

**Arunkumar B.R**  
Scientist (Soil Science)  
ICAR-KVK  
University of Agricultural and  
Horticultural Sciences  
Shivamogga  
Karnataka  
India – 577 225

**Corresponding Author**  
Arunkumar B. R  
arunybr011@gmail.com

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## **Glomalin: A Good Soil Aggregator**

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**Glomalin Related Soil Protein (GRSP) is an insoluble, hydrophobic, proteinaceous extended hyphae combined with soil Arbuscular mycorrhizal (AM) fungi play an important role in the soil health and quality by improving the soil fertility, plant nutrition, soil aggregation and stabled soil structure. The efficacy and concentration of GRSP in soil to form extensive strong and thick mycelia association with soil particles like sand, silt and clay is mainly depends on soil AM fungal isolate and colonies. These AM fungal and GRSP association is directly affect and influence the soil aggregates and soil structure stability by hyphen envelopment of sand, silt and clay particles. This indicates the GRSP effect in soil aggregation and stability. Selection of good isolate of AM fungus from soil ecosystem plays a significant part in improvement of soil quality, health, and land reclamation and restoration activities.**

### **INTRODUCTION**

Plant growth and development is closely related to soil quality and health. Managing the soil in agriculture with various cultural operations plays a important role in conserve and supplement the soil biomass which interns helps in good crop yields and quality. Using Arbuscular Mycorrhizal Fungi (AMF) in agriculture becomes a significant thought in low cost inputs organic farming or agriculture. Soil particles like sand, silt and clay aggregation is an complex activity in soil that is primarily depending on soil microorganisms and humus, which produce adhesive substance (glomalin) which acts as a glue or gum, that adhere soil particles together. These adhesive substances (glomalin) largely contain carbonaceous organic compounds that preserve soil microbes from dehydration. Arbuscular Mycorrhizal Fungi (AMF) that produce glue in large amounts and named as glomalin. It was first identified at USDA on hyphae of Arbuscular Mycorrhizal Fungi (AMF) by Sara F Wright (1996).

### PROPERTIES OF GLOMALIN

Glomalin is very hard and resistant to microbial decomposition and passive in nature in soil ecosystem atleast 10 to 50 years and water – resistant in nature but soluble at elevated temperatures (121°C). These characters of glomalin make soil aggregation and structure stability. Higher concentration of glomalin in soil gives more water infiltration, more permeability of air, good root and development, more soil microbial activity, resistant to soil surface crust and top soil erosion.

### ROLE OF GLOMALIN IN SOIL AGGREGATION

Arbuscular Mycorrhizal fungal hyphae can develop several inches (up to 1 to 2 inches) beyond plant root rhizosphere and able to mobilize the soil nutrients more efficiently into plant roots. In soil plants roots develop a mutual relationship with AM fungal and produce several fine roots to access the nutrients from soil. Several hyphae are produced from AM fungus during the life of the plant. Growth of AM fungal mainly takes place in active rhizosphere. These hyphae are not covered with thick epidermal outer surface, it coat with adhesive glue called glomalin produced by AM fungus to protect and keep water and nutrients to plant availability. Stability of soil structure is mainly depends on the how best soil particles are aggregated. Soil particles aggregation is a dynamic process that held together of soil organic matter, mineral and soil particles into stable aggregates. These aggregates are contain high plant nutrients and very hard and shows resistance to erosion abrasion. Hyphae is a basic building block in soil aggregation process which act as a skeleton upon which soil particles surround and held together by glomalin glues and protects them. Adhering substance like glomalin and polysaccharides produce from fungus and bacteria helps in coating and develop a protective layer. Glomalin glue is a significant biomolecule in soil aggregation and structure development and plays important role in stabilization of soil aggregates. If soil aggregates are weak and not stabilized they are more susceptible for rainfall drops and erosion. The soil nutrients and soil organic matter present in weak soil aggregates may lose in erosion abrasion. So, glomalin is a good natural stabilizing agent which helps in retention of nutrients, water and organic carbon in soil for very long period and shows resistant to microbial degradation.

### GLOMALIN FUNCTION IN SOIL

- It aggregates soil particles like sand, silt and clay.
- It strongly held the soil organic matter and minerals, nutrients and water. Act as an ideal cementing or stabilizing agent in soil aggregation.
- Shows resistant to microbial degradation.
- Reduces the water and wind erosion of surface soil.
- Water retention capacity of soil increases.
- Increase the infiltration rate.
- Enhance the nutrient cycle especially carbon, nitrogen, phosphorus and sulphur.
- Reduce the soil crusting and compaction.
- Enhance the good root growth and penetration.
- Act as a storage house of soil carbon and nitrogen.
- Mobilize the unavailable phosphorus in soil.

### GLOMALIN MANAGEMENT IN SOILS

- Practice zero tillage, natural farming, and biodynamic farming and allow AMF to develop in agriculture field during the crop growth.
- Ploughing of field damage the hyphal mass or connections that produce the cementing material called glomalin. Damaging of the hypal mass leads to reduce the development of colonies and hyphae to start the action during second or next season crop in root zone.
- Using legumes or mulch crops to enhance the AM fungus to colonize in root rhizosphere.
- In the field condition phosphorus level should be maintain in adequate quantity which helps in AM fungus to colonize rapidly.
- AM fungus will not associate in non-mycorrhizal crops roots belong to Brassicaceae (broccoli, canola, cauliflower and cabbage). In these crop grown field AM fungus colonies or spores are less in number.

### CONCLUSION

Glomalin-Related Soil Protein (GRSP) is a glue substance produced by thread like fungal hyphae, that act as a funnel or trap for soil nutrients and water to crop root system. This adhering glue substance string the sand, silt and clay particles with organic matter and mineral to make up the good soil aggregates with stabilized soil structure. It coordinates the soil-water-plant root continuum by improving soil health and quality crop production and also lock the carbon for long period in passive nature in soil, through which climate change can be mitigate by sequester the soil carbon.