Absorption of Mineral Salts.—

The minerals are absorbed by the cells of epiblema. Solution from soil. Minerals are essential Component of all plant life, about 57 minerals have been detected in plants. The young roots have various growth zone - root cap, root apex, meristematic zone, elongation zone, root hair zone and maturation zone. Some physiologist suggested that the elongation zone and maturation zone of the root-apex are capable of absorbing nutrients and supply to shoot. It is also suggest that phosphate, potassium and ammonium ions are absorbed freely from all locations of roots, Calcium is absorbed from apical part of root where as Iron is absorbed from root tip.

So the process of intake of mineral nutrients from soil solution to plant through various part of roots is called mineral absorption. ~~Plant mineral absorbed by root~~ Plant absorb minerals from the soil through the root surface by two ways.

Various theories have been put forward from time to time about absorption mechanism Mechanisms of Mineral Salt absorption are categorized into two groups.

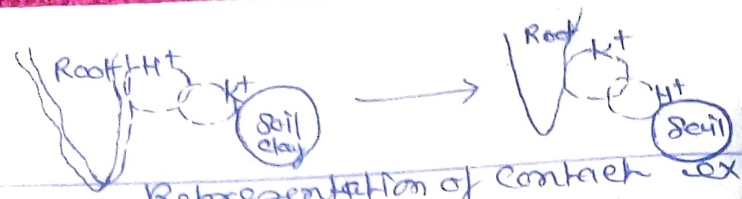
(i) Passive absorption & (ii) Active absorption.

Passive absorption — In passive absorption it is believed that the metabolic energy is not use in process of absorption. The uptake of ions by only by physical process. There are various theories proposed by physiologist

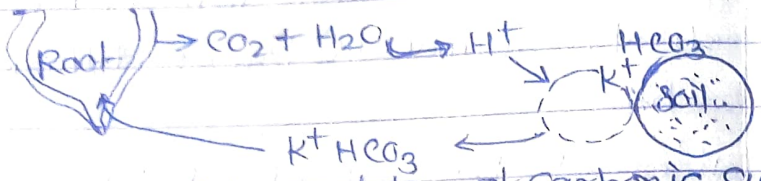
(i) By diffusion — uptake of ions (salts) takes place through the root surface which are close contact by simple diffusion due to their concentration in the soil solution is higher than plant sap, Under certain conditions the uptake is facilitated by transpiration from aerial parts of plant. The whole process is unaffected by temp. or metabolic inhibitors. It is assumed that this free diffusion of solutes follows simple law of diffusion.

Ion Exchange — Most substances in contact with water including clay particles and root surfaces assume a negative charge. Many type of cations are absorbed on the root surfaces because of the attraction between opposite charges. These cations can be exchanged for other cations present in the soil and a new cation absorbed on the root surface. Further transport of the cations inside the root cell would be a passive diffusion. In cation exchange process no ions enters or leaves the root cell, except by exchange by another ion. Example. H^+ from the root surfaces can be exchanged for mineral cations such as K^+, Na^+, NH_4^+ etc. This will result into net gain of mineral ions at expense of H^+.

Anions can also be exchanged with free OH^- in same manner but it is not very common. They can enter the cell by simple diffusion process, The process of ion exchange may be contact exchange or carbonic exchange.



Representation of contact exchange



Representation of carbonic acid exchange

Mass flow theory — (Kramer 1956)

According to this theory, ions can move through roots along with mass flow of water under the influence of transpiration. In case of tomato it is found that increased rate of transpiration increase the absorption of salts.

Donnan Equilibrium — F.G. Donnan (1927). This theory is applicable to a situation when certain non diffusible anions (such as proteins) are present on one side of a membrane Because of their molecular size proteins do not diffuse in or out of the cells through their membranes, while mineral ions can do this. Non diffusible protein ions can be termed as 'fixed' ions, when excess of protein is present on the inner side of the membrane. It will allow the inward diffusion of cations so that the two charges (cations & anions) are balanced.

Donnan formulated that the diffusion will continue until an equilibrium called Donnan equilibrium.