MORPHOLOGY AND GENESIS OF PODZOLS
J. S. JOFFE (a)

Introduction

Geographically, podzols cover probably the largest habitable area of the earth's land surface. They extend, according to the map of Glinka (5), from the subarctic region, at the boundary line of forest vegetation, through the temperate zone, up to a few degrees north of the Mediterranean in Europe, to about the parallel 50° north latitude in Asia (at the Pacific coast it extends as far south as the parallel 40°) and North America (at the Atlantic coast it extends as far south as the parallel 40° north latitude). According to estimates of the Russian Bureau of Soils (3), more than 10 million of the 21 million square kilometers of the area in U.S.S.R. are classified as podzolized. This does not include the close to a million square kilometers of forest steppe soils which are also a sub-type or transition type of podzols.

According to Glinka (5), the climatic conditions of the podzol zone, where a wide range of meteorological data is averaged, are: 500 to 570 mm. of rainfall and a mean annual temperature of 3.6° C. Within this zone any temperature rise is accompanied by a rise in the annual precipitation and vice versa—any temperature lowering is accompanied by a lowering in the annual precipitation. In other words, the net results of these two primary factors of climate, which include also evaporation and humidity, are a definite leaching process and a biotic environment characteristic of this climatic region, namely forests and meadows.

One of the outstanding morphological features of a mature podzol profile is the bleached A₂ horizon, and this is perhaps the reason why this zone has been studied much more than any other soil zone, save the chernozem. Another one widely discerned is the physical property of compactness in the B horizon with the characteristic coloration of the iron and humus which accumulate there, sometimes accompanied with concretions or ortstein formation.

Of the physical properties which are typical for podzols, structure is outstanding. In mature podzols the A horizon is practically structureless, or of a loose structure which becomes platy towards the B horizon and nutty in the B. Color is also a distinguishing property of the podzol profile. The A₁ horizon is gray or brownish gray with a sprinkling of white dots here and there. The A₂ horizon is lighter in color, sometimes almost ash-gray to white, which gives to the podzol profile the distinctive morphological characteristic spoken of above. When it comes to the B horizon the color changes again from a light reddish brown to a dark reddish brown, depending on the relative quantities of iron and humus.

Biologically, the podzol horizons have been investigated to any great extent, but from the available and from the knowledge we have, it is apparent that A₂ is rich in fungi and poor in bacteria. On the other hand, A₁ and B are lower in fungi, especially B, and high in bacteria. Thus the fungi are intermediate in A₂, as pointed out by Williams (27), who builds his speculative ideas about the podzol process on the theory of fungus activity and the formation of aceric and aporicenic acids, with the separate spherulites, which in a large measure are responsible for the light coloration of the A₂ horizon.

Description of Podzol Profile

Any mature podzol is subject to the same soil cut the acquired characteristics outlined in general it is as follows:

A₀ layer. It consists primarily of forest soil cut the acquired characteristics outlined above and in general it is as following:

A₀ layer. It consists primarily of forest debris or sod—the latter in the case of meadow podzols made up of decomposed, partly decomposed organic materials, usually intermingled with less mineral soil material. The latter condition is marked when the forest floor is of the duff type. This layer is known as the humus accumulative. On a loamy parent material this layer is shallow—2 to 3 cm. In peat podzols where the water table is high, or conditions are favorable to swamping as in the case of certain types of deposit, the A₀ layer might reach a depth of 10 cm. On the other hand, in very light sandy parent materials with good aeration, the A₀ layer may in places be lacking.

A₁ horizon. 5 to 14 cm. thick depending on the texture of the parent material. It is deeper or finer than on the light sandy types of parent where it is sometimes very shallow. Some horizons are impregnated with the mineral constant color is dark gray to grayish, or brownish powdery and silty in the case of the loamy or sandy parent materials the A₂ horizon might be in depth of 2 feet or more—a case noticed by