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POSSIBILITIES OF CORRELATING WOOD AND POLLEN DATA FROM THE RHENISH BROWNCOAL

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SUMMARY

An investigation was made of wood samples from some browncoal quarries in the southwestern part of the Rhenish browncoal district. The results that were obtained are compared with those of palynological studies on material from the same quarries. Possibilities of correlating the data from the two kinds of studies are discussed.

INTRODUCTION

From two browncoal quarries a pollen diagram and also a list of wood species were drawn up. These are the quarry "Anna" at Haanrade in the south of the province of Limburg and the quarry "Maria Theresia" at Herzogenrath in Western Germany. The distance between these quarries is about 2.5 km.

The pollen diagram of Haanrade was prepared by MANTEN (1958), that of Herzogenrath by MEULENKAMP (1966). A list of the families represented in the pollen diagrams was drawn up and the percentage of each family plotted. The wood lists were prepared by the present author, that from Herzogenrath in coöperation with A. Voorrips (Table I).

By comparison of the two lists, a number of similarities became obvious.

FACTORS

Both Pinales and Cupressales are represented in the pollen lists and also in the wood lists. There is a notable difference in the low pollen percentage and the high wood percentage in the lists. A number (7) of dicotyledonous families are represented in both types of lists. Fourteen families are represented by pollen

grains only and of two families only wood has been found. Also, at first sight there appears to be not much correlation possible.

When we pay attention to the factors that influence the dispersal and preservation of pollen and wood, we see that some of the factors differ considerably in their influences upon these materials.

Wind

The wind brings in pollen over some distance from the place where it is finally preserved. In effect, a good deal of the pollen rain is coming from outside the bog. Therefore, the pollen diagram gives some information about the surrounding vegetation but, at the same time, the surrounding vegetation is making its influence felt in the total diagram and makes it difficult to reconstruct the local vegetation.

The list of woodspecies, on the other hand, is unlikely to have been affected by this wind factor, since wind will only exceptionally bring leafy branches, and far less whole trees, into the bog. Consequently the wood list gives information about the local vegetation.

Water

Water can act as a factor in both pollen and wood dispersal. The effect with regard to pollen dispersal will not differ very much from the effect of the wind. The effect on wood would not have been very great for in this case the vegetation of the bog was in all probability a brook forest, with rather dense masses of tangled stems and branches. Therefore, it is unlikely that any floating piece of wood penetrated into these places.

Insects

Insects act as pollen disseminators, but their influence on pollen diagrams is rather incidental as they carry only the rather sticky pollen of insect pollinators that are generally characterized by producing only a small amount of pollen. Their influence on the wood is to destroy part of it, before it is water-logged in the wet peat bog.

Corrosion

Finally, there is a factor corrosion: The pollen of some species is only slightly affected by corrosion, while others will be totally destroyed. The same is true for wood. When corrosion does not act in a similar manner with the wood

and pollen of the same family, one of these will survive and show that it has occurred, even though the other form cannot be found, e.g., Lauraceae. The wind-pollinated amentifers produce more pollen than the insect-pollinated plants and the pollen of the former will be spread over quite a considerable area, while pollen of the latter will not spread into the air at all, or in a very small amount only.

From these considerations may be stated that:

(*1*) When only pollen and no wood is found of a particular plant, there are two possibilities: (*a*) either the plant occurred outside the bog and there has been no wood belonging to it inside the bog at all, or (*b*) the wood totally decayed. In both cases other plant remains must be used to check which of the alternatives is applicable.

(*2*) Only wood and no pollen was found. In this case the species must have formed part of the local vegetation.

(*3*) There is much pollen and little wood: The plant has formed part of the vegetation, either a large part or, alternatively, a small part with a high pollen production. Attention should also be paid to the possibilities of over- and under-representation of wood and pollen.

(*4*) There is much wood but little pollen: the species had a large part in the vegetation and the pollen partly disappeared, has been corroded or was produced in very small amounts. In this case, as in (*2*), the wood list will be, to some extend, a correction of and supplementation to the pollen list.

POLLEN AND WOOD LISTS

With these factors in mind it is possible to interpret the difference and similarities between pollen and wood lists.

Coniferae

Pinales produced 5.5 and 7% of the found pollen, and 22 and 23% of the wood remains. The wood will be somewhat overrepresented as conifer wood stands to decay very well and, therefore, rather small pieces, e.g., branches, etc., will survive. This is even more so in the case of the Cupressales: 4 and 2% pollen, 13 and 52% wood. Here the wood will be overrepresented even more so than in the case of the Pinales, but it is also clear that the pollen is underrepresented.

Hamamelidaceae

Little or no pollen and 2% wood. The pollen of these amentifers is clearly underrepresented, whereas the wood is rather strongly subject to decay and will, therefore, not be overrepresented.

Aquifoliaceae and Cyrillaceae

The lists are rather different. The Aquifoliaceae show in both localities a pollen percentage of 2, and constitute 4 and 1 % respectively of the wood remains. When there is some constancy between pollen and wood production in any one species, there must have been a difference in corrosion circumstances between these quarries. This will be a point of further investigation. These two families are insect pollinated, implying that a certain amount of underrepresentation is to be expected in their pollen percentages.

Rutaceae, Nyssaceae, Sapotaceae and Symplocaceae

The percentages of pollen and wood correspond rather well. These families must have taken part in the vegetation of the bog.

The occurrence of the following families (Table I: Anacardiaceae–Ulmaceae) must be explained in the above mentioned two ways.

(*1*) They did not occur in the bog vegetation, e.g., Fagaceae, Betulaceae p.p. Anacardiaceae, Juglandaceae, Tiliaceae, etc.

(*2*) Others must have been growing in the bog, but the wood was totally destroyed, e.g., Myricaceae, Ericaceae, Betulaceae p.p., Salicaceae, etc.

For some families we have no reliable records at all; these families will be the subject of further investigations.

Lauraceae and Leguminosae

No pollen and rather much wood is found in the two quarries. Although the wood is very resistent and very well preserved and, therefore, some over-representation is probable, it must be noted that, especially in the case of the second family, a special investigation needs to be undertaken to learn something about its fossil pollen. It is rather improbable that Leguminosae pollen would be totally destroyed by corrosion as, for example, in the case of the Lauraceae. Another possibility is that the pollen count has been too low. In this case the wood list gives additional information which is lacking from the pollen list.

CONCLUSIONS

(*1*) Wood lists of browncoal bogs give some information about the local vegetation only, whereas pollen diagrams also register part of the surrounding vegetation.

(*2*) In some cases wood lists form a correction or addition to the pollen-analytical results.

TABLE I

COMPARISON OF THE ABUNDANCE OF POLLEN GRAINS AND WOOD REMAINS IN BROWNCOAL FROM TWO QUARRIES IN THE SOUTHEASTERN NETHERLANDS AND ADJACENT GERMANY

Order or family	*Pollen (%)*		*Wood remains (%)*		*Wood remains (pieces)*	
	Haan-rade	*Her-zogen-rath*	*Haan-rade*	*Her-zogen-rath*	*Haan-rade*	*Her-zogen-rath*
Pinales	5.5	7	22	23	18	105
Cupressales	4	2	13	52	10	237
Hamamelidaceae	×	—	1	2	1	9
Aquifoliaceae	2	2	8	1	7	4
Cyrillaceae	11	> 35	4	1	3	4
Nyssaceae	1.1	—	1	—	1	—
Rutaceae	1	—	6	0.5	5	2
Sapotaceae	0.8	5	—	0.3	—	1
Symplocaceae	1	—	25	5.2	21	21
Anacardiaceae	5	7	—	—	—	—
Araliaceae	0.3	—	—	—	—	—
Betulaceae–Myricaceae	27	40	—	—	—	—
Caprifoliaceae	1.1	×	—	—	—	—
Empetraceae	×	—	—	—	—	—
Ericaceae	5	2	—	—	—	—
Fagaceae	35	23	—	—	—	—
Juglandaceae	0.3	×	—	—	—	—
Oleaceae	×	—	—	—	—	—
Platanaceae	2	1	—	—	—	—
Rhamnaceae	×	—	—	—	—	—
Salicaceae	2	1	—	—	—	—
Tiliaceae	×	×	—	—	—	—
Ulmaceae	—	5	—	—	—	—
Lauraceae	—	—	20	12	16	54
Leguminosae	—	—	—	3	—	13

× = present

(*3*) In many cases the absence of wood of certain families cannot give any information as to whether the plants were growing inside or outside the bog.

(*4*) At present it is only possible to correlate on a qualitative, not quantitative, basis.

(*5*) Our knowledge of fossil wood, especially that of dicotyledons is still meagre. It gives rise to faulty determinations and omissions in wood lists. This affects their usefulness.

(*6*) Further investigation of wood from more quarries will be necessary to give a better idea about the distribution of woody pollen producers inside and outside the browncoal bogs.

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