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# Review: Arbuscular Mycorrhizal Fungi and Phosphorus Solubilizing Bacteria: Plausible Candidates or *Striga hermonthica* Management in Sorghum

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## Introduction & Aim

Sorghum is one of the major food grain crops in the world, especially in developing countries. In savannah regions of Africa where sorghum is one of the major staple foods, it is particularly overwhelmed by infestation by the root hemiparasite *Striga hermonthica* (Del.) Benth. (Orobanchaceae) (Harris-Shultz *et al*., 2019).

Parasitic weeds are major contributors to hunger, malnutrition and food insecurity across sub-Saharan and northern Africa by reducing crop yields. The parasitic weed of the genus *Striga*, generally termed as "witchweed", is a noxious root parasite having a broad range of hosts including many important germinaceous crops. Food production losses due to *Striga* in African countries range from 20% to 90% amounting to over 10 million tons of food annually. In Sudan, *S. hermonthica* is a common weed in most of cereals' cultivated areas extending from WadiHalfa to Kosti and from El Fasher to Kassala ( Magdoline *et al*., 2013).

Several *Striga* control methods including mechanical, biological and chemical have been developed. Biological control of weeds by using microbial agents means the utilization of microbial living organisms to manipulate, suppress, reduce or eradicate the weeds. Different microorganisms such as fungi and bacteria have a great inhibitory effect on *Striga* seeds germination and their developmental stages. Masteling *et al*. (2019) proposed several potential mechanisms by which microbes can suppress parasitic plant infection. Microbes can interfere directly with the parasite's life cycle, by either their pathogenic effect on parasite seeds or by reduction of parasite seed germination and haustorium formation.

The review aimed to discuss the effects of arbuscular mycorrhiza fungi (AMF), Phosphorus Solubilizing Bacteria (PBS) and interaction on *Striga* hermonthica management in Sorghum.

## Method: Literature Search

Data bases
Direct Sciences, Google Scholar, Web of Sciences, Springer Link
Key words
Sorghum, *Striga*, Arbuscular Mycorrhiazal Fungi, phosphorus Solubilizing Bacteria, Interaction

## Interaction AMF and PSB with Plant

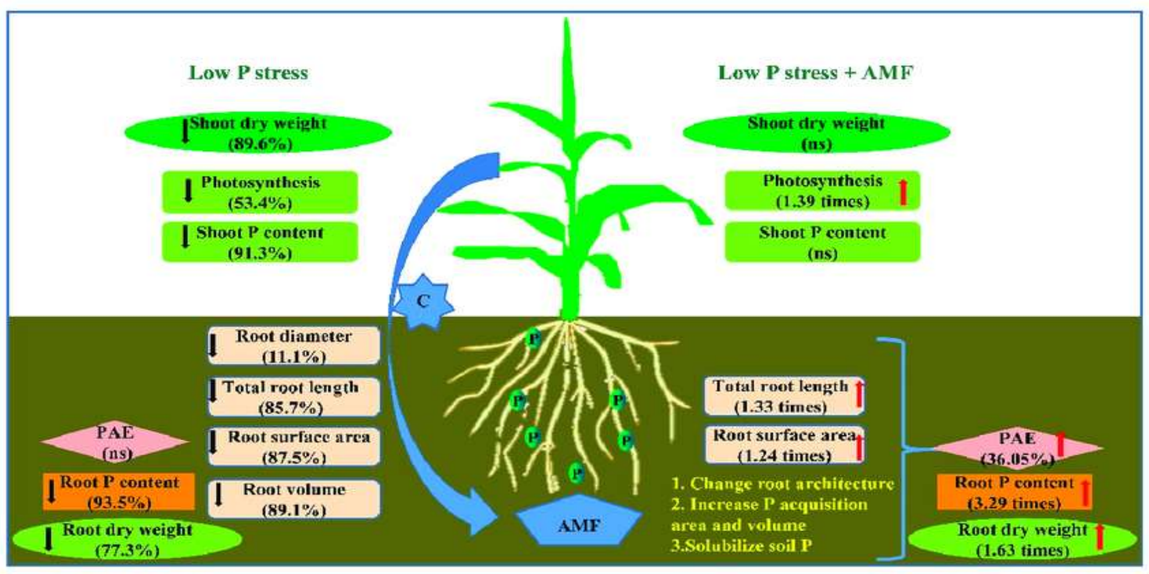


**Fig.1. The Role of Arbuscular Mycorrhizal Fungi in Improving Plant Growth (Liyan *et al*., 2022)**

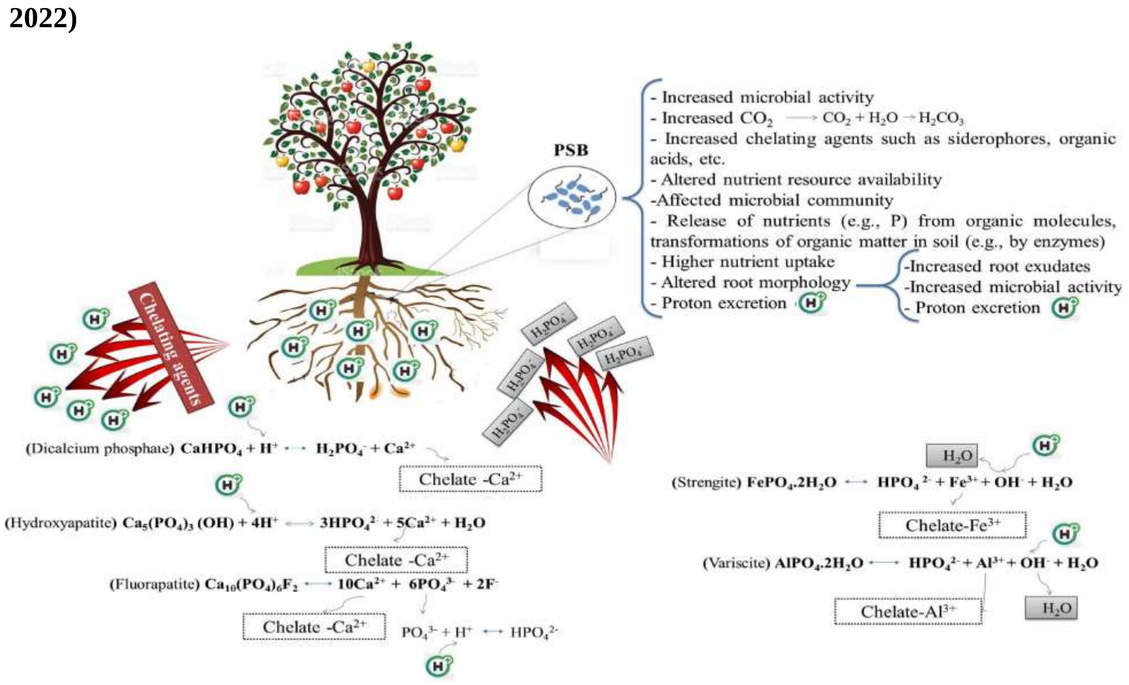


**Fig. 2. Phosphate Solubilizing Bacteria (PSB) Play To Improve Plant (Etesami *et al*., 2020)**

## Biology and Ecology of Parasite

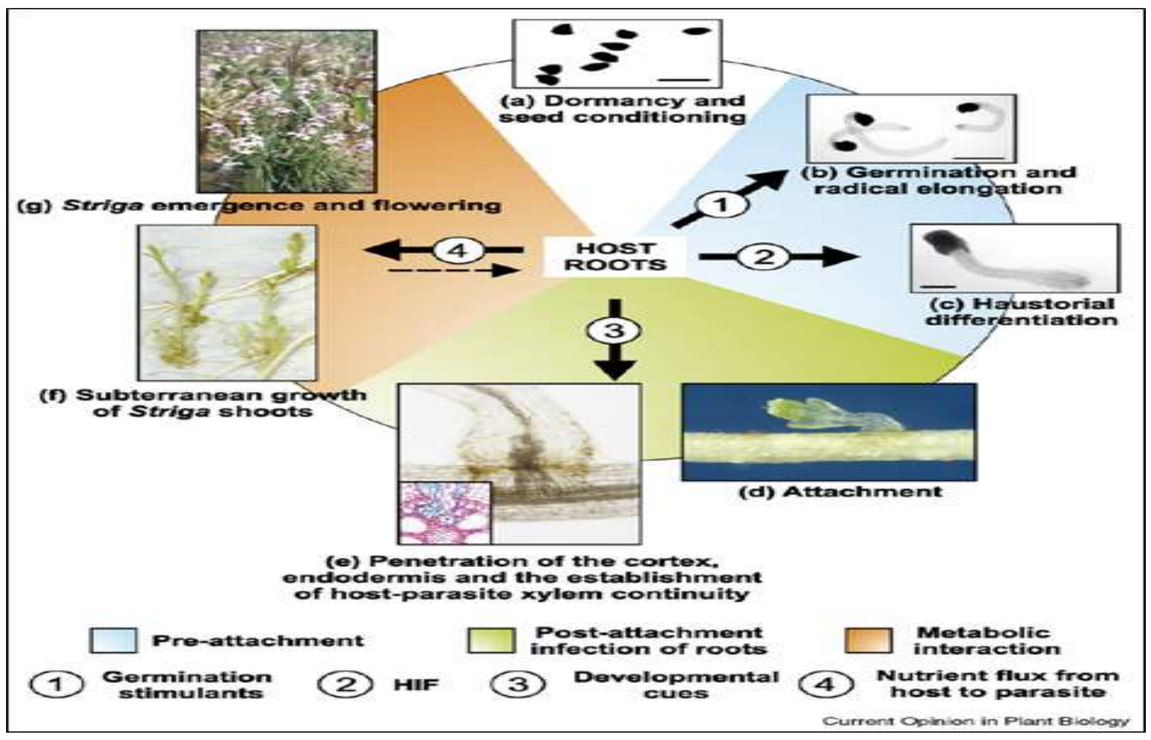


**Fig.3. Life Cycle of *Striga hermonthica* (Scholes and Press,2008)**

## Findings

Colonization by Arbuscular Mycorrhizal Fungi of Sorghum Leads to Reduced germination and Subsequent Attachment and Emergence of *Striga hermonthica*. Germination of *Striga* seeds, which is induced by root exudates, was significantly lower with exudates of AM sorghum plants (Lendzemo *et al*., 2007).

The performance of the AMF alone or in combinations with bacterial strains was significantly better than that of the bacteria alone in terms of reduction of *Striga* infestation, plant height and dry matter (Hassan *et al*., 2011).

Microorganisms such as bacterial and fungal species are more effective in controlling these biological constraints. They are used as suicidal germination, germination inhibitors and decaying seed banks, produce volatile organic compounds and challenge the viability of *Striga* seed banks. (Mamo Bekele, 2020).

The relationship between symbiotic arbuscular mycorrhizal fungi (AMF) and strigolactones (SLs) stands as an important interplay that has a significant impact on increased resistance to environmental stresses and improved nutrient uptake and the subsequent enhanced plant growth (Gökhan *et al*., 2023).

AM fungi increase the primary and secondary metabolites, as well as soluble proteins and carbohydrates, in cereals crops. AM fungi have been shown to improve plant biomass, yield, and productivity in cereal crops (Yaseen et al., 2022).

## Conclusion

The soil mycorrhizae are important for plant growth development and health. The use of mycorrhizae has great potential to protect plants from diseases through their biocontrol mechanism. This offers an alternative environment-friendly strategy by reducing the use of chemicals. The high specificity of many organisms (AM fungi and bacteria), feeding exclusively on selected hosts, in our case parasitic weeds, can be considered an advantage because these organisms may work as biocontrol agents where other weed control options have failed.

## References

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