

STRAIN DEVELOPMENTS IN HERBAGE PLANTS.

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The evolution of species in response to, and their perpetuation in harmony with, the forces of the habitat is, I think, accepted by at least all ecologists.

Man in his agriculture has taken up the wild species at a certain point in their evolution and has applied them in a variety of ways. New habitats have been created, and just as species evolved in response to the call of the habitat under wild conditions, so today we can recognise strain in species evolved to suit altered habitat under cultivation. The more widely and variously used the species, the greater significance is attachable to strain within those species.

I wish to confine my attention to five species, in the study of which during the past three years the Station has done considerable work.

Perennial ryegrass, cocksfoot, white clover, red clover, and brown top; these species it will be recognized, are widely exploited in grasslands in virtually all parts of the world.

Each district and each country, according to soil and climate, have used these species in, roughly, four different ways.

1. For truly permanent pasture that remains down for a long period of years;
2. For short rotation pastures that are ploughed **every** 2 - 4 years;
3. For strictly temporary pastures that last only 1 - 2 years; and
4. for seed production purposes under any one of the above headings.

From our researches to date, we may say, according to the farming system practices, so different strains of herbage plants have developed. The old permanent pastures hold (with certain exceptions) to the permanent strain. The short rotation areas have evolved a short-lived type. The arable and annual cropping areas have run distinctly to an annual type,

The closely-settled, arable, middle Europe has produced an annual red clover - Italian or French red strains, an annual perennial ryegrass, and an annual white clover. Similarly, the short rotation areas of Great Britain and New Zealand have produced a short-lived red clover - broad red type; a short-lived ryegrass type - false perennial type; and a short-lived white clover - stubble land types.

The truly permanent pastures of Great Britain and New Zealand have produced perennial ryegrass - true perennial type; perennial white clover - New Zealand white and Kentish white, and a permanent red clover - Montgomery, Cornish Marl and indigenous wild red types; a perennial cocksfoot - Akaroa type and British indigenous type.

In the case of COcksfoot seed production in Denmark on an intensive scale, a seed production type has been evolved. In the case of brown top in New Zealand at least, there are two definite ecotypes - one perfectly adapted to the wetter, sour, stiff clay-soils, and the other adapted to the drier and arable belt of Canterbury.

The one exception to the rule that permanent pastures yield always perennial plants is seen in weak swards that permit of reseeding. Such weakness may be due to drought, over-treading, over-grazing, or smother from seed or hay crops. Under these conditions an annual population can maintain itself in the sward and perpetuate itself by re-seeding in **the** weak turf during the autumn,

Thus, old pasture cannot be taken as an infallible guide to type, or rather should we say because a soil type has not been ploughed and sown for five years or over, it does not necessarily follow that the sward populating that soil type is necessarily old pasture and therefore may contain short-lived types of plants. This has been amply demonstrated in our trials in regard to certified white clover where a minimum five-year age limit was set. Many of these certified lines consisted of short-lived white clover types, but, in general, it must be said that the minimum five-year limit tended definitely towards an improvement in type.

Then, again, there appears to be another factor working in the permanent pastures that appears to be of prime importance in selection. High production sets up intense competition, with the inevitable result that only high production types persist there. This seems clearly demonstrated in the case of New Zealand wild white. This clover type is found, in nature only on extremely high-production country, and would appear to be high producing itself; of necessity, else it could not have survived against such intense competition. The Kentish Wild White would appear to be a type produced under moderately low-production permanent pasture, and I feel this type would be utterly useless as an associate in those high production swards where the New Zealand Wild White is so perfectly at home. This brings forward rather an important concept in searching for high producing strains to suit our dairy and potential dairy country that is, year in and year out, having money in manure expended upon it, i.e., to search for high production strains in areas that have been in permanently high-production grassland for many years.

This brings up the important point of whether we need to aim at more than one herbage type of any one species. My own opinion is that the application of strain should widen the habitat range of any one grassland species rather than limit that range. What I mean by this is, and there is ample evidence in our ryegrass and white clover work particularly to substantiate it, that in all probability we can select plants among the ryegrasses, for example, that can take the place of lower production species, such as Cr. dogstail, Poa pratensis, etc., or perhaps in wet places that will eliminate Timothy, Meadow foxtail, Poa trivialis, etc., and perhaps even there is a ryegrass type that will effectively deal with brown top on its own particular habitat.

Similarly with white clover for high production soil types there is already on hand New Zealand wild white No. 1. For soils slightly lower in fertility and with slightly less competition New Zealand wild No. 2 is admirably suited. For soils still lower in fertility Kentish wild white should do well; for normal short-rotation country the ordinary New Zealand type is eminently suited and for the strictly arable and annual soil types there is the Dutch type, I am afraid our certification officer is getting rather excited over the prospect, but none the less the possibility is there and the types actually on hand. Moreover, it may be a necessity, for I am not at all sure that high production types on arable soil types will do as well as will the annual Dutch types found on those soil types in plenty today.

The application of strain would appear to have a wider significance than the actual earmarking of one specific type under the seal of certification.

Strain work in relation to habitat may, ultimately have a very important bearing not only on the types that it may be necessary to produce but also from the point of view of locating in one or more definite habitats a type or types that will have a much wider range than that where it is actually found growing at the moment. The important thing I feel in collecting for strain is to collect from known association types.

Strain work in New Zealand, thanks to the machinery of certification being rapidly brought to bear, has developed very fast. Last year between 80 - 90 thousand bushels of ryegrass were sealed and tagged, including 9,000 bushels once-grown in the South Island. Virtually, the whole of the 250 tons of brown top seed produced carries a certification guarantee of being true to type and free of red top.

In regard to white clover, a definite New Zealand wild white type has been found and definite paddocks of this type are being located, and as soon as the farmers again harvest these areas, the crop will be sealed and tagged. A good deal of work has been done on New Zealand cocksfoot, and it is now certain that with but a few minor reservations, the whole New Zealand cocksfoot seed crop would be certified to (for purposes of the export trade) as a good grazing type of cocksfoot in contradistinction to the poor grazing strain as represented by Danish cocksfoot.

I see in herbage seed production, of approved strains, with a State guarantee by certification, an opening in the seed trade of the work that we must on no consideration let slip through our fingers for the want of co-ordinated effort and some little backing. We have got the goods in New Zealand - our Hawkes' Bay ryegrass has no equal; our cocksfoot is the right herbage type; our New Zealand wild white clover type is unexcelled in persistency and production; our brown top is relatively pure and can be harvested probably cheaper than anywhere else in the world owing to small dressing losses. The only thing we lack within our shores is the Montgomery red clover type, but it would take but a little organisation to get commercial Montgomery lines imported and tested and improved in New Zealand; and from this to work up an export in this type of red clover. Our Lotus Major, our Yorkshire fog, our Chewings Fescue all can be muchly improved and the improved product - though at first only slightly improved - could be certified to. And then again, there is quite a small but lucrative trade in the development of Phalaris tuberosa (syn. bulbosa) for Australian demands. New Zealand has the climate, material, men and machinery to make a big bid for a high place in the seed trade of the world, and I would be loathe to see our efforts in this, and the possibilities latent in it, stultified by lack of support at the present time. The matter of organisation and push is urgent.

-I should like to quote two letters recently received from Mr. Wm. Davies, who, you know, was on loan to New Zealand for two years. On his return to Aberystwyth he writes:-

(1st letter, dated 11/6/31)

"Relative to the white clover trials at Aberystwyth, from what I have seen here, I should say that they pretty well endorse the trials we conducted at the Plant Research Station in Palmerston.. New Zealand wild white No. 1 and No. 2 are outstandingly better than ordinary New Zealand, but virtually the whole of these samples that we have had here are appreciably better than any North European types. It is still doubtful, I think, whether New Zealand wild white, No. 1 and No. 2 will ever replace Kentish in Great Britain. Personally, I hardly think it will, and Captain Williams agrees entirely with this view. This need not deter New Zealand in the least from attempting to build up a clover seed export trade to this country, for, as you know, we are importing some four or five hundred tons annually of white clover from North Europe, and the whole of this may be regraded-as useless for the purposes of Great Britain. There is every indication to suggest that New Zealand wild white, having regard to the proper types, can, with material benefit to us at this end, replace the whole of the North European type which we now use. There is, therefore, a market for New Zealand white clover in this country amounting to several hundred tons annually. During the past few days we have had the pleasure at this Station of entertaining members of the Seed Trade of Great Britain. We had a fairly representative gathering from all parts of the country, and I would judge that members of the Trade are entirely convinced that your New Zealand strains are superior to North European both in regard to white clover and to cocksfoot. They have never, of course, had adequate trials of Hawkes Bay ryegrass, for any New Zealand rye-grass that comes into this country is normally of the South Island type,

"The Seed Trade, however, claim, and I think rightly, that New Zealand white and also New Zealand cocksfoot is generally, too high in price, and, more important still, that there is no guarantee of supplies. For example, this year they can buy it would seem New Zealand cocksfoot in plentiful supply at about 80/- a cwt. wholesale. That is the normal price of Danish, but there is no guarantee at all that next year they can get any supplies of New Zealand cocksfoot. On the basis of talks I had with various people I would think that if New Zealand could put adequate supplies of cocksfoot and adequate supplies of white clover on the British market, and do that annually at a reasonable price, then we could very quickly replace the whole of the North European crops by the New Zealand. What is going to happen at the end of this year is very difficult to say, for there is probably a four to five thousand ton crop of Danish cocksfoot which will in quite large part be brought into this country and the probability is that with New Zealand cocksfoot in plentiful supply and already under order that Danish Cocksfoot will be sold for prices normally ruling for ryegrass. The question then arises, can New Zealand stand the strain of intense competition from the Danish end and who is likely to give way first, the Danish farmer or the New Zealand cocksfoot grower? For my own part I would say the very best of luck to New Zealand for you have undoubtedly the commercial strains that are going to help us a great deal, and I think on the whole the British farmer is convinced of their value, but, at the same time, in times of financial stress as at the present, price will have to play a very important part in comparative sales."

(2nd letter, dated 22/5/31):

"I have been over the ryegrass fairly thoroughly and I think it would be true to say that Hawke's Bay ryegrass acts pretty well here as it does at P.N. The relation between it and types 3-5 N.Z. are exactly as they were at P.N. Tour Ba 200 is just about as it stands on the area with you. All the English commercial lots we have here are better than the N.Z. types 4-5 and at least as good as your Ba 200. Not so good as H.B. average. The Hawke's Bay with us is not doing as well as our British indigenous lines, at least not as well as those of them that are correctly named. I think I endorse the policy adopted by our Station in breeding for an extreme pasture type designed for relatively low potential production habitats. Also to breed for the more favourable lowland habitats, around a rather different mean. I would again reiterate to you that you must in your selection work look to two or possibly three major types, or at least you should consider whether or not you are after Ba on a wide or a narrow range of soil conditions. You might ask my opinion as to whether or not H.B. ryegrass, selected or unselected, has any potential value outside N.Z. My answer would be that in Britain there is a need for an improved "hay" type (as we here term it) and H.B. as it stands does help to fulfill this need, and I think if New Zealand puts herself right in regard to certification and is able to supply H.B. ryegrass at a reasonably cheap price - say, not above 10/- -- 15/- per bushel of 20 lbs. retail price in Britain - then she can sell as much as she likes here to our mutual benefit. Then, again, there is the Australian market to think of. If I figure correctly H.B. ryegrass will have a great place in Australia and I feel that if economic conditions improve at all in the Commonwealth then they are going to be active importers of seed for some number of years. Ultimately, I think Australia will herself develop a herbage seed industry at least sufficient to satisfy her own domestic needs. All this means, of course, that New Zealand has got to develop her industry rapidly and has to have it organised soundly so that she can face up to competitors whether they be Imperial or foreign.

"New Zealand is quite capable of doing so and she has **the advantage** of a good start plus an actively-minded **personnel**, both in **the** seed trade and in the official Departments.
Please tell them from me to go ahead and see that they do so, having due regard to world economic forces."
