No.	Species of grasses found.	No of grass plants for the 12 countings.	Average per counting.	Percentage grass to plants.	Species of weeds found.	No. of weeds for 12 countings.	Average per counting.	Percentage weeds to plants.
	<i>Panicum distachyum</i>	270	22.5	45.0	<i>Alternanthera echinata</i>	3	0.2	0.5
	<i>Cynodon dactylon</i>	150	12.5	25.0	<i>Achyranthes aspera</i>	7	0.6	1.2
	Other grasses	32	3.0	5.3	<i>Euphorbia</i> sp.	6	0.5	1.0
					Other weeds	2	0.1	0.3
23	<i>Andropogon contortus</i>	270	22.5	32.7	<i>Sida</i> sp.	1	...	0.1
	<i>Chloris barbata</i>	84	7.0	10.5	<i>Loucas stricta</i>	1	...	0.1
	<i>Eragrostis spp.</i>	36	3.0	4.5	<i>Vicia indica</i>	1	...	0.1
	<i>Panicum spp.</i>	115	9.6	14.3	<i>Bidens pilosa</i>	1	...	0.1
	<i>Cynodon dactylon</i>	24	2.0	3.0	<i>Euphorbia</i> sp.	7	...	0.8
	<i>Andropogon pertusus</i>	177	14.75	22.1	<i>Eclipta alba</i>	2	...	0.2
	<i>Digitaria sanguinalis</i>				<i>Lagascea mollis</i>	1	...	0.1
	<i>var. ciliaris</i>	82	7.0	10.2	<i>Alternanthera echinata</i>	2	...	0.2
					<i>Achyranthes aspera</i>	1	...	0.1
					<i>Tridax procumbens</i>	2	...	0.2
					<i>Argemone mexicana</i>	1	...	0.1

**Grass mixtures.** This is a problem not satisfactorily solved for ranching and farm conditions in this country. Mixtures have been no doubt suggested for the lawn. *Cynodon dactylon* is certainly the very best grass for the lawn. It would be quite useful to include *Andropogon pertusus* for the lawns on account of the similarity of the habits.

So far there does not seem to be any recognised classification of Indian grasses for pastures. To begin with what are 'bottom' grasses and what are 'top' grasses in India? *Cynodon dactylon*, and probably *Andropogon pertusus*, *Panicum javanicum*, *Eragrostis ciliaris* and *Eleusine aegyptiaca* may be classed as bottom grasses for pasture purposes. Symonds has stated that he has grown *Cynodon dactylon* several feet high under irrigation. The two legumes already mentioned could be included under bottom herbage. It must however be mentioned that as these legumes are dormant in the very dry periods there will be patches of land devoid of herbage wherever these were present, but soon after rains they make an appearance again.

For top grasses, *Ischemum laxum*, *Chloris Gayana*, *Chloris barbata*, *Pennisetum cenchroides*, *Paspalum crobiculatum*, *Digitaria sanguinalis*, *Andropogon contortus*, *Andropogon annulatus* and *caricosus*, *Eragrostis Willdenoviana* and *Panicum repens* will be found very useful.

Pasture study in this country is still in its infancy. Work is being continued here with a view to throw light on the pastures from the point of view of animal husbandry.

**Summary:**—The pastures at the Livestock Research Station, Hosur, have been classified as permanent, tank bed, tank bund, channel banks, temporary and irrigated pastures and studied. In addition to botanical analysis the quantity and quality of pastures are explained. The competition between species of grasses is explained and those species suited for temporary and permanent leys are mentioned. From observations made at Hosur grass mixtures are suggested.

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#### References.

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## THE CULTIVATION OF CUMIN<sup>2</sup> IN THE PERIAKULAM TALUK.

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Cumin is a crop cultivated in very few places in this Presidency and Periyakulam in the Madura District is one. Approximately it occupies an area of 300 acres in this Taluk. It is a very delicate crop, requiring much attention and care. It requires a mild climate and is grown during the South West Monsoon season in garden lands under wells. The duration of the crop is two months and it is cultivated between June and August.

Good, well drained, rich red loam is best suited for a successful growth of the crop, and it is not systematically rotated with any crop. But it is generally followed either by chillies or late Ragi and cholam.

The soil is ploughed as many times as possible and a good fine tilth is obtained. Usually seven ploughings are given. After the third ploughing, good, well-rotten cattle manure, at 30 to 35 cart loads per

<sup>2</sup> Latin *Cumin cuminum*; Tamil *Jecragam*; Telugu *Jilakara*; Malayalam *Jerakam*.