

Composition of the Bracken Frond throughout its Growing Season

DURING 1942, the variation in the composition of the bracken frond throughout its growing season was investigated in Perthshire at Ballochraggan, the bracken experimental area of the West of Scotland Agricultural College. A uniform 100 yards square area of hill bracken was chosen on typical Scottish upland soil and from it fronds were taken at intervals throughout the season.

At each sampling a hundred fronds were weighed and the dry matter determined. It was noted that the percentage dry matter increased until the beginning of July and thereafter remained constant until September, when it again increased. It is interesting to note that the date on which the percentage dry matter became constant is approximately that regarded as most suitable for eradication by cutting.

The percentages of nitrogen, phosphorus, potassium, calcium and magnesium were determined in the dry matter and several points were observed.

The percentage of potassium (expressed as oxide) in the dry matter ranged from 5.60 in May to 0.86 in October, which emphasizes the recognized power of bracken to accumulate this element in the frond. It is debatable whether this high concentration is absolutely necessary for the normal metabolism of bracken, but if it is, then the problem of bracken eradication might be further explored by investigating the potassium absorption mechanism of the plant.

Throughout the season the percentages of nitrogen, phosphorus, potassium and magnesium in the dry matter progressively declined, the rate of fall being greater in the early stages. The percentage of potassium decreased considerably more rapidly than the others. On the other hand, the percentage calcium in the dry matter increased steadily until September, after which it decreased slightly, a condition often found in the leaves of plants.

The actual weights of certain elements in a hundred fronds were calculated for each sample, and it was noted that the maximum amounts of dry matter, nitrogen, phosphorus, potassium and magnesium occurred in the fronds about the beginning of August, whereas the maximum calcium did not occur until September. The amounts of dry matter, magnesium and calcium which were lost from the frond at the end of the season were relatively small, being 15.2 per cent of the dry matter, 24.0 per cent of the MgO and 11.9 per cent of the CaO. Conversely, the percentages of nitrogen, phosphorus and potassium lost were relatively great, being 72.8 per cent of the nitrogen, 77.8 per cent of the P_2O_5 and 63.2 per cent of the K_2O . The probable migration of nitrogen, phosphorus and potassium from, and the retention of the calcium and magnesium in, the ageing leaf are in accordance with the general views on such matters.

The rates of absorption are interesting. More than 70 per cent of the phosphorus was taken up before the second week of June, while less than 15 per cent of the calcium was absorbed in the same period. Between 30 and 50 per cent of the nitrogen, potassium and magnesium were absorbed during that time. Some authors have suggested that phosphorus is associated with intense meristematic activity, and the early absorption of P_2O_5 by bracken may be further evidence for this.

When the ratios of the amounts of certain elements absorbed by a hundred fronds at successive stages of growth were compared, it appeared that the only ratio which tended to be constant was the N/K_2O . This relationship has been observed in some other plants and suggests that nitrogen and potassium compounds may be closely associated in the metabolism of the frond.

It is intended to carry this investigation further in 1944 by examining and comparing the composition of rhizomes and fronds throughout the season. This should supply information about the movement of nutrients into the plant from the soil and their distribution between rhizome and frond. It is also hoped to study on similar lines the nutrition of poorly developed bracken and to correlate this with factors of the environment. At the same time the importance of information on the general biochemistry of bracken, about which surprisingly little is known, will be borne in mind.

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The Ishihara Test for Colour Blindness

Vernon and Straker¹ claim that 5.37–9.45 per cent of colour blind men were found in Great Britain, according to district, averaging 7.49 per cent. This is about twice the accepted figure. They suggest the difference is due to use of "a modified form" of the Stilling and Ishihara Tests, which "picks out many of the colour-weak, or anomalous trichromats, as well as the strictly colour-blind".

In my investigation², 87 subjects tested with the Rayleigh equation were given the Ishihara Test (8th edition, 1939). They were 14 red-green blind men, 4 red-green blind women, 2 green anomalous men, 13 red-green weak men and 18 red-green weak women, 9 normal men and 27 normal women. The red-green weak have two to four times, and the colour blind five to twenty-one times the modal threshold for distinguishing the red-green variable disk from the standard yellow. The anomalous have a small threshold but a big deviation ($> 3\sigma$); the colour blind a very big threshold but usually a small deviation (whether protanopes or deuteranopes). The anomalous are not true intermediates between colour weak and colour blind³. Houston's⁴ view is confirmed that the colour blind form a separate group in the population, because only 2 per cent of the men or women other than colour blind have more than three times, and only 2 of the 18 colour blind less than six times the modal red-green threshold, while true intermediates were not found.

The accompanying table shows that in the Ishihara Test no colour blind or anomalous subject in this experiment gave more than one reading unequivocally correct in twenty-four plates (the first of the twenty-five plates is always correct and only used to show the subject what to do). Four protanopes were not distinguished from deuteranopes by the test, nor two deuteranopes from protanopes. Moderately colour blind were not consistently distinguished from extreme, nor anomalous from colour blind, and this has been confirmed later with red anomalous, though some lesser deviants make fewer mistakes.