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## Assessing Grass Growth in Marginal Soil Using Treatments of Nitrogen Fertilizer and Time Sequence of Raw Organic Matter Incubation

\*Burhanuddin Rasyid<sup>1,2</sup>, Masato Oda<sup>2</sup>, and Hide Omae<sup>2</sup>

<sup>1</sup>Dept. of Soil Science, Fac. of Agriculture, Hasanuddin University-Indonesia  
<sup>2</sup>Japan International Research Center for Agricultural Sciences (JIRCAS)

### Introduction

The influence of organic matter incorporation and nitrogen application on soil properties was explained in many research report. However, time sequence incubation of raw material is still challenge to be explore especially in application on marginal land. The mineralization rate is one focus to incorporate organic matter into soil for plant growth. The composition and activity of the soil microbial community are key factors controlling the amounts of C and N mineralized. The aim of this study is to assess plant growth in the marginal soil applied by nitrogen and raw organic matter in different time incubation.

### Materials and Methods

Pot experiment was carried out in green house of Tropical Agriculture Research Front (TARF) – JIRCAS, Ishigaki, Okinawa Pref. Rose grass as plant with high ability adaption to marginal condition was growth as object plant study. Factorial experimental design arrangement with three factors was applied in this experiment as Nitrogen fertilizer (Urea slow release LP-40 type), maize organic matter (OM), and incubation time sequence of organic matter. Nitrogen treatment was arranged in 4 (four) level of organic matter: 0 ton/ha, 2 ton/ha, 4 ton/ha, and 8 ton/ha. The other factors were 3 (three) concentrations of nitrogen fertilizer: 0 kgN/ha, 10 kgN/ha, and 40 kgN/ha, and incubation time of organic matter before planting: 0 DAI (day after incubation), 7 DAI, and 14 DAI respectively. Plants were harvest after 60 days. To compare the assessment, another experiment was conduct in house field with 5 m (length) x 1 m (withd). Two types of plastic mulch and no mulch, nitrogen fertilizer (0 kgN/ha, 10 kgN/ha and 40 kgN/ha), and 2 ton/ha organic matter (incorporated all plots) was applied as treatment with two replications. Results of the factorial treatments were examined with two-way ANOVA model using IBM-SPSS software ver. 20 to analyze significant differences due to treatment effects. Normality data was ascertained with Shapiro-Wilk test. General linear regression further analyzed the amount of variance explained by the dependence of one variable on another where treatments relationship was implied. Significant differences tested with Least Significant Difference (LSD) post-hoc test.

### Results and Discussion

Incubation time sequence of organic matter (OM) was clearly effect of biomass production for single or combination treatment (Table 1), but no significant effect was shown for one time application (Table 2) Nitrogen fertilzer treatment was increase biomass, however difference effect was shown with time incubation compare to once time application. Significant effect was found in 40 kgN/ha within 14 days incubation, but almost same result in addition 10 kgN/ha and 40 kgN/ha for once time application OM (Fig. 1 and 3). We also found that poly-V. mulch has better effect than sheet mulch (Fig. 4). In addition, incubation time has variable result correspond to level of organic matter applied into soil. For the zero time, increasing of OM level tend to be increase biomass, but increasing OM level could be decrease biomass production (Fig. 2). This study suggest that incorporation of OM accompanied by nitrogen fertilizer and time incubation has importance to be applied in marginal soil. For the future study, effect of OM to other environmental factors (microorganism activity, soil nutrient content, ect.) to be interested.

622 x 42 = 24

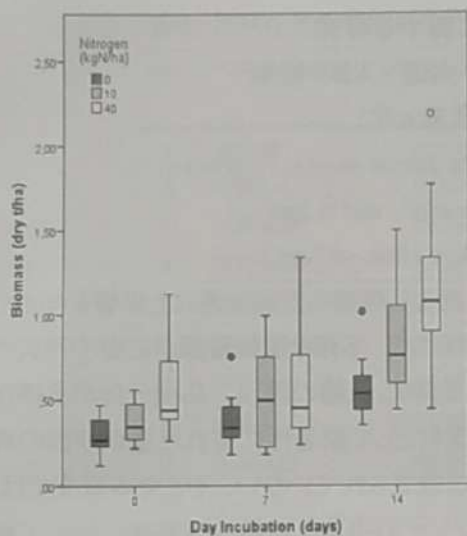


Fig. 1 Effect of incubation time and nitrogen

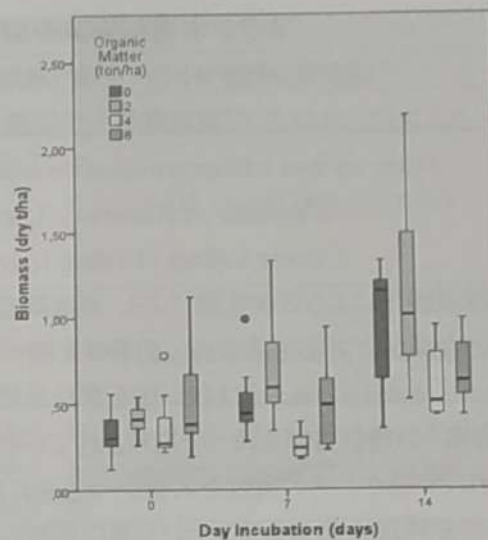


Fig. 2 Effect of incubation time and organic matter

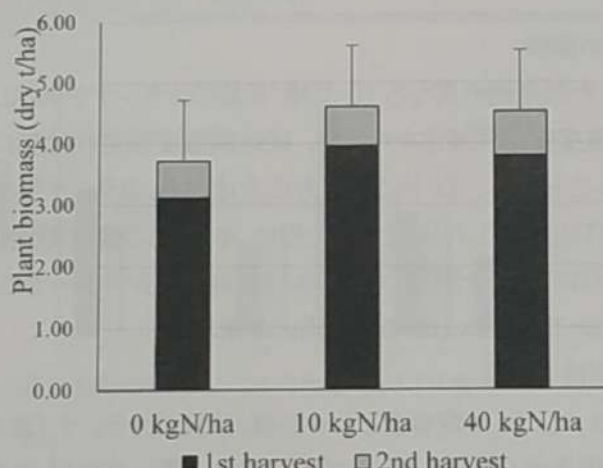


Fig. 3 Effect of nitrogen application (house exp.)

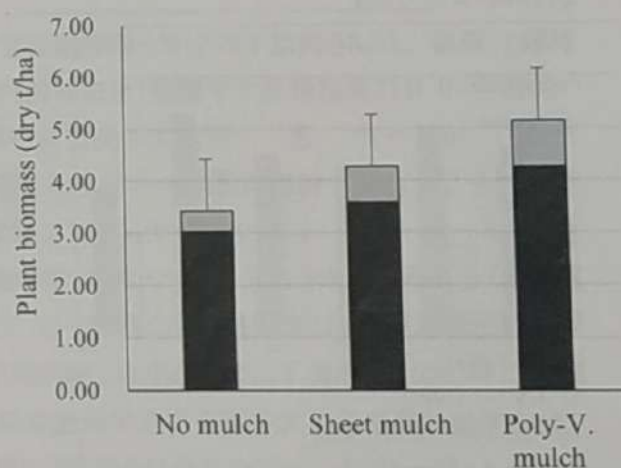


Fig. 4 Effect of mulch (house exp.)

Table 1. Analysis of variance (ANOVA) of assessing parameters in pot experiment

Source	SS	df	MS	F-value	P-value
Nitrogen	2,154	2	1,077	29,267	0,000
Organic	1,700	3	0,567	15,399	0,000
Day	4,090	2	2,045	55,568	0,000
Nitrogen *	0,875	6	0,146	3,962	0,002
Organic					
Nitrogen * Day	0,580	4	0,145	3,943	0,006
Organic * Day	1,242	6	0,207	5,624	0,000
Nitrogen * Organic	0,986	12	0,082	2,233	0,019
* Day					
Error	2,650	72	0,037		
Total	51,21	108			
Corrected Total	14,27	107			

R Squared = ,814 (Adjusted R Squared = ,724), SS=Sum Square, MS= Mean Square

Nitrogen	P-value	Mulch-type	P-value	
0 g	0,154	No Mulch	Sheet mulch -0,174	
		4 g	Poly sheet	-0,141
			Sheet mulch	No Mulch -0,032
1 g	0,487	Poly sheet	Poly sheet -0,070	
			0 g	0,428
4 g	0,487	Poly sheet	No Mulch -0,065	
			1 g	Sheet mulch -0,136

Table 2. Post-hoc analysis of house field exp.