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RESEARCH ARTICLE

PROVISION OF MICRORHIZA FUNGI AGAINST SALINE STRESS IN CHILI PLANTS

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Abstract

This experiment was a factorial randomized block design (RAK). The screen house used was the screen house of the experimental garden of the Faculty of Agricultural and Animal Sciences, Indonesian National Islamic University. The land was taken from the coast of Kuala Kab. Bireuen, Aceh. Soil was taken from the top soil layer with a depth of 0-25 cm. Mycorrhizae were placed in planting holes around the root area at a depth of 2-3 cm according to the treatment per plant before the seeds were planted in polybags. Then the planting hole that has been given mycorrhizae is covered again with soil. Mycorrhizal application was carried out once at the time of seed planting. Harvesting can be done by picking the fruit and its stalk. The analysis was carried out to determine the level of ability of mycorrhizal species to help plants in the absorption of P nutrients to maximize chili plant production, the effect of chili varieties had a significant effect on root infection at 45 DAP, a very significant effect on stem diameter at 15 DAP, wet root weight, number of fruit planted, dry weight. fruit, had a significant effect on plant height at 15 DAP, stem diameter at 30 DAP and fruit weight at planting, but had no significant effect on plant height at 30 and 45 DAP, stem diameter at 45 DAP, number of leaves at 15, 30 and 45 DAP, weight dry root, root wet weight, root dry weight, root length, number of productive branches 45 DAP. The results showed that the variety had a very significant effect on the growth of chili plants. The best variety was found in the Lado variety in the vegetative phase which could be seen from the variables of plant height 15 and 30 DAP, stem diameter at 15 and 30 DAP, number of leaves at 15, 30 and 45 DAP. While the generative phase of the best variety was found in the PM 999 variety which could be seen in the variables Number of fruit, fruit weight, dry weight, root wet weight and root length.

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Introduction:-

Red chili (*Capsicum annum* L.) is a horticultural plant that belongs to the Solanaceae family. Red chili has high economic and nutritional value. The nutritional content found in red chili plants such as protein, fat, carbohydrates, calcium, vitamins (A and C) makes red chili a commodity that is needed by the community for cooking ingredients (Rindani, 2015). Red chili is very popular in Indonesia because it has a delicious taste. Spicy also has good

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nutritional content. In 100 g of chili, it contains 90.9% water content, 31 calories, 1 g protein, 0.3 g fat, 7.3 g carbohydrates, 29 mg calcium, 24 mg phosphorus, 47 mg vit A and 18 mg vit C. (Sutrisni, 2016).

The decline in quality and unstable red chili production is caused by erratic weather, pests, diseases, viruses and fungi. Therefore the cultivation of red chili plants requires optimal care and appropriate environmental conditions (Suwardani et al., 2014). Mycorrhizae have a significant effect on all parameters of chili yields, namely the weight of harvested chilies, the number of harvested fruits, the dry weight of the plant, and the wet weight of the roots (Yusuf et al. 2017).

Mycorrhizae are fungi (fungi) in symbiosis with plants. Usually this symbiosis is located in the root system of plants. There are also fungi that have symbiosis with other fungi, but the term mycorrhizal is usually indicated for fungi that carry out symbiosis with plants. Giving mycorrhizae to plants can increase the ability of plants to take up P that is not available from the root area of the plant so as to help fruit formation (Rengganis et al, 2014).

Materials and Method:-

The research was conducted at the Experimental Garden, Plant Disease Laboratory and Soil Biology Laboratory, Faculty of Agriculture, Universitas Islam Kebangsaan Indonesia, Bireuen, Aceh. This research was conducted in Mei to November 2021. The seeds used in this study were varieties of Perintis varieties, PM 999 and Lado. Mycorrhiza used in this study were mycorrhiza of *Glomus* sp, *Acaulusporasp* and mixtures. The design used in this experiment was a 4 × 3 Factorial Randomized Block Design with 3 replications, it had 12 treatment combinations consisting of two treatment factors, namely the first factor type of mycorrhiza and the second factor chili varieties. Data was analized using Microsoft Office Excel 2019 applications. The soil was taken from kuala Village, Syiah Kuala Banda Aceh. The soil is taken from the top soil layer with a depth of 0-25 cm. Then the soil is sifted using a 2 mm sieve. The media stirred until it homogen. Each polybag was given mycorrhiza according to their respective types and controls (without of mycorrhiza addition). Mycorrhiza were placed in planting holes around the root area at a depth of 2-3 cm according to the treatment per plant before the seeds were planted in polybags. Then the planting holes that have been given mycorrhiza were covered again with soil. The application of mycorrhiza was done once during seed planting. In the experimental polybag prepared and given the treatment of mycorrhiza a planting hole of 2-3 cm deep was made. Each planting hole was planted with 2 seed of chili. Then the planting hole was covered with soil and watered until the field capacity. One plant was selected and then transferred to a 15kg polybag and maintained until harvesting time. Each unit of experimental unit consists of 3 experimental unit polybags Maintenance activities carried out include watering, replanting, pest and disease control. Watering was done every day in the morning and evening. Watering was carried out by using spout until the field capacity. Pest and disease control is carried out by spraying active compound and deltamethrin fungicides when plants were attacked by pests and fungi with a concentration of 2 ml / 1 water.

Result and Discussion:-

Result

Effect of varieties on growth and yield of chili plants on saline soil

The results of the F test on analysis of variance showed that the influence of chili varieties had a very significant effect on wet root weight 110 DAP but not significant effect on 110 DAP dry weight, root wet weight 110 DAP, root dry weight 110 DAP, root length 110 DAP, number of productive branches. 45 DAP,

Table 1:- Average number of productive branches aged 45 DAP in various treatments of chili varieties.

Chili varieties	Number of productive branches plant
	45 DAP
Perintis	7,45
PM 999	8,45
Lado	7,93

Table 2:- Average wet weight of 110 DAP in various varietal treatments.

Chili varieties	Wet weight plant (g)
	110 DAP
Perintis	13,85 a
PM 999	25,89 b

Lado	24,69 b
BNJ 0,05	2,14

Table 3:- The average dry weight of 110 DAP in various varietal treatments.

Chili varieties	Dry weight plant (g)
	110 DAP
Perintis	4,38
PM 999	6,71
Lado	6,98

Table 4:- Average wet weight of roots aged 110 DAP in various treatments of chili varieties.

Chili varieties	Wet weight of roots plant (g)
	110 DAP
Perintis	1,05
PM 999	1,53
Lado	1,51

Table 5:- Average dry weight of roots aged 110 DAP on various varietal treatments.

Chili varieties	Root dry weight plant (g)
	110 DAP
Perintis	0,46
PM 999	0,50
Lado	0,52

Table 6:- Average root length at 110 DAP on various varietal treatments.

Chili varieties	root length plant
	110DAP
Perintis	12,80
PM 999	19,40
Lado	17,45

Effect of mycorrhizal species on growth and yield of chili plants on saline soil

The results of the F test on analysis of variance showed that the mycorrhizal type had no significant effect on height, number of productive branches 45 DAP, fruit weight of plant 110 DAP, dry weight of plant roots 110 DAP, dry weight of plant roots 110 DAP, wet weight of plant roots 110 DAP. Planting 110 DAP, Plant root length 110 DAP.

Table 7:- Average number of productive branches aged 45 DAP in various types of mycorrhizal treatments.

Mycorrhizal species (10 g/plant)	Number of productive branches
Control	5,55
Glomus	6,11
<i>Acauluspora</i>	7,00
Mixed	8,64

Table 8:- Average wet weight of 110 DAP age in various types of mycorrhizal treatment.

Mycorrhizal species (10 g/plant)	Wet weight plant (g)
Control	20,90
Glomus	27,27
<i>Acauluspora</i>	21,15
Mixed	21,91

Table 9:- Average dry weight of 110 DAP age in various types of mycorrhizal treatments.

Mycorrhizal species (10 g/plant)	dry weight plant (g)
Control	4,96
Glomus	7,18

<i>Acauluspora</i>	5,94
Mixed	5,74

Table 10:- The average wet weight of roots aged 110 DAP on various types of mycorrhizal treatments.

Mycorrhizal species (10 g/plant)	Wet weight of roots plant (g)
Control	1,25
Glomus	2,00
<i>Acauluspora</i>	1,12
Mixed	1,09

Table 11:- Average dry weight of roots aged 110 DAP on various types of mycorrhizal Treatments.

Mycorrhizal species (10 g/plant)	Root dry weight (g)
Control	0,64
Glomus	0,85
<i>Acauluspora</i>	0,61
Mixed	0,54

Table 12:- Average root length of 110 DAP on Various Mycorrhizal Types Treatments.

Mycorrhizal species (10 g/plant)	Root length(cm)
Control	17,22
Glomus	22,38
<i>Acauluspora</i>	17,54
Mixed	17,04

Discussion:-**Effect of variety on growth and yield of chili plants on saline soil**

The results showed that the variety had a very significant effect on the growth of chili plants. The best variety was found in the Lado variety in the vegetative phase which could be seen from the variables of plant height 15 and 30 DAP, stem diameter at 15 and 30 DAP, number of leaves at 15, 30 and 45 DAP. While the generative phase of the best variety was found in the PM 999 variety which could be seen in the variables Number of fruit, fruit weight, dry weight, root wet weight and root length.

During the growth period, the best plant growth quality was found in the Lado variety. This shows that local varieties of Lado species are able to compete with other varieties. This is evidenced by several parameters on the growth of the Lado variety competing with the PM 999 variety with a small difference in numbers. While the results of PM 999 were superior to Lado, this was also in line with the results of the study (Maulana, 2020) which showed that varieties had a very significant effect on stem diameter 15 Days After Planting (DAP), significantly affected plant height 15 DAP and diameter stems at 30 DAP from these parameters, the difference in varieties affected the differences in varieties.

Effect Of Mycorrhizal Species On Growth And Yield Of Chili Plants On Saline Soil

The results of the research showed that mycorrhizal species had a significant effect on the number of fruits, stem diameter at 30 DAP, but no significant effect on chili plant height at 15, 30 and 45 DAP, stem diameter at 15 and 45 DAP, number of leaves planted at the age of 15 and 45 DAP. ages 15, 30 and 45 DAP. The best growth and yield of chili was found in the mycorrhizal species *Glomus moseae* 10 g/plant.

This indicated that the height of chili plants at the age of 15 and 30 DAP tended to be higher in the *glomus* mycorrhizal species which were significantly different from other types of mycorrhizae. At the age of 45 DAP, the mycorrhizal types that tended to be better were found in the *Acauluspora* species.

Mycorrhizal fungi are a form of association between fungi and roots of higher plants, where mycorrhizal fungi infect plant roots and then help absorb nutrients from the soil for plant growth and development (Ramadhan, et al.; 2015). This is in line with Ronco et al., (2018) which states that Horticulture is the best field for the use of AMF for nurseries. There are two main benefits of introducing mycorrhiza fungi to horticulture plants, which are stronger growth in nurseries and improved performance after planting in the field. Chili (*Capsicum annum* L.) is one of the

most common plants produced in nurseries, and one of the most important in Argentina's horticultural region.. Uptake of nutrients through mass flow, high P uptake is also due to fungal hyphae also secreting the enzyme phosphatase which able to release P from specific bonds, making it available to plants (Parawansa, et al; 2014). Mycorrhizae as biological agents can also act as natural enemies of harmful fungi such as Ralstonia and Fusarium which cause bacterial wilt in horticultural plants (Aulia, et al; 2016).

Conclusion:-

Varieties had a very significant effect on the wet weight of 110 DAP, the best chili plant growth was found in the Lado variety and the best chili yields were found in the PM 999 variety.

Mycorrhizal type had no significant effect on all observed parameters. The best growth and yield of chili plants was found in the mycorrhizal species *Glomus Moseae*.

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