

The effect of manurial treatment on the composition of the pasture is very marked for different constituents. This is particularly true of early spring growth, which on plots treated with super-phosphate, potash, and ammonium sulphate contains relatively large amounts of all constituents, with the exception of lime. The percentages of constituents on treated pasture are maintained at a higher level throughout the season than is the case on the untreated pasture. Notable exceptions to this rule are, however, the curves for lime and chlorine, which run at the same level, or, indeed, drop below, the corresponding curves for untreated pasture.

Lime treatment of the pasture has given little benefit in raising the percentage of lime in the grass, but has had a marked influence in increasing the percentage of phosphate, potash, and nitrogen.

The use of ammonium sulphate has resulted in a great reduction in the percentage of lime in the pasture, particularly marked where ammonium sulphate has been used without phosphates and potash. The percentage of nitrogen in the pasture has been slightly increased where ammonium sulphate was applied.

III. Causes of Stock-ailment on the Moutere Hills Pastures.

In the last annual report attention was drawn to the serious mortality of stock associated with the sheep industry on the Moutere Hills type of soil in the Nelson District. One of the most striking features of stock-ailment on these pastures was the widespread occurrence of xanthin calculi in the kidneys of sheep. On certain farms mortality in sheep was high, and the presence of xanthin calculi was shown frequently to be a predisposing cause of death. Several preliminary analyses of pastures have been presented in earlier reports from the Cawthron Institute, but although the analytical data indicated deficiencies of lime, phosphate, and nitrogen, the figures were not outstandingly low, as might have been expected in the case of a pasture giving such poor results with stock.

In order to secure further information concerning the causes of stock-ailment, several field experiments were laid down to ascertain whether the pastures could be rendered healthy for stock by lime or fertilizer treatment. In addition, analyses of pasture-samples from three typical farms have been made at intervals throughout the season. The effect of lime and different fertilizers on the chemical composition of the pasture has also been studied. The analytical data obtained in this investigation show that the chemical composition of the untreated natural pasture varies greatly during the season. During the midsummer and early autumn period great deficiencies in phosphate, nitrogen, and soluble ash occur. The analytical data for this period show that the composition of Moutere pastures approaches closely that of other highly deficient pastures examined by investigators in other countries.

The whole of the chemical data obtained during this investigation has been published in a bulletin, entitled "Moutere Hills Pastures—Seasonal Variation in and Influence of Fertilizer on their Chemical Composition."

The more important conclusions resulting from the chemical investigation are as follows:—

(1) The farm associated with the highest mortality of sheep, and showing the greatest incidence of xanthin calculi, had the poorest pasture and soil. Pastures on this farm contained the lowest percentages of lime, phosphoric acid, nitrogen, and soluble ash.

(2) The chemical composition of Moutere pastures was best in the spring. The composition was worst in the dry summer and early autumn periods. An improvement in chemical composition occurred after rains in March.

The variations in chemical composition of the pasture follow closely the behaviour of sheep, which are known to increase rapidly in weight during the spring and early summer. During the midsummer period a reduction in live weight frequently occurs. A small increase in live weight is usually associated with the late autumn period of grazing.

(3) Applications of lime and phosphatic fertilizers increased the percentages of minerals in the pasture. Ammonium phosphate effected a great improvement in the percentage of phosphoric acid, but greatly reduced the percentage of lime.

(4) By suitable treatment with lime and phosphate a good mixed pasture of English grasses and clovers can be maintained on the Moutere Hills soil. Such a pasture maintains sheep in excellent condition, and its chemical composition compares favourably with that of other good pastures in the Waimea County.

General.

In the early part of the year covered by this report Mr. O. Barton, Assistant Agriculturist at the Cawthron Institute, replaced Mr. J. A. Bruce (resigned) as field officer for the mineral content of pastures investigation. Dr. Askew, assisted by Mr. L. Bishop and Mr. L. Hodgson, has been responsible for the chemical work which has figured so prominently in all the investigations. Mr. W. C. Davies, Curator of the Cawthron Institute, has assisted in botanical studies of pastures and in the photographic illustration of reports and papers.

The following papers and bulletins have been published since the commencement of the mineral content of pastures investigation.

- (1) "The Mineral Contents of Typical Pastures in the Waimea County, Nelson," by T. Rigg and H. O. Askew.
- (2) "The Value of Sulphur for the Fertilization of Lucerne," by B. W. Doak.
- (3) "The Mineral Contents of Lucerne," by B. W. Doak.
- (4) "A Widespread Occurrence of Xanthin Calculi," by T. H. Easterfield, T. Rigg, H. O. Askew, and J. A. Bruce.
- (5) "The Occurrence of Xanthin Calculi in New Zealand Sheep," by T. H. Easterfield and J. A. Bruce.