



Exploration of indigenous arbuscular mycorrhizal fungi in saline soil

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ABSTRACT. High concentration of salt in saline soil inhibits plants to grow normally. Good management of this soil may improve this land to be more productive. Utilization of indigenous beneficial soil microorganisms such_ as arbuscular mycorrhizal fungi (AMF) isolated from saline soil has been known to be able to increase plant growth and mycorrhizal sporulation. This study aimed to explore indigenous AMF species in saline soil, in West_ Java. This research was conducted in salt impacted areas in the northern coastal area of West Java i.e. Karawang, Subang, Indramayu, and Cirebon. The method used for soil sampling is by transect with the length of ordinate point in every 500 m of the coastline. The number of AMF spores, mycorrhizal colonization, and mycorrhizal species identification were analyzed. The result showed that the number of indigenous AMF spores per 25 g soil were 109 in Karawang, 50 in Indramayu, 170 in Subang, and 100 in Cirebon. The average mycorrhizal colonization was 90 %. *Glomus* sp. and *Gigaspora* sp. were found to be dominant in those soils. This result implies that some mycorrhizal fungi can live and maybe had good adaptation in saline soil and from symbiosis activity with the plant. Therefore they are the potential to be evaluated and used to improve saline land productivity in the future.

Keywords : *Indigenous mycorrhiza, saline soil, land productivity.*

INTRODUCTION

In saline soil, has a low fertility and high concentration of salt in saline soil inhibits plant to grow. Good management of this soil may improve this land to be more productive (Bauders, Catyilis, & Waskosty, 2014)

Salinity reduces water availability for plant use. High salt levels hinder water absorption, inducing physiological drought in the plant. This is referred to as the osmotic or water-deficit effect of salinity. Plants are generally most sensitive to salinity during germination and early growth (Sonon et al., 1980)

Saline soils have contained various microbes that can counteract with osmotic stress conditions that allow plants to maintain turgor and metabolism of plant cells (Yan, Marschner, Cao, Zuo, & Qin, 2015) The existence of these microbes are capable of supporting the growth and survival of plants. But the population of beneficial microbes in saline soil is still low. Utilization of indigenous beneficial soil microorganism such as arbuscular mycorrhizal fungi (AMF) isolated from saline soil are known to be able to increase plant growth and mycorrhizal sporulation.

Soil Physico-chemical, plant community and abundance of AM fungi are known to be associated with AM fungal infectivity. But interrelationships between these mechanisms have not as yet been fully explored for saline soils (Nurbaity, 2014). This study aimed to explore indigenous AMF species in saline soil, West Java.

MATERIALS AND METHODS

The method used for soil sampling is *Transect* with the length of ordinate point in every 500 m of the coastline. This research was conducted in salt impacted areas on the northern coast of West Java: Subang, Indramayu, and Cirebon.

Sampling site: area affected by salinity on the northern coast of West Java Karawang (10 samples), Subang (3 samples), Indramayu (9 samples) and Cirebon (9 samples). Transect with the length of ordinate point in every 500 m of the coastline AMF evaluation: number of spores, percentage of root colonization, and AMF identification based on spore. The number of AMF spores, mycorrhizal colonization, and mycorrhizal species identification were analyzed.

RESULTS AND DISCUSSION

Sampling Sites

Soil samples were taken in the northern coastal area of West Java with a distance of 500 meters from the coastline. The location of soil sampling in Karawang and Cirebon is a rice field, Sampling location in Indramayu and Subang is dry land of rice planting

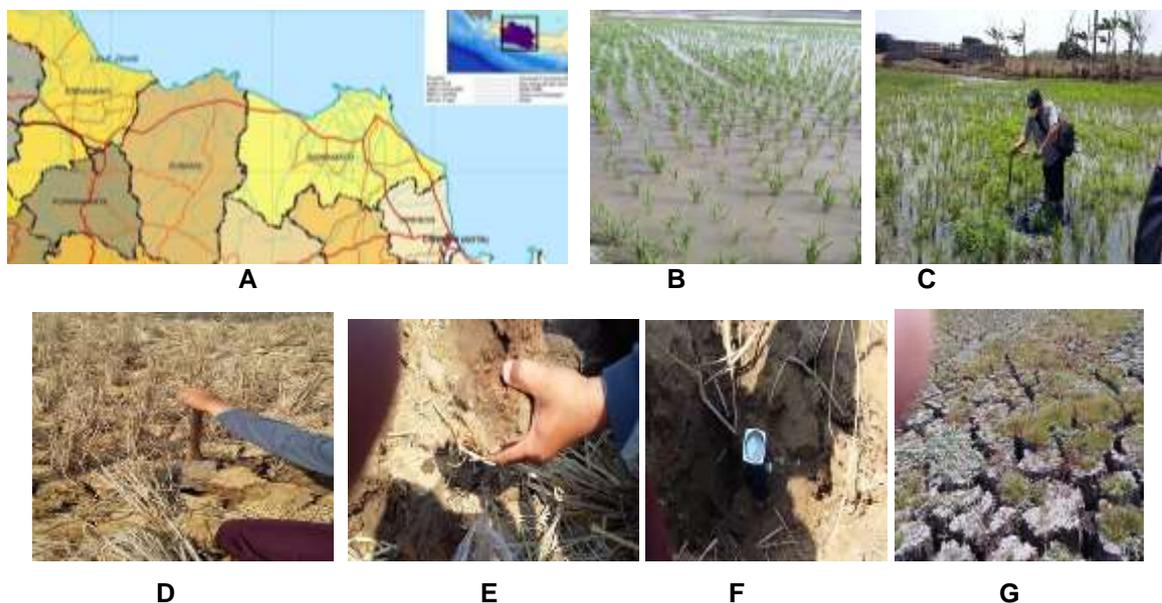


Figure 1. Map of the area of soil sampling on the coast of West Java (A), Karawang (B, C) and Cirebon (F) is the rice field. Indramayu (D, E), Subang (G) is dry land of rice planting

Number of Spore AMF

Salinity y an excess of dissolved salts in the soil is readily detected by electrical conductivity. (Grisso & Engineer, 2009) soil EC can be related to specific soil properties that affect crop yield, such as topsoil depth, pH, salt concentrations, and available water-holding capacity(Grisso & Engineer, 2009)

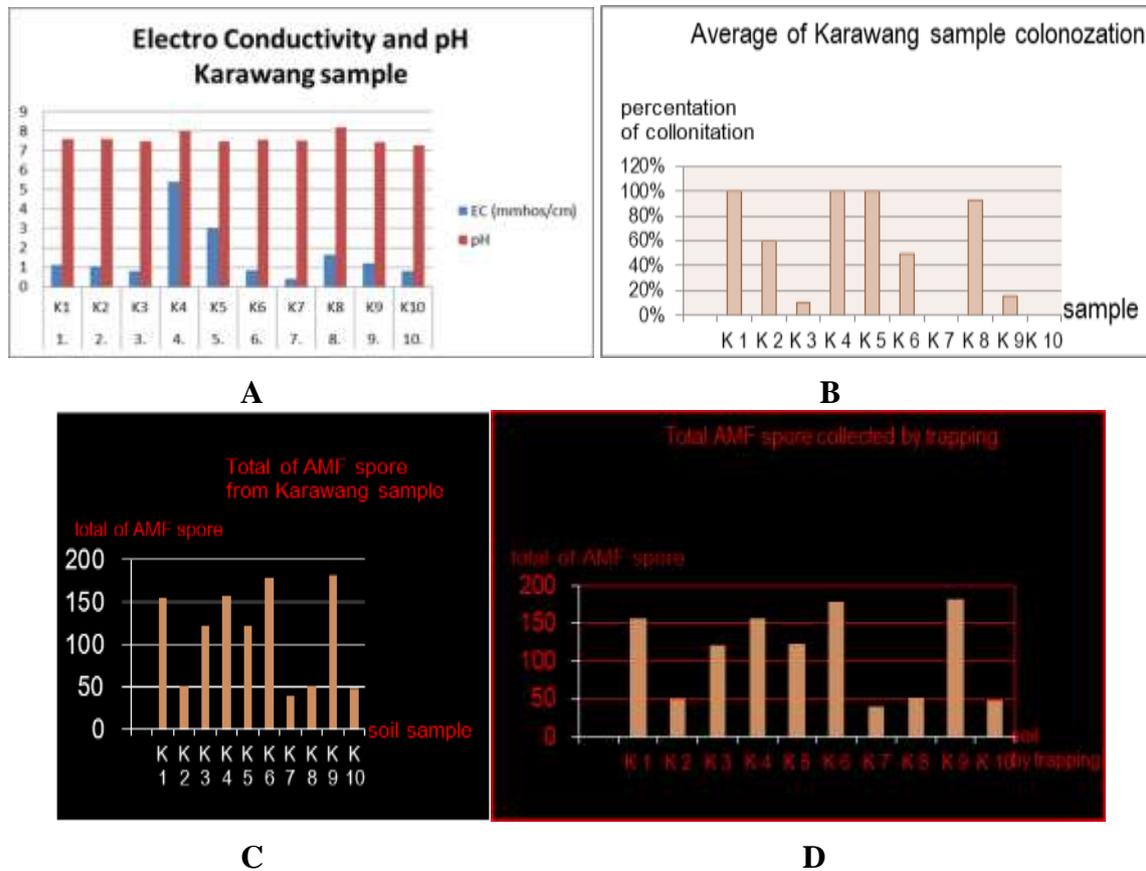


Figure 2. A. Electrical conductivity and pH soil sample B. Average of Karawang sample colonization from karawang. C. Total of AMF spore from Karawang sample D. Total AMF spores collected by trapping from Karawang

Based on the results of the analysis of the number of spores by wet screening method shows the difference coordinate point gives the different number of spores on the Soil Samples Karawang. Preliminary analysis indicates that the samples Karawang of Karawang 2 and 4 have the highest number of spores compared FMA to other samples, namely 133 spores / 25 g and 134 spores / 25 g (Figure 2)

Trapping is done on each sample Karawang to determine the performance of the AMF. . Through this trapping can demonstrate that AMF can synergize with the roots of plants that promote plant growth. The results showed AMF trapping has different levels of mutualism with plant roots.

The highest number of spores shown by Sample Karawang 9 nonsignificant the Sample of Karawang 6 namely 182 spores / 25g and 179 spores / 25g. Trapping results also show an increasing number of spores as compared to the number of spores FMA early. This result proved that there was a symbiosis between plant roots and FMA in providing nutrients and water for plants.

AMF colonization level of the roots of plant shows there differences in levels AMF colonization in the roots of plants. The samples of Karawang 1, 4 and 5 had a colonization rate of 100%.

By the number of spores AMF on trapping results, the number of spores in the sample Karawang 1, Karawang 4, and Karawang 5 lower as compared to Sample from Karawang 9 and Karawang 6. was because during the analysis they are still in the process of colonization. AMF To form spores support by unfavorable conditions. colonization Karawang sample 9 and Karawang 6 low can be caused by less favorable conditions to form a mutualistic symbiosis with plant roots. So that the sample was spore AMF dormant in water stress

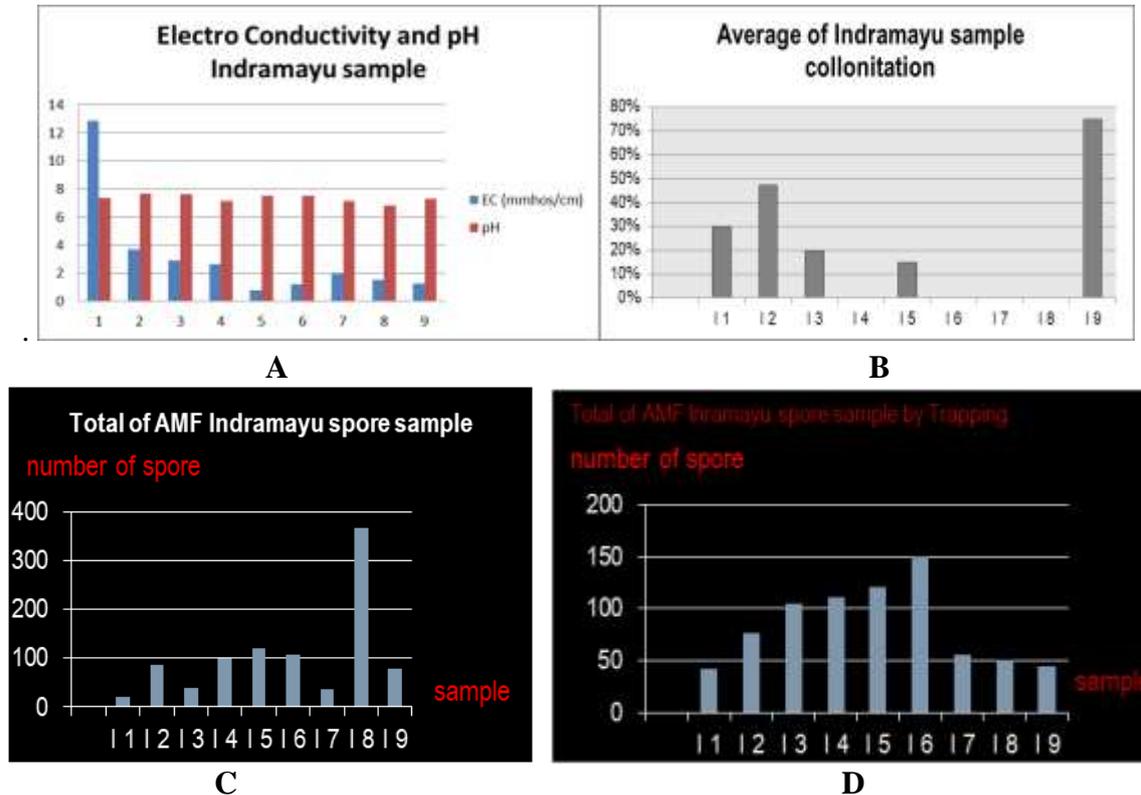


Figure 3. A. Electro Conductivity and pH Indramayu Sample B.. Average of Indramayu sample colonization C. Total of AMF Indramayu spore sample, D. Total of AMF Indramayu spore sample by Trapping

The results of the analysis of the number of the spore by wet screening method show the difference coordinate point gives a different number of spore on the soil sample of Indramayu.

Preliminary analysis indicates the sample of Indramayu 8 has the highest number of spores AMF than to other samples namely 369 spores / 25 g. Based on trapping results, Indramayu samples showed an increase in the number of spores compared to the number of spores AMF during the preliminary analysis. The results show the sample trapping Indramayu 6 gives the number of spores that are higher than the other samples namely 150 spores / 25 g.

Increasing the number of AMF spores in trapping showed that there was mutualism between plant roots and FMA. Trapping is done able to stimulate the formation of spores FMA. Colonization in Indramayu samples showed different results. The results shown by the highest colonization samples Indramayu 9 (figure 3).

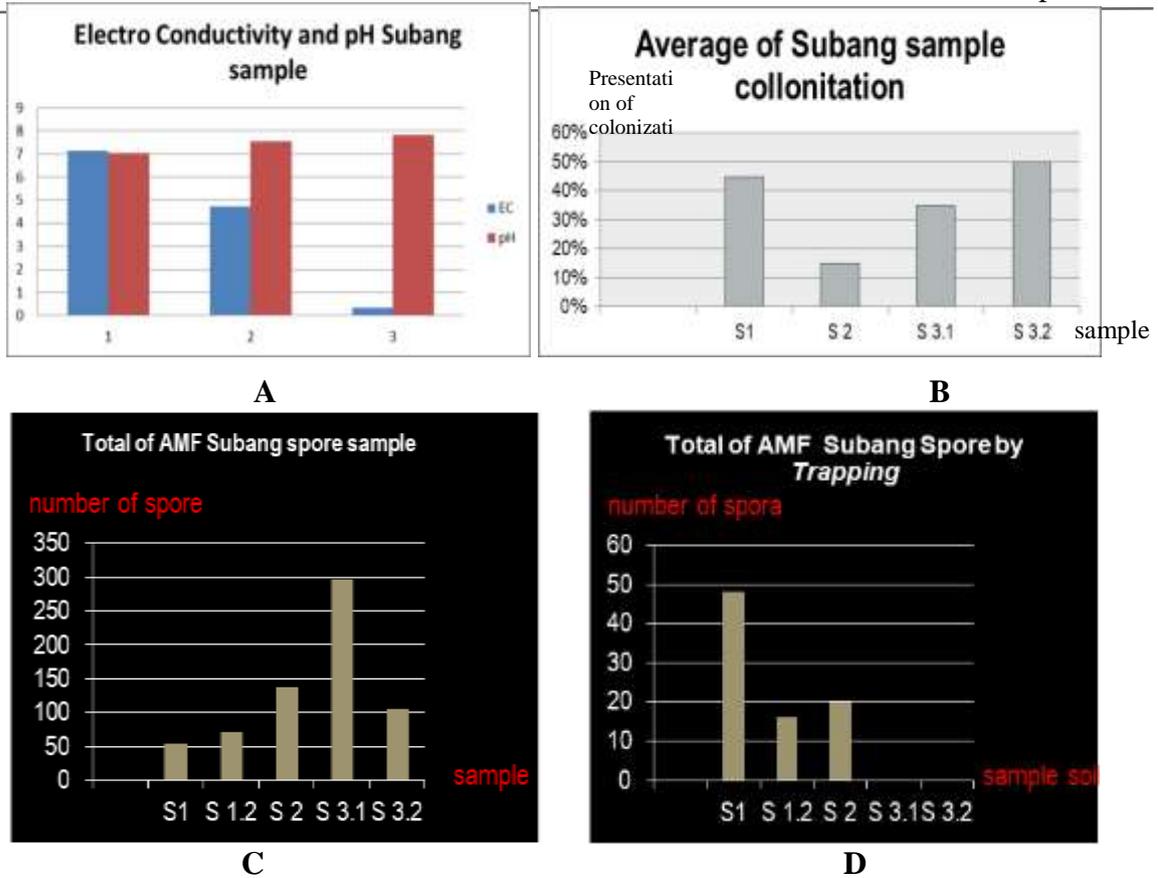


Figure 3. A. Electro conductivity and pH Subang sample, B. Average of Subang sample colonization, C. Total of AMF Subang spore sample, D. Total of AMF Subang spore sample by Trapping

Preliminary analysis showed the number of spores Subang Samples are differences in the number of spores to coordinate sampling. Trapping results showed no increase in the number of spores in the sample Subang. This is due to the physical condition of the soil is less support.

For the development of the AMF. Colonization in Subang samples showed levels of colonization. $\leq 50\%$ it shows the development of the less well AMF and the association between the AMF and roots of plants not run well.

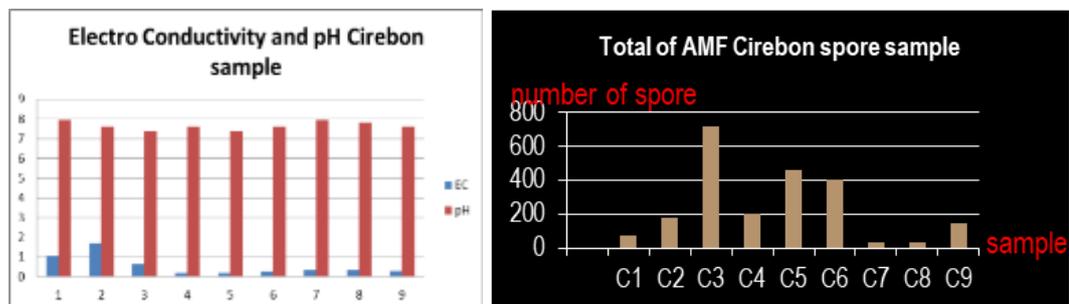


Figure 4. A. Electro Conductivity and pH Cirebon Sample B. Total of AMF Cirebon spore sample

The result of the analysis shows the number of spore sample number Cirebon AMF in the sample is higher than the other samples. The highest number of spores Cirebon AMF sample was in Example 3, which reached 716 spores / 25 g. This means Cirebon has the potential to source AMF.

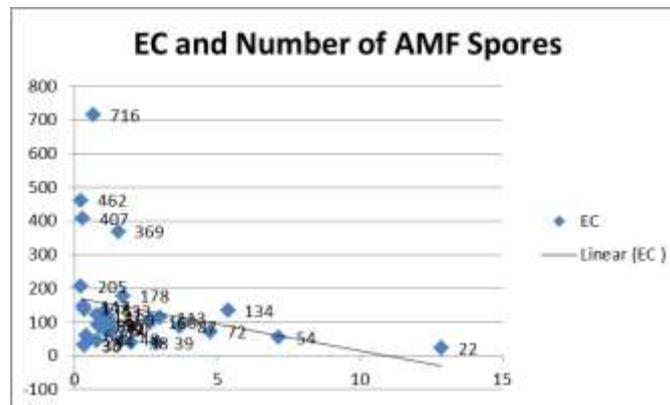


Figure 5. Average Electro conductivity and Number of AMF spore

CONCLUSION

The result showed that the number of indigenous AMF spores per 25 g soil was 109 in Karawang, 50 in Indramayu, 170 in Subang, and 100 in Cirebon. The average mycorrhizal colonization was 90 %. *Glomus* sp. and *Gigaspora* sp. were found to be dominant in those soils. The results showed that the number of original AMF spores in Karawang, Indramayu, Subang, and Cirebon was greater and was dominated by gigasporae and glomus types. This result implies that some mycorrhizal fungi can live and maybe had good adaptation in saline soil and from symbiosis with plants. Therefore they are potential to be evaluated and used to improve saline land productivity in the future.

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