

Effect of Thiobacillus and Mycorrhiza fungi under different levels of sulfur on yield and yield components of soybean

F.Balloe¹, M.R.Ardakani¹, F. Rejali², M.R. Ramzanpoor³, G.R.Alizade³ and F.Mohebbati¹

1 Islamic Azad University-Karaj Branch / IRAN

2 Soil And Water Research Institute / IRAN

3 Agricultural Research Center – Mazandaran / IRAN

Introduction:

Phosphorus (P) and Sulfur (S) are two necessary nutrients that increase the growth and yield of the plants. Deficit of these nutrients in the soil, usually compensate by use of chemical fertilizers and but these fertilizers have harmful effects on the environment and decrease the quality of agricultural products therefore biological fertilizers are more interested for using in agricultural ecosystems (Nadian,2005).

It is well documented that application mycorrhiza fungi caused increase water absorption and nutrients special phosphorus and transmission those to host plants cells and improve growth and photosynthesis and produce more assimilate .Also mycorrhiza has synergistic effects with most of other microorganisms that have increasing effect on yield and yield components most of crops(Lukiwatid et al., 2002; Marulanda et.al, 2003).

Thiobacillus cause increase oxidation sulfur and decrease soil pH and increase produce sulfat in soil therefore caused increase absorption some nutrients especial phosphor in soil.(Messick&Fan,1999) Use of thiobacillus and sulfur together in soil significantly positive affected in 1% level on weight of thousand seed and soybean yield because of thiobacillus increase oxidation sulfur and decrease soil pH therefore caused increase absorption some useable nutrients.(Sharma,2003)

Material and Methods:

This research has been done to assess the use of mycorrhizal symbiosis and thiobacillus bacteria as biological fertilizers and sulfur as a chemical fertilizer.Effects of three factors including mycorrhiza (without and with application – *Glomus intraradices*) ,Thiobacillus (without and with application – *Thiobacillus sp.*) and sulfur (0, 150 and 300 kg/ ha in the form of ammonia sulphate) assessed using a factorial experiment in the form of complete randomized block design with 3replications, in agriculture and natural resources researche center of Mazandaran province (Sari). Effects of 3 mentioned factors on some parameters like yield ,biomass ,weight of thousand seeds, number of sheath in plant , have been studied.

Results:

Results of parameters varince analysis indicated that mycorrhizal symbiosis affected significantly the considered qualities except yeild , but the thiobacillus bacteria only affect any yield and application 150,300 kilogeram per hectare sulfur caused increase yild,biomass , harvest indext and 300 kilogeram per hectare caused increase weight of thousand seed and , number of sheath in bush because of sulfur is necessary and useful material nutrients for plants sothat cause increase growth and yield . reciprocal effects of thiobacillus with 150, 300 kilograms per hectare sulfur maximum effects on yield and weigt of thousand seed and application 300 kilograms per hectare sulfur accompanied by thiobacillus caused increase biomass,harvest indext and number of sheath in bush because of bacteria cause oxidation sulfur and reduce soil pH around plant roots and cause increase absorption water and material nutrients increase yield and yield component.application thiobacillus

and mycorrhiza could increase all parameters because of application mycorrhiza fungi caused increase absorption water and material nutrients special phosphor and transmission those to host plants cells and progress growth and increase photosynthesis and produce assimilate and stored those and also synergistic effects bacteria caused increase weight of thousand seed, number of sheath in bush and therefore cause increase yield and application mycorrhiza and non-application sulfur cause increase all parameters. mycorrhiza accompanied by thiobacillus and mycorrhiza as non – use of sulfur , exerted most effects on above qualities .these results indicated that , although each factor has had a positive effect on growth and yeild, and other qualities reciprocal effects of those, exerted considered effects. This research indicated that mycorrhiza accompanied by thiobacillus bacteria and thiobacillus accompanied by sulfur caused improvement in yield and yield component because of having bacteria accompanied synergistic effects. so that the greatest yield 6103 kilograms per hectare related to treatment application sulfur 300 kilograms per hectare and application thiobacillus and non – application mycorrhiza.

Table 1- variance analysis yield ,biomass ,weight of thousand seeds, number of sheath in bush and harvest index

MS						
s.o.v	df	Yield(kg/ha)	biomass (kg/ha)	weight of thousand seeds(g)	number of sheath i n bush	HI
Rep	2	321952/194	843039/088	426/177	6372/924	3/744
S	2	*1243169/861	*267400/406	*502/092	*19065/861	*247/87
T	1	*1339806/250	213706/181	492/996	14440/028	*187/088
ST	2	**3919796/583	*2175672/301	*241/568	*20801/583	**257/043
M	1	132374/694	*1011163/961	*747/948	*18100	*231/432
SM	2	*638362/528	*1446522/862	*374/215	*26298/694	*250/842
TM	1	*633342/028	*1646859/015	*396/017	*20528/028	*328/066
STM	2	*6348002/528	*2405244/986	110/144	2648/694	**469/921
E		311513/250	11303353/058	316/855	7556/961	61/062
CV		11/27	9/70	9/16	19/68	11/55

n.s: not significant

*, **: significant at the 5%, 1% level of probability

References:

- 1-Lukiwataid, D.R. and R.D.M. Simanungkalit. 2002. Dry matter yield, N and P uptake of soybean with *Glomus manihotis* and *Bradyrhizobium japonicum* . 17th Word Congress of Soil Science, 14-21 August , Thailand. PP: 1190-1198.
- 2-Marulanda, A., R. Azcon, and J.M. Ruiz – Lozano. 2003. Contribution of six arbuscular mycorrhizal fungal isolates to water uptake by *Lactuca sativa* plants under drought stress. Plant Physiol. 119: 526 – 533.
- 3-Nadian,H.A.2005.Research interaction between bacteria(*Rhizobium trifolli*) and mycorrhiza fungi (*Glomus intraradices*) on growth and phosphorus absoraption and nitrogen in trifolli.9th Congress o
- 4-Messick , D.L. and M.X.Fan. 1999. The role of sulfur fertilizer in oil crop production. IFA Regional conference for Asia and The Pacific. 14 – 17 NOV. Kuala Lumpur, Malaysia f Soil Science in Iran, 32 p.
- 5- Sharma , A. K. 2003. Biofertilizers for sustainable agriculture. 407 pp. Agrobios (India).