UNUSUAL ADVENTIVES ON ALKALI-WASTE IN S. LANCASHIRE

By G. HIND

At a botanical exhibition at Bolton School in July 1954, I was surprised to see specimens of *Orchis fuchsii* Druce and *Gymnadenia conopsea* (L.) R.Br. in a section dealing with local flora, since neither plant was recorded for the district (2).

Their given locality was an alkali-waste heap, disused and overgrown, which, on investigation by myself and others, revealed in addition:—

Erigeron acer L., *Linum catharticum* L., *Orchis purpurella* T. & T. A. Steph., *Orchis incarnata* L., *Orobanche minor* Sm. and *Sisyrinchium angustifolium* Mill.

LOCALITY

The waste-heap is very large, flat-topped, and approximately triangular with steep sides. It is at the confluence of two rivers and its third side is bounded by a canal.

SOIL

The soil is well-drained and has a pH of 7·1 to 7·3 at a depth of 1″. Its surface is thinly covered with cinders, below which is a black loam in increasing admixture with waste until, 7″ to 9″ down, raw waste is reached.

When tipped, the waste would contain sandstone (of local origin) and calcium sulphide (3), but on weathering, the latter undergoes the following change:

1. $CaS + 2O_2 = CaSO_4$ to produce the neutral and almost insoluble sulphate. The following reaction occurs to a lesser extent:

2. $CaS + H_2CO_3 = CaCO_3 + H_2S$ (simplified) and thus the weathered waste contains sandstone, calcium sulphate and a small proportion of calcium carbonate. This last, together with limestone imported as a raw material and often spilled when being unloaded, accounts for the alkalinity of the soil.

SOURCE OF ADVENTIVES

Waste was last tipped in c. 1880 and since then a colony of *G. conopsea* containing several hundred plants, has developed.

It is possible that this colony may have arisen from a single casual introduction, but it is also possible either that a number of tubers were introduced, or that seed was brought in over a period.

The tubers or seed were probably introduced with the limestone, which was brought by canal from either Buxton (Derbyshire) or the Clitheroe district (E. Lancs. and W. Yorks.).

Linum catharticum, which is abundant on the tip, was common and generally distributed in both Derbyshire (6) and the West Riding (4) as also was *Orchis fuchsii.* Both *O. incarnata* and *G. conopsea* were, however, rare and local in Derbyshire in 1889, but in W. Yorks were respectively very common and locally common (4 & 1). Furthermore, *O. purpurella* is recorded as such only for Yorkshire where it is 'common in calcareous marshes' (5).

It is difficult to be sure how seeds of, say, *O. purpurella* reached the quarried limestone, but it is possible that when the waste-heap became disused it was covered with soil (containing tubers and perhaps seeds) brought specially for the purpose from an orchidiferous locality, most likely in Yorks.

Indeed, it is notable that all the orchids mentioned often occur together in such Yorkshire calcareous bogland as that near Malham Tarn, and that *Taraxacum spectabile* agg., *Pulicaria dysenterica* and *Succisa pratensis* occur with them on the waste, indicating a helophytic origin.

It is assumed that *L. catharticum* and *Erigeron acer* were introduced with the limestone. In support of this is the fact that *L. catharticum* abounds on nearby alkali-waste heaps where it is not accompanied by any orchids.

Orobanche minor here grows on *Trifolium pratense* and both were probably introduced together. I am unable, however, to find any record of *O. minor* from the Clitheroe area.

Sisyrinchium angustifolium is likewise of doubtful origin but is most likely an adventive because there are no gardens near by. I can find no old record for Yorkshire or E. Lancs. and it is perhaps not coincidental that this species and *O. minor* occur close together some distance from the main orchid colony, and hardly elsewhere.

One naturally suspects their source to be where both are native, possibly W. Ireland, and I find that between 1760 and 1834 iron pyrites were imported from Wicklow (7) to supply a sulphuric acid plant on the same site.

Wicklow, however, is in E. Ireland and further difficulties arise in explaining how the seeds or rhizomes escaped subsequent burial in alkali-waste.

Conclusion

Similar waste-heaps occur near many industrial towns and deserve investigation by both botanists and local historians, ideally in co-operation. The results of this investigation would have been even more inconclusive had not the industrial history of the site been the subject of recent research.

ACKNOWLEDGMENTS

I am indebted to Mr. J. B. L. Worthington for historic details, to the Rev. C. E. Shaw, to Imperial Chemical Industries Ltd., General Division, and to Mr. A. Hazelwood of the Bolton Museum for his continued encouragement and advice.

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