DOMINANCY AND DOMINANCE COMMUNITIES*

BY

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Dominancy of a species is to be considered as an expression of the success, the species has in the struggle for life, and as the concurrence may be taken as the essential plant sociological factor, the dominancy must, from a theoretical point of view, be of great importance for this branche of science.

Now the case is that dominancy shows itself in different respects. In the first place the predominating, tallest plants determine for the greater part the appearance and the rough composition of the botanical landscape. In the second place, the often mosaiclike variance of dominants forms the more detailed structure of the plantcover. In the third place, the mass working of predominating species changes the original habitat in the long run more or less. Clear examples of this are the succession in silting up, in forming of dunes and of land by water- and marshplants. In the fourth place dominancy of a species indicates special characteristics of the habitat.

Up till now the ecological significance of dominancy was, though for good reasons, only supposed. With the aid of the results of our analyses of the herbage and the habitat of 855 Dutch grasslands the latter could also be proved now. The botanical composition of these grasslands was studied by using the 25 cm^2 specific frequency (= frequency of occurrence) method (2, 3, 4) and the dry weight analysis (= productivity method) (3, 5, 10). The environmental factors, noted or analysed, were a.o. use of the land, degree of humidity, percentages of humus, sand (fine and coarse) and clay, phosphate- and potash status and pH-water of the soil.

It is shown that the more frequently a species occurs the more evident its coherence with special environmental factors demonstrates itself. This, however, does not avail for every species regarding every habitat factor, but only for those species which are *frequency indicator* for special factors. Exceptions are the few species, called by us *presence indicators* which only need to be present in a small quantity to give good indications concerning an environmental factor, and further those species which even at a high frequency have not any indicating value for this factor. A good example of the latter group is *Festuca*

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rubra L. which grass can be as frequent at a pH 4 as at a pH 8. (It seems that the tuftforming strain of this species is strongly acidloving in contrast with the strain with rhizomes which is moderately lime-loving.)

Now, for instance, it generally appears to be true that for frequency indicators the spreading (standard deviation) around the mean pH becomes smaller at higher 25 cm² frequencies (of occurrence) and higher weight percentages. Moreover with acido-frequent species (e.g. *Agrostis canina* L. and *Anthoxanthum odoratum* L. (Fig. 1)) the mean pH changes to the acid side with increasing frequency, but with basifrequent species as *Dactylis glomerata* L. (Fig. 2 and 3) and *Trifolium fragiferum* L. (8: Fig. 2) it changes to the basic side (see Tables 1 and 2). This change can be explained by the unequal distribution of the grasslands over the different pH classes and the already mentioned grouping around the mean pH, when they appear more in mass.

Presence indicators behave in a different way. They react so strongly on the environmental factor, for which they are presence indicator, that they show in low frequencies an equally small spreading

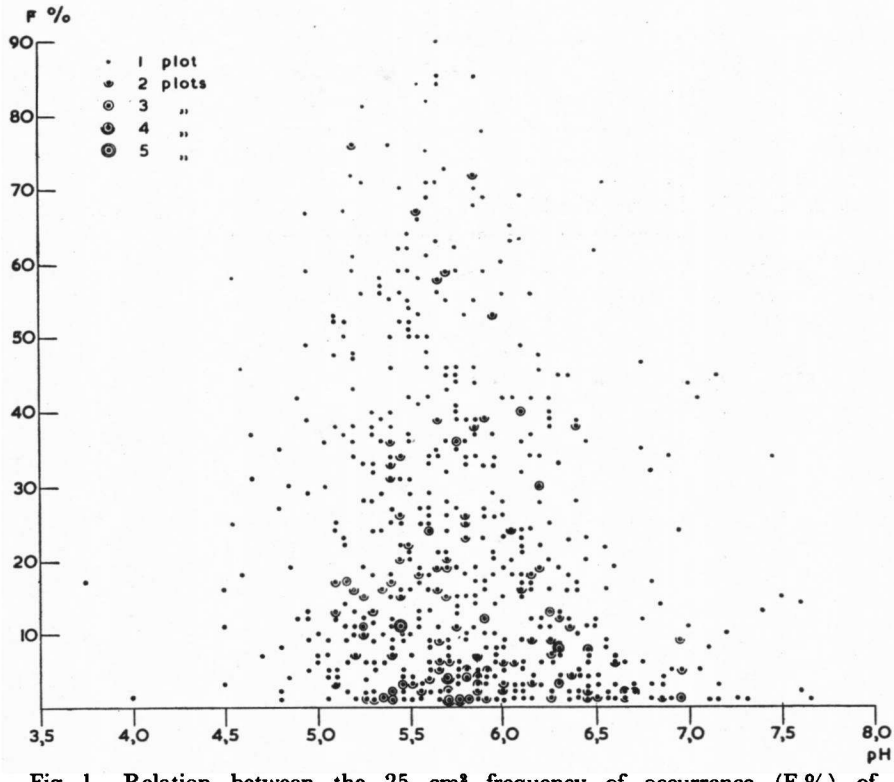

Fig. 1. Relation between the 25 cm² frequency of occurrence (F %) of *Anthoxanthum odoratum* L. and the pH-water of the soil.

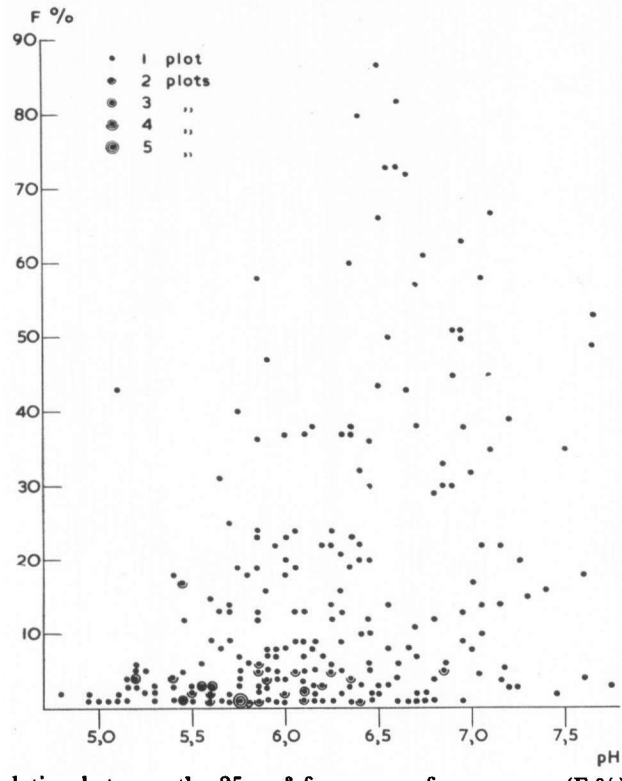

Fig. 2. Relation between the 25 cm² frequency of occurrence (F %) of *Dactylis glomerata* L. and the pH-water of the soil.

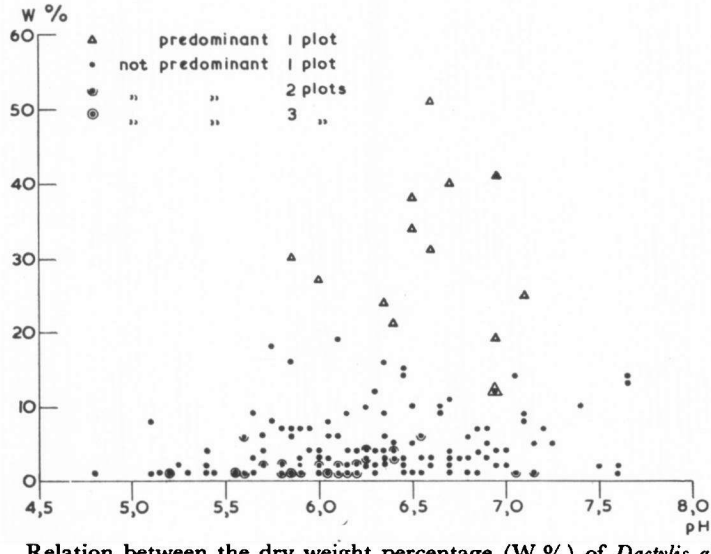

Fig. 3. Relation between the dry weight percentage (W %) of *Dactylis glomerata* L. and the pH-water of the soil.

TABLE 1

Mean pH and standard deviation (σ) of *Anthoxanthum odoratum* L. and *Dactylis glomerata* L. at different frequency (F) classes.

	Anthoxanthum odoratum			*Dactylis glomerata*		
F %	Mean pH	σ	Number of plots	Mean pH	σ	Number of plots
1—10	5.9	0.59	264	6.0	0.58	172
11—25	5.8	0.55	184	6.3	0.56	52
26—50	5.7	0.49	153	6.6	0.56	31
> 50	5.6	0.33	73	6.7	0.39	17

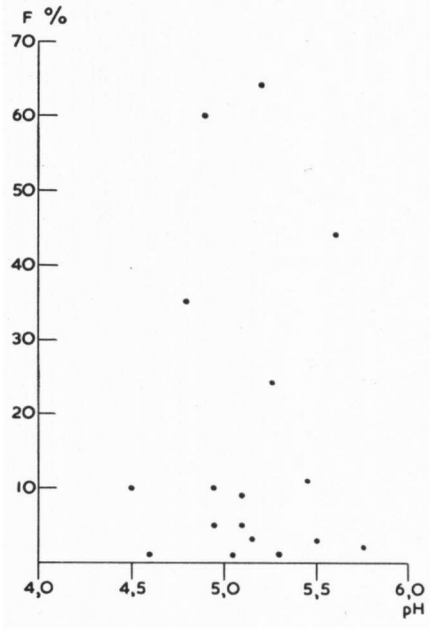

Fig. 4. Relation between the 25 cm² frequency of occurrence of *Nardus stricta* L. and the pH-water of the soil.

around the mean value of the concerning habitat factor as in high frequencies. So for these species, there does not occur a changing of the mean pH in acid- or basic direction at higher frequencies. Examples of real presence indicators are up till now: *Nardus stricta* L. (Fig. 4) for acid soils (pH-water 4.5—5.8) and *Festuca ovina* L. (8: Fig. 1) for an insufficient phosphate status. Of this, the number of data is relatively small and it is not impossible that in extending this number, *Nardus* will appear to behave, regarding the pH, more as a frequency- than as a presence indicator. All this only concerns separate habitat factors and so it is an open question if exclusive characteristic species (School of BRAUN-BLANQUET), essentially being the same as the presence indicators for the habitat as a whole, even occur in grassland. Therefore all or nearly all characteristic species would be selective or preferential, at least in the grassland formation.

After this illustration of the importance of dominancy, particularly from an ecological point of view, we will consider now the *dominance communities*. Apart from the fine mosaic-forming differences in predominancy, a sward often shows, in this research of the Dutch grasslands a dominance community is determined by the species which has the highest average dry weight percentage in the area sampled. If the weight part of the leading species amounts to at least 25 or 50 %, the dominance community is called pure and very pure respectively. If the weight percentage of the dominant is under 25 which often occurs or if two or more species form the leading part, we speak of an impure and mixed community respectively. The facts, published already before (6, 7, 9), that dominancy can change temporarily under influence of the season, or by influences of weather conditions as drought or severe frost, are a great prejudice for the characterization by the predominating species, but do not change much of the indicating value of predominancy.

In the paper about the valuation and ecology of dominance communities (1) are given in Table 1 the lowest, mean and highest grades of quality of the sward for the principal dominance communities and in Table 2 the preference of those communities for distinct degrees of the most important environmental factors (use, humidity, clay-humus percentage, type of soil, pH, phosphate- and potash condition). The agricultural valuation of the relative dominance communities is decreasing in the following order (mean grades of quality between brackets): *Lolium perenne* (7.4), *Poa trivialis* (6.4), *Cynosurus cristatus* (6.3), *Dactylis glomerata* (6.2), *Poa pratensis* (6.1), *Trifolium repens* (6.0), *Alopecurus pratensis* (6.0), *Festuca pratensis* (5.9), *Agrostis stolonifera* (5.8), *Holcus lanatus* (5.1), *Agrostis tenuis* (5.0),

TABLE 2

Mean pH and standard deviation (σ) of *Dactylis glomerata* L., either predominant in weight or not.

Dactylis glomerata	Mean pH	σ	Number of plots
Not predominant	6.3	0.59	146
Predominant	6.6	0.36	13

TABLE 3

Dry weight yields of dominance communities in different years, expressed in percentages of the year average of all grasslands of which the yield is determined. Number of botanical analyses between brackets.

Dominance community	1946	1947	1948	1949
Lolium perenne	114 (63)	102 (33)	99 (15)	107 (18)
Festuca pratensis	102 (15)	118 (3)	60 (1)	116 (2)
Poa trivialis	118 (6)	106 (2)	101 (1)	
Agrostis stolonifera	96 (20)	96 (25)	89 (1)	95 (8)
Festuca rubra	92 (12)	74 (3)	87 (6)	98 (5)

Festuca rubra (4.6), *Deschampsia caespitosa* (3.8), *Agrostis canina* (2.9), and *Molinia coerulea* (1.9). With regard to the synecology, it appears a.o. that the *Poa trivialis*-community generally occurs at a better P-status than the community of *Lolium perenne*, while this is just the contrary with the potash status. The latter community is also in a high degree bound to neither too moist, nor too dry a situation of the soil and is especially found on pure pastures (only grazed grasslands).

To complete, Table 3 gives the dry weight yields of the herbage of the most occurring dominance communities for the years 1946, 1947, 1948 and 1949, expressed in percentages of the year average of all grasslands of the yield research of M.L. 'T HART (Wageningen), including those of which no botanical analysis has been made. In agricultural view, it is of importance that for certain communities (e.g. those of *Poa trivialis*, *Lolium perenne* and *Festuca pratensis*) the yields generally lie higher than the average yield, and for others, e.g. those of *Agrostis stolonifera* and *Festuca rubra*, the yields lie below that mean yield. In proportion to the weight amount of the predominant species being higher, this is more pronounced.

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