freed from the excess of alkali are exceedingly fertile*—but that its presence is simply owing to certain climatic conditions, briefly, to an insufficient rainfall. Alkali soils, therefore, are characteristic of arid or semi-arid districts only, and these in Canada may be said to be restricted to certain areas in British Columbia, South-western Alberta and in a limited degree, Saskatchewan and Manitoba.

## THE COMPOSITION AND DISTRIBUTION OF THE SALTS IN ALKALI SOILS.

The compounds known collectively as alkali comprise chiefly sodium sulphate (Glauber's salts), sodium carbonate (washing soda), sodium chloride (common salt), magnesium sulphate (Epsom salts), and occasionally the chlorides of calcium and magnesium. The total amount of these salts present is extremely variable, percentages from 0·1 to 3·0 being recorded for a depth of the first four inches, from which fact it naturally follows that great differences exist amongst alkali soils as regards their degree of injuriousness to plant life. Again, the 'alkali' may be practically confined, in a concentrated form, to the immediate surface or perhaps upper six inches of soil, or it may be distributed throughout three or four feet, forming an almost negligible percentage of the total soil, depending on the nature of the soil and the amount of rainfall. Towards the end of the dry season, however, there will always be more or less of accumulation of the alkali towards the surface.**

## 'WHITE' AND 'BLACK' ALKALI.

While the amount of alkali present is undoubtedly a factor gravely affecting the productiveness of a soil and the possibility of its profitable reclamation, the nature of the alkali is a matter of still greater importance. Two classes of alkali are generally recognized 'white' and 'black,' (so-called from the appearance of the respective incrustations) differing as regards the intensity of their toxic action on vegetable life, and also in their amenableness to simple remedial measures.

*White alkali* consists chiefly of the sulphate and chloride of sodium (Glauber's salt and common salt), but may also contain notable quantities of chloride and sulphate of magnesium (bittern and Epsom salts). Instances have been met by the writer in which the greater part of the alkali was made up almost entirely of these salts of magnesium, but such are not very common. White alkali is, therefore, a generic term, and is used to designate any or all of the aforementioned salts; as already remarked, it is commonly a mixture of several of them.

*Black alkali* is characterized by the presence of sodium carbonate (sal soda, washing soda), though this compound is almost always associated with one or more of the chlorides and sulphates mentioned in the preceding paragraph. Sodium carbonate is, as is well known, white, but from the fact that it acts upon and dissolves the decayed vegetable matter (humus) of the soil the incrustation is tinged dark brown or black—hence the name. Water standing in pools on soils impregnated with the carbonate is invariably of a darker colour and much resembles a strong solution of coffee.

## INJURY TO PLANTS BY ALKALI.

It follows from what has been said regarding the soluble nature of the 'alkali' salts that the soil-water on such impregnated land is a more or less concentrated solution of these compounds. It is the soil moisture which assists in the germination of

* Chemical analysis has shown that as a class the soils of arid or semi-arid regions are considerably richer in plant food than those of humid districts, and this is particularly true as respects lime and potash.

** Associated with the salts named and which must all be considered injurious to crops, are notable quantities of many compounds useful as plant food, *e.g.*, compounds of potash and phosphoric acid, and these give to the soil, freed from alkali, the high degree of fertility for which such soils are remarkable.