

## GYPSUM APPLICATION: A BOON TO AGRICULTURAL SYSTEM

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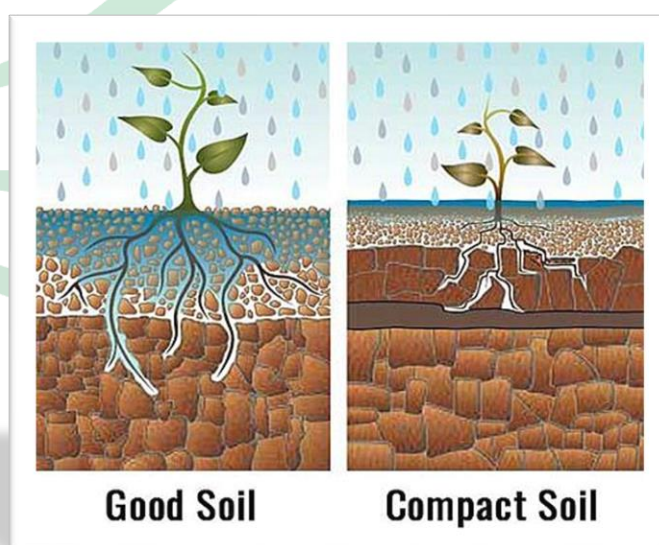
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The population pressure over the world is increasing and the thirst to produce more food is also growing simultaneously. This quest for producing more has food has burdened the soil systems which in turn have started their deterioration. Intensive cultivation practices and use of poor-quality irrigation water eventually leads to salinity and sodicity in soil unless extreme care is being taken place.



When such soil conditions are created, it is a general practice to go for usage of soil amendments which are materials applied to soil to correct its condition. One such most commonly used amendment in agricultural production is “Gypsum”.

Gypsum fertilizers are being used in agriculture from very long time and it plays a very important role in crop nutrition as it provided two very essential nutrients for plant growth *i.e.* calcium and sulphur. Later, more interesting role of sulphur drew attention *i.e.* role as soil amendment and ability to correct sodic soils (soils with higher Exchangeable Sodium



Percentage). The calcium ions present in gypsum replaces sodium ions in the clay lattice and

provides better structure to soil. Apart from this, gypsum application plays very important role in agriculture.

### **Benefits of gypsum application in agriculture:**

#### **1. Improves soil structure:**

The excess of sodium ions present in the soil causes deflocculation *i.e.* destruction of soil structure by dispersing the soil colloids. This negative effect can be neutralized by the presence of calcium ions which flocculates the soil by binding the soil aggregates together.

#### **2. Ensures proper seed germination:**

Presence of crust in the soil is one of the major issues which hinders the seed germination. Due to presence of surface crust the plumule emergence is affected and ultimately seed fails to emerge. Gypsum has got the potential to decrease and prevent the compaction of soil and ensures better germination. Due to reduced compaction, it becomes easier to go for tillage operations as well as less energy is needed in tillage operations.

#### **3. Acts as a soil reclaimant:**

Crop growth is highly affected due to presence of sodium ions in sodic soils. Sodium ions not only deflocculates the soil but also hinders with normal root activity. Calcium present in gypsum replaces the sodium ions and creates favorable environment for crop growth.

#### **4. Improves water status in soil:**

Calcium ions present in gypsum reduce the crust formation in soil as a result of which the infiltration of water increases and runoff is reduced. It increases the soil moisture status and reduces erosion. Improved water status also has favorable effect on improving water use efficiency in the soil.



#### **5. Helps in soil pH maintenance:**

When applied to sodic soils, gypsum reduces the pH and brings it close to neutral value and makes it suitable for crop cultivation. On the other hand, gypsum applied to acidic soils increases the soil pH and makes it more favorable for crop production. Hydroxyl ions in the clay lattice are replaced by sulphate ions and hydroxyl ions released into the soil solution increases the soil pH.

#### **6. Reclaims soils having magnesium toxicity:**

Calcium: Magnesium ratio plays a very important role in successful crop production. However, disturbed ratio can lead to disturbed nutrient dynamics in the soil. Gypsum application can create a much favorable ratio.

#### **7. Modifies the effect of liming in acidic soils:**

Lime application is said to ameliorate acidic soils by increasing the pH and bringing it towards neutrality. Lime applied has a limitation that it can not reach the subsoil layers. Gypsum has the ability to penetrate into deeper soil layers and modifies the pH. This improves the rooting of crop in deeper soil layers and will prove to be more beneficial for crops.

#### **8. Acts as reclaimant for high sodium water:**

Poor quality irrigation water is not suitable for irrigation purpose especially water having high SAR (Sodium Absorption Ratio). Higher sodium content in irrigation water has several disadvantages such as deflocculation, reduced permeability and infiltration because sodium ions replaces calcium and magnesium ions adsorbed on clay complexes. When such water is to be used for irrigation, soil or water should be treated with gypsum to reclaim it and this reclaimed water can be used for effective crop production.

#### **9. Aids better absorption of other nutrients:**

Calcium is an essential nutrient required by the plants, which plays an important role in uptake of other nutrients. It is an essential part of a number of biochemical reactions through which plant absorbs nutrients. It prevents the uptake of heavy metals which are dangerous for plant and human health.

**10. Acts as a quality enhancer:**

Calcium is a key nutrient that plays an important role in Gibberellic acid, Auxin and Abscisic Acid signaling to reduce fruit set, initiation of ripening, cell division, cell expansion and fruit softening. It is essentially required for development of quality fruits. Gypsum being a rich source of calcium, supplies ample amount of it to plants and thus helps in production of better-quality fruits. Further, it is applied to oilseeds also due to presence of sulphur, which is known to increase quality and quantity of oil in oilseed crops.

**11. Prevents volatilization losses:**

Under high soil pH condition, the applied nitrogen fertilizers are subjected to volatilization and they are lost in gaseous form. Calcium present in gypsum can cause volatilization in two ways: firstly, it can precipitate the carbonates and decrease the effective soil pH. Second, a complex of calcium salts can be formed with ammonium hydroxide, which prevents the loss of ammonia to the atmosphere.

**12. Acts as yield enhancer:**

Gypsum application provides subtle benefit to crops as stated above. All these factors directly or indirectly affect the crop production. When conditions for crop growth are favorable, automatically higher yield levels are recorded.

**Conclusion:**

Considering the above stated facts, we can say that gypsum which may be used as a soil amendments or fertilizer plays a very important role in improving the overall performance of agricultural systems. It works from soil improvement, crop improvement and ultimately leads to yield and quality enhancement. Therefore, focus should be given on judicious use of such materials so that better soil health and production levels can be attained.