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INTERNATIONAL JOURNAL OF INNOVATIVE SCIENCE AND RESEARCH TECHNOLOGY

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The Effect of Plant Density at the Maize-Soybean Intercropping Pattern Inoculated With Mycorrhizae and Organic Fertilizer to the Growth and Yield in Dry Land North Lombok, Indonesia

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Abstract:- To avoid the risk of crop failure in a dry land, which is poor in organic matter and at the same time can increase the yield of maize and soybeans, intercropping cultivation techniques and the provision of organic materials are needed. This research aimed to determine the effect of plant density on the intercropping pattern of maize soybean inoculated with mycorrhizae and the addition of organic fertilizers to the growth and yield of maize soybean in dryland North Lombok. This research was conducted at Akar-Akar village in Bayan district of North Lombok. The experimental design with Randomized Block Design (RBD) with three blocks and five treatments intercropping patterns, i.e., P1 = 2 rows of corn: 2 rows of soybeans, P2 = 3 rows of corn: 2 rows of soybeans, P3 = 3 rows of corn: 3 rows of soybeans, P4 = 4 rows of corn: 2 rows of soybeans, P5 = 4 rows of corn: 3 rows of soybeans. Data were analyzed using two-way analysis of variance (ANOVA) and Tukey's HSD (Honestly Significant Difference) means-tested at a 5% level of significance. The results showed that the intercropping density of 3 maize rows: 3 rows of soybean show the best growth and yield. Growth and yields on intercropping plant density treatment of 3 rows of maize : 3 rows of soybeans gave the highest yields on the wet and dry weight of maize cobs and soybean pods per plant, as well as the wet and dry weight of biomass, maize cobs and soybean pods per plot with the best results if compared to the density of other intercropping plants. The intercropping density of 3 maize rows: 3 rows of soybeans can also increase the number of spores and the percentage of mycorrhizae infections compared to other intercropping treatments.

Keywords:- *Plant density, intercropping, mycorrhizae, dry land.*

I. INTRODUCTION

Demand for soybeans and maize tends to increase every year. Maize consumption in 2009, 2010 and 2011 was 17.989 million tons, 20.06 million tons and 20.550 million tons. Soybean consumption in 2009, 2010 and 2011 was 2.013 million tons, 2.353 million tons and 2.489 million tons, respectively. Maize production in 2011 was 17.664 million tons, and soybean was 851.286 thousand tons (BPS, 2015). Based on these figures, it can be seen that domestic consumption needs to be imported. To increase the production of maize and soybeans in meeting the need for maize and soybeans can be overcome by alternative diversification, as well as intercropping techniques and providing organic materials (Sudantha and Astiko, 2020).

Intercropping is a planting system by planting two or more plants at the same time and place. Some of the advantages of intercropping systems are having economic value, higher yields than monoculture, reducing the risk of crop failure, cutting off crop pest cycles, crop yields and increasing the efficiency of planting space (Hirpa, 2004; Prahasta, 2009).

Also, plant density will affect the effectiveness of nutrient absorption by plants. The higher the density of plants, the more plant population per unit area, so that nutrient competition between plants is tighter. As a result, plant growth will be disrupted, and crop production will decline (Pangli, 2016 and Yang et al., 2017).

Expansion of the planting area or extensification can be carried out in dryland cultivation, for example, by planting intercropping maize and soybeans. Dryland is a potential marginal land to be developed in the province of Nusa Tenggara Barat (NTB). The dry land area in NTB reaches 84% or 1.8 million hectares from the existing land area of 2,015,000 ha (BPNTB, 2003). Despite this, the use of dry land still experiences many obstacles. However, the effect of plant density on soybean maize intercropping patterns on growth and yield has not been widely revealed. Therefore, this research shows the Effect Of Plant Density On The Maize-Soybean Intercropping Pattern Inoculated With Mycorrhizae And Organic Fertilizer To The Growth And Yield In Dry Land North Lombok.

II. MATERIALS & METHODS

- *Time and Place of Experiment*

This research will be carried out from March to June 2019, which is located in Akar-Akar village in Bayan district of North Lombok. Observation of mycorrhizae and soil nutrient status was carried out at the Soil Microbiology

ISSN No:-2456-2165

and Chemistry Laboratory, Faculty of Agriculture, University of Mataram.

➢ *Experimental design*

The experimental design used was Randomized Block Design (RBD) with the treatment of 5 intercropping patterns, namely: P1 = 2 rows of maize: 2 rows of soybeans, P2 = 3 rows of maize: 2 rows of soybeans, P3 = 3 rows of maize: 3 rows of soybeans, P4 = 4 rows of maize: 2 rows of soybeans, P5 = 4 rows of maize: 3 rows of soybeans. Each treatment three times so that as many as 15 experimental plots were obtained.

➢ *Inoculum MA Indigenous*

MA indigenous inoculum, which will be used in this experiment, is the result of a private collection named M_{AA01} mycorrhizae isolate, which is the best collection of indigenous mycorrhizal isolates from North Lombok (Collection Dr. Ir. Wahyu Astiko MP).

➢ *Planting*

Planting maize and soybean seeds are done by planting, following the maize-soybean intercropping treatment pattern. Each hole is filled with two maize seeds and two soybean seeds with a spacing of maize, which is 60 cm x 40 cm, while the distance of soybean planting is 30 cm x 20 cm. Replanting is done by replanting maize and soybean seeds at the age of 7 days after sowing (das) to replace dead plants or grow abnormally. After the plants grow, thinning is done by leaving one plant that is done at the age of 14 das.

➢ *Fertilization*

Fertilization using organic fertilizer is done by giving a dose of 15 tons/ha or equivalent to 360 g/hole for maize plants and as much as 180 g/hole for soybean plants. Inorganic fertilizer is given as much as 180 kg/ha Urea and 120 kg/ha Phonska for maize plants, while for soybean plants 120 kg/ha Urea and 60 kg/ha Phonska. The first fertilization of maize was carried out at 7 das with a dose of 60 kg/ha Urea and 60 kg/ha Phonska. The second Urea and Phonska fertilizer were given at 21 das at a dose of 60 kg/ha, and the third fertilization was carried at 60 kg/ha Urea at 28 das. The first soybean fertilization is done by giving 40 kg/ha of Urea and 20 kg/ha Phonska and the age of 7 das remaining doses of 80 kg/ha of Urea and 40 kg/ha of Phonska is given at the age of 28 das.

➢ *Plant Protection*

Plant protection is carried out with Azadirachtin plant pesticides from “nimba" trees with the trade name OrgaNeem with a concentration of 5 ml/liter of water with a spraying interval once every seven days.

➢ *Observation of Parameters*

The parameters of this research are plant height, number of leaves, wet and dry weight of root and shoot (g), the weight of cob and dry pods per plant (g), length of cob and pod (cm), the diameter of cob and pod (cm), the weight of seed per plot (kg), weight of 1000 grains of maize and soybean (g), number of mycorrhizal spores, and percentage of infection in roots (%).

➢ *Data Analysis*

Data were analyzed using two-way analysis of variance (ANOVA) and Tukey's HSD (Honestly Significant Difference) means-tested at a 5% level of significance.

III. RESULTS AND DISCUSSION

➢ *Maize and Soybean Growth*

Data in Table 1 shows the density treatment of 3 rows of maize: 3 rows of soybean (P3) if one row of maize is added to 4 rows of maize: 3 rows of soybeans (P5) there is a decrease in plant height in maize starting at 42 das, 56 das, 70 das and 84 das respectively 11.42%, 3.19%, 5.09%, and 5.41% and for soybean plants respectively 41.72%, 12.79%, 14.13%, and 15, respectively. 88%.

Treatment	Plant height							
	42 das		56 das		70 das		84 das	
	Maize	Soybean	Maize	Soybean	Maize	Soybean	Maize	Soybean
P1 (2M : 2S)	51.79^{b}	39.22^{b}	145.55^{b}	44.11^{c}	164.22^{bc}	49.88^{c}	165.89^{ab}	61.67^{bc}
P2 (3M : 2 S)	52.43^{b}	39.88^{b}	151.77^{ab}	50.22^{bc}	161.94^{c}	66.00^{b}	166.33^{ab}	66.66^{ab}
P3 (3M : 3 S)	61.94^{a}	52.44^{a}	161.66^{a}	63.66^{a}	173.33^{a}	76.22^{a}	176.22^{a}	78.22^{a}
P4 (4M : 2S)	52.82^{b}	40.66^{b}	152.22^{ab}	47.99^{d}	165.00^{ab}	56.00a^{b}	171.44^{ab}	68.88^{b}
P5 (4M : 3S)	55.59^{b}	37.00^{b}	156.66^{ab}	56.44^{ab}	165.88^{ab}	66.78^{ab}	167.16^{bc}	67.50^{b}
HSD 5%	2.49	5.06	8.21	6.57	16.57	6.96	5.21	3.54

Table 1:- Plant height on several cropping density patterns of soybean maize intercrops (Figures followed by the same letters in the same column show results not significantly different according to HSD test 5%)

This fact shows the growth of plant height if three rows of corn are changed to 4 rows of corn can reduce plant height. This fact indicates that the regulation of plant density between maize rows in intercropping systems with soybeans can increase the growth and yield of both plants (Sitompul and Guritmo, 1995). Allegedly plant density of 3 rows of corn: 3 rows of soybeans make better use of nutrients, water and light, thus stimulating plant height growth (Mao et al., 2012).

In Table 2, the development of the number of leaves from 42 days to 84 days in the plant density of 3 rows of maize: 3 rows of soybeans (P3) is the highest and generally significantly different from other treatments.

Treatment	Number of leaves							
	42 das		56 das		70 das		84 das	
	Maize	Soybean	Maize	Soybean	Maize	Soybean	Maize	Soybean
P1 (2M : 2S)	7.65^{c}	19.78^{b}	12.11^{b}	38.11^{ab}	11.66^{d}	45.66^{bc}	11.66^{b}	164.22^{bc}
P2 (3M : 2 S)	8.11^{bc}	21.59^{b}	12.44^{ab}	34.33^{b}	12.22^{d}	53.00^{ab}	12.33^{b}	161.94^{c}
P3 (3M : 3 S)	9.55^{a}	29.29^{a}	13.55^{a}	43.11^{a}	15.55^{a}	56.22^{a}	13.00^{a}	176.22^{a}
P4 (4M : 2S)	8.83^{ab}	21.84^{ab}	12.44^{ab}	34.22^{b}	13.77^{bc}	46.11^{bc}	11.66^{b}	171.44^{ab}
P5 (4M : 3S)	8.86^{b}	21.38^{b}	12.55^{ab}	37.22^{ab}	14.89^{ab}	50.66^{abc}	11.66^{b}	167.16^{bc}
HSD 5%	0.48	3.00	0.76	3.96	0.93	4.77	1.13	4.17

Table 2: -The average development number of leaves in the density of maize and soybean intercropping plants (numbers followed by the same letters in the same column show results not significantly different according to HSD test 5%)

See the data in Table 2 if 3 rows of maize : 3 rows of soybeans (P3) added to 4 rows of maize (P5) there was a decrease in the number of leaves in maize plants from 42 days to 84 days respectively by 7.78 %, 7.96%, 4.43%, and 11.49%, while the soybean crops were 36.99%, 13.13%, 10.97%, and 5.9%, respectively.

Facts about the development of the number of leaves in 3 rows of corn: 3 rows of high soybeans are thought to be caused by plant density 3 rows of corn: 3 rows of soybeans can trigger the development of the number of leaves. High leaf growth is caused by the photosynthesis process that goes well, causing plant growth also to be good, so that it can trigger the development of a better number of leaves (Sasaki, et al, 2016).

➢ *Wet and Dry Biomass Weight*

As seen in Table 3, the weight of maize root biomass at 40 days after planting and the following day, if maize rows were added to 4 lines, there was a decrease in the weight of wet root biomass by 22.52% and 433.51%, while for the wet biomass shoot weight of maize plants there was a decrease of 9, 55% and 320.28%. As for soybean plants, the weight reduction of wet root biomass was 14.61% and 153.73%, while for the wet biomass shoots, the soybean crop weight decreased by 24.13% and 88.55%.

Treatment	Maize				Soybean			
	Root		Shoot		Root		Shoot	
	40 das (g/plant)	92 das (g/plant)	40 das (g/plant)	92 das (g/plant)	40 das (g/plant)	92 das (g/plant)	40 das (g/plant)	92 das (g/plant)
Wet biomass weight								
P1(2M : 2S)	35.17^{c}	136.10^{b}	273.30^{c}	249.26^{c}	0.66^{bc}	0.79^{b}	11.47^{ab}	15.25^{cd}
P2(3M : 2S)	30.56^{d}	63.23^{c}	220.00^{d}	166.32^{d}	0.96^{ab}	1.55^{b}	10.70^{b}	11.90^{de}
P3(3M : 3S)	49.22^{a}	191.88^{a}	310.69^{a}	624.63^{a}	1.49^{a}	3.40^{a}	18.62^{a}	36.24^{a}
P4(4M : 2S)	47.94^{a}	89.73^{c}	292.00^{b}	369.83^{b}	1.21^{ab}	1.09^{b}	14.51^{ab}	20.44^{b}
P5(4M : 3S)	40.17^{b}	35.80^{d}	283.58^{bc}	148.62^{d}	1.30^{ab}	1.34^{b}	15.00^{ab}	19.22^{c}
HSD 5%	1.79	12.39	7.46	29.25	0.22	0.65	3.63	3.32
Dry biomass weight								
P1(2M : 2S)	16.60^{a}	46.67^{b}	31.64^{c}	117.41^{c}	0.38^{ab}	0.59^{ab}	2.19^{b}	6.60^{bc}
P2(3M : 2S)	11.82^{b}	41.82^{b}	47.46^{b}	136.71^{c}	0.31^{ab}	0.94^{ab}	3.21^{ab}	4.59^{bc}
P3(3M : 3S)	17.45^{a}	56.26^{a}	88.93^{a}	381.19^{a}	0.54^{a}	1.81^{a}	3.88^{a}	12.26^{a}
P4(4M : 2S)	15.50^{a}	26.06^{b}	56.76^{b}	250.07^{b}	0.39^{ab}	1.16^{ab}	3.62^{ab}	7.20^{bc}
P5(4M : 3S)	12.35^{b}	12.50^{c}	47.68^{b}	68.97^{c}	0.37^{ab}	0.75^{ab}	1.73^{c}	8.82^{ab}
HSD 5%	1.66	5.29	7.18	14.47	0.11	0.69	0.38	2.49

Table 3: - Average Root Weights and Shoot Plants at 40 das and 92 das Various Treatment of Intercropping Patterns (numbers followed by the same letters in the same column show the results are not significantly different according to the HSD test 5%)

ISSN No:-2456-2165

If 3 rows of maize are added to 4 rows of maize, there will be a decrease in the dry root biomass weight of maize plants by 41.29% and 350.8% while for the dry biomass shoots of maize plants by 86.51% and 452.68%. As for soybean plants, the decrease in dry root biomass weight was 45.94% and 141.33%, and in the shoot, dry biomass weight was 124.27% and 39%. There is a decrease in the treatment of plant density if added to 4 rows of maize because there is an unbalanced crop density so that it can trigger competition between plants.

This fact that maize plants are included in C4 plants, which are photosynthetic plants, which are more effective at higher light intensities. Also, maize is classified as a C4 plant. It can adapt well to the limiting factors of growth and production because the more effective photosynthesis, the higher the amount of energy available and will increase the amount of photosynthesis to the optimum (Yamori et al., 2014). This photosynthesis will later be transferred to the maize planting organs to make the biomass weight of maize high (Edmaedes, 1979).

In Table 4 the weight of crop stover, the weight of maize cobs and soybean pods harvested per plot, and weight of maize cobs and crop pods at 92 days after harvest in intercropping density 3 rows of maize: 3 rows of soybeans are the highest both in maize and soybeans and significantly different from other treatments.

Treatment	Maize			Soybean		
	BW (kg/plot)	CW (g/plant)	CWp (kg/plot)	BW (kg/plot)	WP (g/plant)	WPp (kg/plot)
Wet weight						
P1(2M : 2S)	20.67^{c}	195.49^{c}	31.68^{b}	2.66^{c}	33.43^{d}	3.79^{ab}
P2(3M : 2S)	19.10^{d}	163.83^{d}	22.23^{e}	3.90^{b}	30.57^{e}	4.54^{ab}
P3(3M : 3S)	26.78^{a}	295.38^{a}	34.57^{a}	5.92^{a}	47.83^{a}	9.31^{a}
P4(4M : 2S)	22.70^{b}	227.09^{b}	28.28^{c}	1.20^{e}	42.78^{b}	4.56^{ab}
P5(4M : 3S)	25.95^{ab}	143.04^{d}	25.41^{d}	1.95^{d}	37.26^{c}	2.30^{ab}
HSD 5%	1.10	7.17	1.82	0.13	0.79	7.11
Dry weight						
P1(2M : 2S)	15.33^{b}	144.30^{c}	14.70^{cd}	0.53^{bc}	5.40^{b}	0.90^{b}
P2(3M : 2S)	14.33^{c}	146.57^{c}	12.15^{cd}	0.83^{b}	3.52^{c}	1.68^{ab}
P3(3M : 3S)	20.94^{a}	278.93^{a}	18.31^{a}	1.21^{a}	11.83^{a}	3.78^{a}
P4(4M : 2S)	18.13^{ab}	227.09^{b}	15.84^{ab}	0.30^{cd}	10.21^{ab}	1.30^{b}
P5(4M : 3S)	19.30^{a}	87.25^{c}	14.28^{bc}	0.39^{cd}	10.30^{ab}	0.82^{b}
HSD 5%	1.55	25.28	1.89	0.29	1.31	3.55

Table 4: - Average Wet and Dry Weight of Plant Biomass, Weight of Maize Cobs, Soybean Pods per plot and Weight of Maize Cobs and Soybean Pods per plant at 92 das (BW=Biomass Weight per Plots; CW=Cob Weight per plant; CWp=Cob Weight per plot; BW=Biomass Weight per Plots, WP=Weight of pods per plant; WPp=Weight of Pods Per plot, numbers followed by the same letters in the same column show the results are not significantly different according to the HSD test 5%)

Table 4 shows the treatment of 3 rows of maize: 3 rows of soybeans added 1 row of maize to 4 rows of maize (P5) there was a decrease in the weight of the wet stover per plot of maize plants amounted to 3.19%, and 106.50% on the weight of cobs plantations, and 36.04% of the weight of cob per plot. In contrast, in soybean plants, that is 203.58% of the weight of stover per plot, 28.36 of the weight of pod pods and 304.78% of pod weight. The reduction in dry weight stover weight in maize plants was 8.49%, the weight of planted cobs was 219.69%, in the weight of cobs of the plot was 28.22%, while in soybean plants decreased weight of plot stover was 210.25%, the weight of planting pods was 14.85%, and the weight of pod pods was 360.97%.

Shows that in the treatment of plant density 3 rows of maize: 3 rows of soybean nutrients and water are sufficient for the formation of crop stover. Wet stover weight is related to the absorption of water and nutrients in the soil (Hoskinson et al., 2007). Water absorption by plants plays a vital role because it is a medium for the entry of nutrients into plants that will be used for plant growth, one of which is to form crop stover (Gupta et al., 2015).

- *Maize and Soybean Yield*

Table 5 shows that if 3 rows of maize: 3 rows of soybeans (P3) were added to 4 rows of maize (P5), there was a decrease in the weight of 1000 seeds and weight of seeds per plot in maize and soybean plants. In maize, plants decreased by 15.92%, and 10% in soybean plants decreased by 8.91% and 119.7%.

ISSN No:-2456-2165

Treatment	Weight Maize		Weight Soybean	
	1000 grains (g)	Seed per plot (kg/plot)	1000 grains (g)	Seed per plot (kg/plot)
P1(2M : 2S)	236.67^{c}	5.67^{cd}	148.33^{b}	0.169^{c}
P2(3M : 2S)	235.00^{c}	5.87^{bc}	146.67^{b}	0.268^{bc}
P3(3M : 3S)	303.33^{a}	7.37^{a}	183.33^{a}	0.635^{a}
P4(4M : 2S)	231.67^{c}	6.70^{bc}	160.00^{ab}	0.233^{c}
P5(4M : 3S)	261.67^{b}	6.70^{b}	168.33^{ab}	0.289^{b}
HSD 5%	9.91	0.65	18.01	0.228

Table 5: - Average yield of seeds (kg/plot) and weights of 1000 grains of dried maize and soybeans (g) at 92 das (numbers followed by the same letters in the same column show the results are not significantly different according to the HSD test 5%)

This shows that the density of 3 rows maize : 3 rows of soybeans causes better absorption of nutrients, water and sunlight so that the process of plant photosynthesis is better. This results in the formation of generative organs, especially the formation of seeds so that the weight of seeds and 1000 seeds in the treatment of 3 rows of maize : 3 rows of soybeans are higher and significantly different from other density treatments.

Plant density affects the length of the cob, the weight of the cob and the weight of 100 seeds. Increasing the level of plant density per unit area to a certain extent, can increase seed yield. Ainun et al. (2012) state that in addition to genetic factors, environmental factors, especially humidity and temperature around plants, significantly affect plant growth and maize yield (Subedi and Ma, 2009; Astiko and Sudantha, 2020).

Treatment	Cob length (cm)	Cob diameter (cm)	Pod length (cm)	Pod width (cm)
P_1 (2M:2S)	15.73b	3.16abc	3.23bc	0.6b
P_2 (3M:2S)	15.8b	3.16abc	3.46bc	0.53b
P_3 (3M:3S)	18.66a	4.03a	4.83a	1.1a
P_4 (4M:2S)	14.26c	2.6c	3.16c	0.56b
P_5 (4M:3S)	15.36bc	3.63ab	3.6bc	0.66ab
HSD 5%	0.88	0.56	0.3	0.3

Table 6: - Average cob length, cob diameter, pod length and pod width (mean value followed by the same letter in the same column is not significantly different according to the HSD test 5%)

Table 6 shows the treatment of 3 rows of maize: 3 rows of soybeans (P3) If one row of maize is added to four rows of maize (P4) there is a decrease in average length and diameter in both maize and soybean plants. In the length of maize, cobs decreased by 21.49%, in maize cobs diameter by 11.01%, in the length of soybean pods by 34.16% and in the width of soybean pods by 66.66%.

This shows that the length and width of maize cobs and the length and width of soybean pods are affected by nutrients, and the water that is obtained is balanced so that it can trigger high growth in crop yields both in maize and soybean plants (Ali et al., 2009). As well as Idris (2018) suggested that the cob and pods that are long and have a wide diameter will produce more maize seeds.

- *Number of Spores and Mycorrhizae Infection*

See the data in Table 4.7 that in plants 3 rows of maize: 3 rows of soybeans (P3) if added 1 row of maize to 4 rows of maize (P5) there was a decrease in the number of spores at 40 das and 92 das. The decrease in the number of spores at 40 das was 8.06%, and at 92 das was 11.20% while in soybean plants at 40 das was 20.81% and at 92 das was 5.78%. Decrease in the root infection of maize 40 das by 21.15% and at 90 das by 23.38% while in soybean plants at 40 das by 40.39% and at 92 das by 24.49%.

ISSN No:-2456-2165

Treatment	Maize				Soybean			
	Number of Spores		Mycorrhizae Infection		Number of Spores		Mycorrhizae Infection	
	40 das	92 das	40 das	92 das	40 das	92 das	40 das	92 das
P1(2M : 2S)	3997.33^{c}	6745.00^{de}	62.67^{b}	66.00^{cd}	4163.67^{b}	6689.67^{b}	32.67^{b}	46.00^{bc}
P2(3M : 2S)	3993.33^{c}	7035.00^{bc}	62.67^{b}	68.00^{c}	3743.33^{c}	7207.00^{b}	32.67^{b}	48.00^{bc}
P3(3M : 3S)	4542.33^{a}	7688.33^{a}	76.33^{a}	82.67^{a}	4543.33^{a}	7608.33^{a}	46.33^{a}	62.66^{a}
P4(4M : 2S)	4229.67^{b}	7274.67^{b}	63.00^{b}	73.00^{b}	3716.00^{c}	7187.33^{b}	33.00^{b}	53.00^{b}
P5(4M : 3S)	4203.33^{b}	6913.67^{cd}	63.00^{b}	67.00^{c}	3760.67^{c}	7192.33^{b}	33.00^{b}	50.33^{bc}
HSD 5%	28.13	164.59	2.56	2.12	126.43	145.07	2.65	5.08

Table 7:-. Average number of spores (per 100 g of soil) and mycorrhizae infection (%) in intercropping maize soybeans (mean value followed by the same letter in the same column is not significantly different according to the HSD test 5%)

This is thought to be due to the density of 3 rows of maize: 3 rows of soybeans have an excellent mutualism symbiosis so that the ability of mycorrhizae to produce spores shows the effectiveness of mycorrhizal symbiosis in accordance with plant roots. In contrast to the rhizosphere of plants with the addition of high inorganic fertilizer in addition to reducing infection will also reduce the role of mycorrhizae (Abawiet al. 2000).

Increased root infection in plant density 3 rows of maize: 3 rows of soybeans are thought to be related to symbiotic suitability in the root rhizosphere, which can increase the ability of mycorrhizae to infect roots. In addition, it is suspected that the density of the plant occurs in the suitability of the microclimate, which supports the ability of mycorrhizae to infect roots (Sahiran et al., 2019; Astiko and Sudantha, 2019).

IV. CONCLUSION

Intercropping density of 3 maize rows: 3 rows of soybean show the best growth and yield. Growth and yields on intercropping plant density treatment of 3 rows of maize : 3 rows of soybeans gave the highest yields on the wet and dry weight of maize cobs and soybean pods per plant, as well as the wet and dry weight of biomass, maize cobs and soybean pods per plot with the best results if compared to the density of other intercropping plants. The intercropping density of 3 maize rows: 3 rows of soybeans can also increase the number of spores and the percentage of mycorrhizae infections compared to other intercropping treatments.

ACKNOWLEDGMENT

The authors would like to thank the Directorate of Research and Community Service, the General Directorate of Research and Development at the Ministry of Research, Technology and Higher Education (DRPM RISBANG KEMRISTEKDIKTI), and to the University of Mataram, for the research grants with the number of 182/SP2H/LT/DRPM/2019.

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