

TYPES FOUND IN COMMERCIAL CRESTED DOGSTAIL.

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IN crested dogstail there is a great variety in the type of plant which goes to make up any sample. Similar variations occur in other plants and have been recorded. It is intended to record here briefly the variations that occur in dogstail to bring it into line with plants that have been more intensely studied.

This variation in growth-form is observed between different lines, but the variation within any of the New Zealand commercial lines is greater than that between the averages of the lines themselves. There is variation in leafiness, earliness, shape of inflorescence, persistence, and, probably, root development. The variability from plant to plant is so great that one has difficulty in finding two similar plants among thousands of spaced plants from the same line. The type, then, as we see it in mass, represents an intermediate point somewhere between the extremes of the different characters. What we are accustomed to consider a feature of any one sample under observation is merely an accumulation of various features associated together to give a superficial resemblance to that character. It is only when these plants are studied singly and the points of each analysed that we get a true conception of the extent of variability of any one character. From such an approach it is easily seen that modification of environment, be it climatic, biotic, or cultural, can bring about a profound change in the centre point of the observable characters by causing a modification in the incidence of the various forms, even without any actual structural change having occurred in the plants themselves. Thus has been brought about the variation in the lines of dogstail from different countries. The complexity of environmental factors acting on the mass is responsible for the differences observed and described. It is of interest to connect the climatic and cultural conditions affecting the types when considering the characters of each. The types dealt with below are—(1) New Zealand commercial, (2) Irish commercial, (3) roadside and permanent pasture, (4) selections from New Zealand commercial, (5) Kentish, (6) Scotch, (7) Dutch.

New Zealand Commercial.—This type represents the extreme for quick development from seed and earliness of growth. The growth (when seeds are autumn-sown) in the first autumn, winter, and spring is good, but there early develops a stemminess so that palatability falls away soon after active spring growth commences. When the plants are allowed to develop seed-heads, the check to growth is great and summer production is practically at a standstill. There is little activity until after the autumn rains unless the soil is moist, when production may continue through the hot period. Winter growth is rather better than that of Kentish lines. This is the first of the types to flower.

Irish Commercial.—The Irish samples tried out here follow the New Zealand commercial lines very closely in type. This is not

to be wondered at, as much New Zealand commercial seed has been sown in Ireland for seed-production purposes and is harvested in a similar way.

Roadside and Permanent Pasture.-Seed was collected from various roadsides and pastures where dogstail was growing strongly and was well represented in the sward. Such seed germinated more slowly, the resulting plants were somewhat more leafy, but later in starting growth in the spring than the commercial samples. When once established, however, they outyielded the commercial types fairly considerably by the end of the first year, and gave a better winter production. They flowered from three to seven days later than the commercial lines.

Table I.-Yield : Seed sown April, 1933.

Origin.	October, 1933.	December, 1933.	May, 1934.
Commercial	100	100	100
Roadside and permanent pastures	90	108	146

Selections from New Zealand Commercial Lines.-Where selection has been carried out with a view to increasing permanence and leafiness, the end point shows little or no improvement over the roadside and permanent pasture plants. It would appear that there is a certain amount of selection going on in the permanent swards, and that as a consequence the very early flowering types are not well represented. This group flowered from two to six days after the commercial controls.

Kentish.-Here a big change in type- is noted. The seeds are much slower to establish, and in consequence the autumn and early-spring growth-rates (when autumn-sown) are much below that of the commercial lines. Growth proceeds longer into the early summer, and the Kentish permanent-pasture lines were from seven to ten days later in flowering than the controls (New Zealand commercial). Their rate of autumn growth, combined with their close crown and abundance of fine narrow leaves, gives them a better appearance than the controls in April. By mid-winter and at the commencement of the active spring growth, the rate of growth of established plants is somewhat below that of the controls. These English lines are undoubtedly more persistent and leafy than the New Zealand commercial ones, but slower in growth.

Scot&.-Only two samples have been tried out, and these proved to be similar in type to the Kentish.

Dutch.-In respect of time of growth and growth characters, the Kentish lines can be regarded as only intermediate between New Zealand commercial and Dutch. The Dutch lines represent the extreme for slow growth from seed and lateness of spring production, there being a difference of fourteen days between the appearance of flower-heads of the earliest New Zealand commercial and the latest of the Dutch lines. Their winter production, too, is the lowest of the types tried out.

A CONSIDERATION OF THE VARIATIONS DESCRIBED.

The New Zealand types (1, 2, 3, 4) can be grouped together when considering the cause of the development of their specific characters. It seems very probable that when dogstail was first introduced into this country it was of the Kentish or Dutch type. Certain ecological factors began to work, and a distinct type is now present in roadside and permanent pastures from the original introduction. The types which were most suited to the environment came to be represented in greater numbers, so that although there are doubtless most of the original variants present, yet there has been a shifting of the centre of the aggregate of the observable characters. Owing to the greater competition from quickly growing grasses in this country, the smaller, slowly growing, fine-leaved, longer-lived strains have been at a disadvantage. Consequently a stemmy, broad-leaved, early-producing type has predominated which, incidentally, is not very persistent.

In addition to this natural move towards a less leafy but early strain, the method of harvesting the seed which was current until recently has helped to accentuate this character still further. Stapledon, Davies, and others have frequently shown that commercial lines of grasses tested at Aberystwyth and elsewhere have invariably developed parallel tendencies.

For some years dogstail-seed in New Zealand has been harvested from one year and sometimes two year leas. The seed was autumn-sown, and in the following summer a seed crop was taken. Seldom was it left down for two years, owing to the fact that the yield of seed in the second year was poor and weed-growth became unduly strong. This in itself is, as we know, a retrograde step as far as pasture-seed production is concerned. In addition, however, New Zealand got an illicit fame for the brightness of her dogstail-seed. It was definitely favoured on the English market at the expense of the darker local and other imported lines. It generally has been considered by farmer and seedsman alike that a bright seed-sample denoted good harvest weather. The fact is, however, that dogstail ripens best where dull and even damp weather prevails at harvest, and in this respect is the complete reverse of rye-grass. What it really denotes is immaturity, as the best seed is a rich medium brown colour. Stapledon, when he visited New Zealand in 1928, notes this and wrote : "The association of brightness with presumed excellence is indeed a striking example of one of those seed characteristics which have come to have a trade value for no good reason and without the backing of any reliable tests or evidence for its justification."

In an endeavour to get such a sample it was necessary to harvest on the early side ; thus the leafy, slower-growing, late producers were unable to ripen the bulk of their seed in time to be included in the seed harvest, and became more scarce. The selections from New Zealand commercial, roadside and permanent pasture plants can be classed as representing more or less the indigenous type. There is no doubt that they are more productive and rather later-flowering than the commercial strains. The type of artificial selection that has been carried on to increase leafiness

and permanence in commercial lines has its parallel in the natural selection that is taking place in the field, and lies mainly in the direction of discouraging the very early producers, and consequently increasing the proportion of late producers. Thus one would expect an improvement of type by reversion to the stripper for harvesting the seed where, in the main, seed from the late producers is obtained while seed from the early producers tends to be omitted rather than increased.

The harder winters experienced in England engenders more noticeable falling-away of growth during winter-time. As no premium has been placed on earliness of growth (as has been shown to occur with New Zealand commercial samples) the type is later in developing both from seed and in spring. On account of this fact also, it persists better into the summer. The character of earliness appears to be linked with a broad leaf and stemmy growth as opposed to the narrow and more leafy habit of the later-flowering plants. It is possible to draw a parallel between Kentish wild white clover with its slower growth and finer leaf and New Zealand white clover with its more vigorous habits and larger leaf.

Dutch.—This represents the extreme opposite of the New Zealand commercial. The differences displayed by Kentish are still further emphasized here. Winter growth is poor, and for a short period in mid-summer it is as productive as any of the others, but for the remainder of the year growth is less than the other lines. The harder the winter conditions the plants have to withstand the smaller is the annual production, but, treating the lines as a whole, the slower the growth the more leafy the plants are. This type from Holland, though excellent in many respects, is too slow in growth to warrant its extended use in this country.
