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NOTE ON THE DETERMINATION OF MOISTURE IN PASTURE SAMPLES.

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Investigators in the course. of analysis of herbage samples appear to have treated the determination of moisture as one of the simple determinations which can hardly go wrong. Various workers have used drying ovens at 100° - 103° and have left samples in the ovens for periods of six to twentyfour hours. Probably each worker has kept to a fairly constant procedure and by this means has obtained duplicates which agree within reasonable limits. Naturally they have taken the results so obtained to be correct.

Some months ago trouble was found in obtaining satisfactory duplicates in the same oven (Hearson electric) at the same time. Uneven temperatures in the oven were suspected but these were found to be too small to account for the differences. Longer time in the oven did not improve matters at all - in fact the differences often became greater. These tests proved that the longer a sample was kept in the oven at 1000 the greater the loss became. For example, a sample gave the following "Apparent" moisture contents: after 2 hrs. 2.41%, after 4 hrs. 2.98%, after 6 hrs. 3.39%, after 22 hrs. 4.32%, after 44 hrs. 4.88%, after 67 hrs. 5.34%.

'In order to investigate this further, samples with "low" and "high" moisture contents were dried in an electric oven at 100° and also in a desiccator over Conc. Sulphuric acid (boiled for 6 hours) at a pressure of about 10 mm. of, mercury - the sulphuric acid was changed daily. The following results were obtained:-

	Oven.							Over H_2SO_4 5 days (constant weight).
	½ hour	1 hr.	3 hrs.	4½ hrs.	21 hrs.	68 hrs.	92 hrs.	
Sample 1	13.56	13.63	14.13	14.18	15.09	15.73	16.07	12.45
" 2	4.75	4.92	5.70	5.73	6.15	7.18	7.68	4.08
" 3	2.55	2.65	3.24	3.54	3.92	5.05	5.14	2.18

It is apparent that even half-an-hour at 100° drives off most of the mcieture and it would appear that drying over sulphuric acid gives low results. The latter observation is in agreement with the observation that a dried sample of grass when exposed for a few minutes in a desiccator containing sulphuric acid will gain in weight appreciably - the dry grass appearing to have a greater affinity for water than has sulphuric acid (or Calcium chloride). (Note: In these determinations wide-mouthed weighing bottles with lids ground in were used - the lids being put on as soon as the oven was opened).

At this time no vacuum oven was available. Samples were put into 100 cc. conical flasks which were put in the Hearson-oven at 100° and connected to a vacuum lead producing a vacuum of about 30 mm. After 1½ hrs. samples 1, 2 and 3 showed 13.93%, 5.41% and 2.83% loss respectively, and after 3 hrs. 14.18%, 5.48% and 3.23% loss. A further hour under the same conditions resulted in only comparatively slight increases. These samples were again put in the oven but at ordinary pressure for 2 hours, when the losses increased to 14.679, 6.05% and 3.74% respectively.

Through the courtesy of Dr. F. H. McDowall, of the Dairy Research Institute, a vacuum oven and Hyvac pump was borrowed from the Institute. Results obtained with the vacuum oven at 100° and about 10 mm. pressure compared with those obtained in the ordinary oven at 100° showed that while constancy was not obtained in the vacuum oven the losses were not so great nor so rapid as with the ordinary oven. The results indicate that at 100° two oxidation processes may go on: (1) In the presence of air fairly rapid external oxidation occurs, and (2) In the absence of air oxidation still takes place, apparently being an internal or auto-oxidation. The latter statement is supported by the observation that CO_2 is produced in the vacuum chamber.

The next stage in the investigation was lowering of the temperature of the vacuum oven to 60°. At this temperature constant results were not obtained in six hours but are obtained in twenty hours, or possibly in a shorter time.

The results so far indicate the possibility, or even probability, that some samples are more prone to oxidation than are others but what factors are involved is not known.

The investigations described in this article are incomplete and the inferences drawn from the results are liable to be modified after further data is obtained.