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GROWTH OF SWEET CORN (*Zea mays saccharata* (Sturt.) Bailey) AND WEED DENSITY WITH DIFFERENT OF FERTILIZER'S DOSES

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Abstract. *This study aimed to determine the response of the growth of sweet corn plants and weed density to the treatment of bio-fertilizer based on arbuscular mycorrhizal fungi and cow manure fertilizer. The study was conducted using a randomized complete block design (RCBD) in a factorial pattern. The first factor was arbuscular mycorrhiza fungi (AMF) consisting of four doses, namely without AMF (A_0), AMF 5 g/planting hole (A_1), AMF 10 g/planting hole (A_2), AMF 15 g/planting hole (A_3). The second factor was cow manure fertilizer consisting of three doses, namely without cow manure fertilizer (B_0), cow manure fertilizer 3 kg/plot (B_1), cow manure fertilizer 6 kg/plot (B_2). The treatment applied consisted of 12 combinations of treatments with 3 replications, so there were 36 experimental units. The observed variables were plant height, stem diameter, leaf area and weed density. The results showed that the average height of sweet corn was best at 42 DAP in the treatment of cow manure fertilizer 6 kg/plot (B_2) as 111.6 cm. The average highest of stems diameter was at 14 DAP in the treatment of cow manure fertilizer 6 kg/plot (B_2) as 0.40 cm. The average leaf area of sweet corn was at the age of 28 DAP was highest in the combination treatments cow manure fertilizer 6 kg/plot (A_0B_2) and without AMF as 894.5. The weed species with the highest density found was I.cylindrica as 0.5-32.4%, C. kyllingia as 1.3-41.8%, C. rotundus as 1.3-30.3% and F.miliaceae as 1.2-12.7%.*

Keywords: *arbuscular mycorrhiza fungi, bio-fertilizer, cow manure fertilizer, sweet corn, weeds*

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INTRODUCTION

Sweet corn is an agricultural commodity that very popular by the community because it tastes good, sweet, contains a lot of carbohydrates and the more fragrant than ordinary corn. The farmers prefer to cultivate sweet corn because of its high selling value so that it will provide greater profits. According to Hanafi et al. (2012), sweet corn is an agricultural commodity that is very popular, especially by urban residents, because it tastes good and sweet, contains a lot of carbohydrates, less protein and fat.

Sweet corn production at each harvest season is varied. This happens caused by the biotic and abiotic agronomic factors (Olanian, 2015), low soil fertility, and the presence of weeds that grow on crop cultivation land (Silwana & Lucas, 2002). The presence of weeds in sweet corn plantations is one of the factors that have an adverse effect on the growth and production of sweet corn, where they affect directly thecompetition of nutrients, water, sunlight, CO_2 and growing space (Nicholas et al., 2016). Hartzler & Pringnitz (2005) stated that the loss of corn crop due to competition with weeds ranges from 25 - 50%.

Efforts to suppress competition with weeds and improve the growth of sweet corn can be done with the application of biofertilizer based on arbuscular mycorrhizal fungi and cow manure fertilizer. Arbuscular mycorrhizal fungi are alternative technology developed in dryland cultivation that can effectively increase macro and micronutrients. In addition, the roots of plants with mycorrhizal fungi can absorb bounded nutrients such as P to be available for plants (Panjaitan, 2015). The role of mycorrhiza fungi for plant growth and development is in order it's the host received increasing nutrients from the soil, as a biological barrier against root pathogen infections, increasing plant resistance to drought and increasing growth-promoting hormones (Prihastuti, 2007).

Cow manure is a fertilizer that comes from solid waste mixed with food scraps and urine. Cow manure contains high levels of fiber such as cellulose, provide macro and micronutrients for plants, and improve water absorption in the soil (Hartatik et al., 2015). The use of cow manure fertilizer and arbuscular mycorrhizal fungi is expected to provide a maximum growth of sweet corn plants. Hardi et al. (2020) reported that the interaction of arbuscular mycoorhizal fungi and manure affected the increasing P uptake of maize plants and P available in the soil. In this research, the role of arbuscular mycorrhizal fungi and cow manure fertilizer with different doses to the growth of sweet corn were examined.

MATERIALS AND METHODS

Experimental Design

This research was conducted in the village of Rambu-Rambu Jaya, Ranomeeto Barat District, South Konawe Regency, Southeast Sulawesi from August until October 2018. The study was conducted using a randomized complete block design (RCBD) in a factorial pattern. The first factor was arbuscular mycorrhiza fungi (AMF) consisting of four doses, namely without AMF (A_0), AMF 5 g/planting hole (A_1), AMF 10 g/planting hole (A_2), AMF 15 g/planting hole (A_3). The second factor was cow manure fertilizer consisting of three doses, namely without cow manure fertilizer (B_0), cow manure fertilizer 3 kg/plot (B_1), cow manure fertilizer 6 kg/plot (B_2). The treatment applied consisted of 12 combinations of treatments with 3 replications, so there were 36 experimental units.

Preparation of Experimental Land

The research field was cleared from the reeds spraying an active ingredients of herbicides in order to accelerate the death of weeds. The dry reeds were burned so as not to obstruct the tractor's activities in tillage. Furthermore, the remaining roots of the reeds were cleaned and loosened using a hoe, after which the experimental plot was made. The making of the experimental plot was carried out after processing the research area. The size of the overall research area was 48 m x 7 m, with a plot size of 3 m x 2 m. Drainage width between groups was 50 cm and drainage width between plots within groups was 30 cm.

Preparation of Mycorrhiza Fungi and Cow Manure Fertilizer

Mycorrhizal fungi were propagated on maize plants using a mixture of soil media and organic fertilizer with a volume ratio of 2:1 planted on polybags. Using the maize as a propagation media because based on the results Halim et al. (2019), showed mycorrhiza fungi infections in the roots of maize plants ranged from 21.20-35.36%. Propagation of mycorrhizal fungi lasts for 2 months, then harvested by unloading polybags, then destroying chunks of soil and smoothing it to obtain a homogeneous mixture of propagules. The roots of corn plants that freshly harvested wascut into small pieces (size ± 5 cm) and mixed evenly with planting media to get propagules.The propagules were then weighed according to the treatment dose. The cow manure was fermented using Effective Microorganisms-4 (EM-4) for 14 days in order to kill harmful microorganisms and kill weed seeds that are carried by cow manure. The fertilizer was then dried in the sun to reduce the water content.

Application of Cow Manure, Arbuscular Mycorrhizal Fungi and Corn Cultivation

Application of cow manure was carried out oneweek before planting by sprinkling it to the surface of the soil, then flattened and mixed with the soil using a hoe. Application of arbuscular mycorrhizal fungi propagules was at the same time as planting sweet corn where the location of mycorrhizal fungi propagules was under the seeds of sweet corn. The planting hole was made with a depth of ± 5 cm and 40 cm x 70 cm planting space.

Observation Variable

The observed variables were plant height, stem diameter, leaf area (14, 28, 42 DAP), and weed density. The weed density calculated using the formula recommended by Chaves and Bhadanari (1982):

$$\text{Relative density} = \frac{\text{number of individuals of species}}{\text{Total number of individual}} x\ 100\%$$

$$\text{Relative dominance} = \frac{\text{dominance of species}}{\text{dominance of all species}} x\ 100\%$$

$$\text{Relative frequency} = \frac{\text{frequency of species}}{\text{sum frequency of all species}} x\ 100\%$$

Importance value = Relative density + relative dominance + relative frequency

Data Analysis

Data of sweet corn growth were analyzed using analysis of variance (ANOVA) followed by Duncan's Multiple Range Test (DMRT) at the 95% confidence level. Weed data was simply tabulated based on the weed density value.

RESULTS AND DISCUSSION

Effect of AMF and Cow Manure Fertilizer on the Sweet Corn Growth

The interaction of mycorrhiza fungi and cow manure fertilizer has a very significant effect on leaf area at 28 and significant at 42 DAP (Table 1). The treatment of arbuscular mycorrhizal fungi had a very significant effect on plant height and leaf area at 28 DAP, while it significantly affected stem diameter at 14 DAP. The treatment of cow manure fertilizer significantly affected plant height at 14, 28 and 42 DAP; stem diameter at 14 and 28 DAP; andleaf area at 14, 28, and 42 DAP. Both arbuscular mycorrhizal fungi, cow manure fertilizer, and mixture treatment did not significantly affect on stem diameter at 42 DAP. Based on this result arbuscular mycorrhiza fungi and cow manure fertilizer can improve the growth of sweet corn plants. According to Halim et al. (2018), the application of mycorrhizal fungi were able to increase the height of corn plants in all treatments, although the increase is different. The difference is closely related to the infection of mycorrhizal fungi on plant roots, thus affecting the absorption of nutrients. While applying cow manure will added nutrients needed in plant growth as a nutrient source and also in order to improve soil fertility (Baitilwake et al., 2011).

Table 1. Analysis of variance recapitulation of arbuscular mycorrhiza fungi and cow manure fertilizer effect on sweet corn plant growth

Observation variable	Arbucular mycorrhiza fungi (A)	Cow manure fertilizer (B)	Interaction (A*B)
plant height 14 DAP	ns	**	ns
plant height 28 DAP	**	**	ns
plant height 42 DAP	ns	*	ns
stem diameter 14 DAP	*	*	ns
stem diameter 28 DAP	ns	**	ns
stem diameter 42 DAP	ns	ns	ns
leaf area 14 DAP	ns	**	ns
leaf area 28 DAP	*	**	**
leaf area 42 DAP	ns	**	*

Notes: * = significant, ** = very significant, ns = no significant

Plant Height

The results of observations of sweet corn plant height showed that the treatment of cow manure fertilizer had very significant effect on the average height of sweet corn plants at 14 DAP. The average height of sweet corn plants at 14, 28, and 42 DAP are presented in Tables 2 & 3.

The average height of sweet corn at 14 DAP was best obtained from treatment of cow manure fertilizer 6 kg/plot (B_2) (Table 2). It was significantly different compare to treatment without cow manure fertilizer (B_0), while not significantly different compare to the treatment of cow manure fertilizer 3 kg/plot (B_1). The average height of sweet corn plant at 42 DAP was best obtained in the treatment of cow manure 6 kg/plot (B_2) as 111.6 cm which was not significantly different from the treatment of cow manure fertilizer 3 kg/plot (B_1), but significantly different from treatment without cow manure fertilizer (B_0). The treatment of cow manure fertilizer influences early plant vegetative growth, it is suspected that cow manure fertilizer can provide nutrients for plants even in small amounts to increase plant growth. Karimuna et al. (2009), stated that the amount of various nutrients available to plants is sufficient so that the growth and development of the plant go well.

The average height at 28 DAP was highest in the treatment of arbuscular mycorrhizal fungi 15 g/planting hole (A_3) as 59.0 cm which was significantly different from the treatment without arbuscular mycorrhiza fungi, but not significantly different from other treatments (Table 3). The use of arbuscular mycorrhiza fungi can make effective use of high doses of cow manure fertilizer. The cow manure fertilizers can increase soil fertility and improve physical, chemical, biological properties. This is in accordance with the statement of Novel et al. (2018), that manure fertilizer increase the availability of nutrients andthe growth of microorganisms, as well as improve soil structure. Moelyohadi et al. (2013), stated that the role of mycorrhiza for its host plant is to enlarge the area of root hair uptake through the formation of mycelium around the roots.

The microorganism activity in the soil are able to weather cow manure fertilizer, so that soil pores can be formed and sustain water availability in the soil which good for corn growth. According to Bolan (1991), the binding of metal elements in soil nutrients is not yet available, Mycorrhiza in this case facilitates it by converting unavailable nutrients of N, P, and K become available to be absorbed by the plant. Mycorrhiza fungi are able to release P nutrients by the activity of phosphatase enzymes (Cumming & Ning, 2008) so it increase water availability resistance to pathogens, availability of P nutrients, finally it can expand the reach of roots in the soil. Hidayati et al. (2015) stated that interaction occurs due to the influence of the two treatments so that mycorrhizal fungi can associate with plant roots and develop in them to provide nutrients to host plants in the form of P nutrients so as to expand the reach of plant roots and can take nutrients in the soil.

Table 2. Effect of cow manure fertilizer on average plant height at 14 DAP

Treatment	Plant height (cm)	
	14 DAP	42 DAP
without cow manure fertilizer (B_0)	20.2a	97.3a
cow manure fertilizer 3 kg/plot (B_1)	24.2b	112.1b
cow manure fertilizer 6 kg/plot (B_2)	24.8b	111.6b
DRMT 95%	2=2.84 3=2.98	2 =10.89 3=11.45

Notes: the numbers followed by unequal letters in the same row (ab) differ significantly with Duncan Multiple Range Test (DMRT) at 95% confidence level.

Table 3. Effect of arbuscular mycorrhizal fungi and cow manure fertilizer on average plant height at 28 DAP

Treatment of arbuscular mycorrhiza fungi	Plant height (cm)	DMRT 95%
with out arbuscular mycorrhiza fungi (A_0)	46.5b	
arbuscular mycorrhiza fungi 5 g/planting hole (A_1)	53.8a	2 = 6.89
arbuscular mycorrhiza fungi 10 g/planting hole (A_2)	55.8a	3 = 7.24
arbuscular mycorrhiza fungi 15 g/planting hole (A_3)	59.0a	4 = 7.45
Treatment of Cow manure fertilizer	**Plant height (cm)**	**DMRT 95%**
with out cow manure fertilizer (B_0)	47.0b	
cow manure fertilizer 3 kg/plot (B_1)	56.2a	2 = 5.97
cow manure fertilizer 6 kg/plot (B_2)	58.1a	3 = 6.27

Notes: the numbers followed by unequal letters in the same row (ab) differ significantly with Duncan Multiple Range Test (DMRT) at 95% confidence level.

Table 4. Effect of arbuscular mycorrhizal fungi at 14 DAP and cow manure fertilizer at 14 and 28 DAP on average stem diameter

Treatment of arbuscular mycorrhiza fungi	Variable observation	DMRT 95%
with out arbuscular mycorrhiza fungi (A_0)	0.32b	
arbuscular mycorrhiza fungi 5 g/planting hole (A_1)	0.34ab	2 = 0.05
arbuscular mycorrhiza fungi 10 g/planting hole (A_2)	0.38ab	3 = 0.06
arbuscular mycorrhiza fungi 15 g/planting hole (A_3)	0.39a	4 = 0.06
Treatment of Cow manure fertilizer	14 DAP	28 DAP
with out cow manure fertilizer (B_0)	0.33b	0.76b
cow manure fertilizer 3 kg/plot (B_1)	0.35ab	0.99a
cow manure fertilizer 6 kg/plot (B_2)	0.40a	1.05a
DMRT 95%	2= 0.05 3= 0.05	2 = 0.14 3 = 0.15

Notes: the numbers followed by unequal letters in the same row (ab) differ significantly with Duncan Multiple Range Test (DMRT) at 95% confidence level.

Stem Diameter

The highest stem diameter of sweet corn at 14 DAP was obtained in the treatment of arbuscular mycorrhizal fungi 15 g/planting hole (A_3) as 0.39 cm which was significantly different from treatment without arbuscular mycorrhiza fungi (A_0), but it was not significantly different from the other treatments (A_1 and A_2).

The highest average diameter of sweet corn at 14 DAP was obtained in the treatment of cow manure 6 kg/plot (B_2) as 0.40 cm which was significantly different from treatment without cow manure fertilizer (B_0), but not significantly different from treatment of cow manure 3 kg/plot (B_1). At the age 28 DAP the highest stem diameter was obtained in the treatment of 6 kg/plot (B_2) as 1.05 cm which was significantly different from treatment without fertilizer, but it was not significantly different from treatment of 3 kg/plot (B_1). Moelyohadi et al. (2013), stated that the role of mycorrhiza fungi to its host plants is to enlarge the area of root hair uptake through the formation of mycelium around the roots. Due to the expansion of the root area through the aid of mycorrhiza mycelium, more nutrients are absorbed by the host plant compared to other plants that are not symbiotic with mycorrhiza fungi.

Leaf Area

The results of ANOVA indicated that cow manure fertilizer had a very significant effect on the leaf area of sweet corn at 14 DAP. The arbuscular mycorrhizal fungi and cow manure fertilizer, as well as the interaction of them had a significant effect on the leaf area of sweet corn at 28 DAP. The cow manure fertilizer well as the interaction between arbuscular mycorrhiza fungi and cow manure fertilizer respectively have very a significant effect affect to leaf area of sweet corn at 42 DAP.

The highest average of leaf area was obtained in the treatment without cow manure (B_0) as 117.15 which was not significantly different from the treatment of cow manure 6 kg/plot, but significantly different from the treatment of cow manure 3 kg/plot (Table 5). According to Stevenson (1994), manure beside contains nutrients needed by plants also contains humic acids, fulvic, growth hormones et cetera are stimulating plant growth so that nutrient uptake by plants increases.

The average leaf area of sweet corn plants at the age of 28 DAP was highest in the combination treatments of A_0B_2 (without mycorrhizal fungi and cow manure 6 kg/plot) as 894.5 which it was significantly different from with combination treatments of A_0B_0 (without mycorrhizal fungi and without cow manure fertilizer) and A_0B_1 (without mycorrhizal fungi and cow manure fertilizer 3 kg/plot) (Table 6). The average leaf area of sweet corn plant at the age of 42 DAP was highest in the combination treatment of mycorrhizal fungi 15 g/planting hole with cow manure 3 kg/plot as 3833.7 which was significantly different from the combination treatment of mycorrhiza fungi 15 g/planting hole and without cow manure fertilizer. This is in accordance with the statement of Moelyohadi et al. (2013), that cow manure contains a number of nutrients or organic matter that can improve the physical, chemical, and biological properties of the soil. Availability of nutrients in the soil, soil structure and good soil air structure greatly affect the growth and development of roots and the ability of plant roots to absorb nutrients. The development of a good root system can determine the vegetative growth of plants which ultimately determines the reproductive phase and yield of plants.

Table 5. Effect of cow manure on the average leaf area at 14 DAP

Treatment	Leaf area	DMRT 95%
with out cow manure fertilizer (B_0)	117.15a	
cow manure fertilizer 3 kg/plot (B_1)	78.32b	2 = 19.84
cow manure fertilizer 6 kg/plot (B_2)	112.53a	3 = 20.85

Notes: the numbers followed by unequal letters in the same row (ab) differ significantly with Duncan Multiple Range Test (DMRT) at 95% confidence level.

Table 6. Effect of interaction between arbuscular mycorrhiza fungi and cow manure fertilizer on average leaf area at 28 and 42 DAP

Cow manure fertilizer	Arbuscular mycorrhiza fungi (g/planting hole)			
	Observation at 28 DAP			
	0 (A_0)	5 (A_1)	10 (A_2)	15 (A_3)
with out cow manure fertilizer (B_0)	453.2b q	835.8a p	625.4a p	526.4b q
cow manure fertilizer 3 kg/plot (B_1)	412.0b q	724.4a p	788.5a p	850.5a p
cow manure fertilizer 6 kg/plot (B_2)	894.5a p	814.6a p	677.9a p	857.0a p
DMRT 95%	2= 225.61	3 = 237.16	4 = 244.09	
Cow manure fertilizer (kg/plot)	Arbuscular mycorrhiza fungi (g/planting hole)			
	Observation at 42 DAP			
	0 (A_0)	5 (A_1)	10 (A_2)	15 (A_3)
with out cow manure fertilizer (B_0)	2635.3b p	2463.7b p	3187.7a p	2441.8b p
cow manure fertilizer 3 kg/plot (B_1)	2676.2b q	3717.9a p	3328.1a pq	3833.7a p
cow manure fertilizer 6 kg/plot (B_2)	3573.2a p	3291.2a p	3080.9a p	3601.7a p
DMRT 95%	2 = 789.10	3 = 829.50	4 = 853.74	

Notes: the numbers followed by unequal letters in the same row (ab) and column (pq) differ significantly with Duncan Multiple Range Test (DMRT) at 95% confidence level.

Weed Density

The number and species of weeds that grow in each treatment combination plot varies (Table 7). The number of weeds that grow in the combination treatments of without mycorrhiza fungi and cow manure fertilizer with different doses (A_0B_0, A_0B_1, A_0B_2) was 13-20 species, combination treatment of mycorrhizaa fungi 5 g/planting hole and cow manure fertilizer with different doses (A_1B_0, A_1B_1, A_1B_2) was 14-17 species, combination treatments of mycorrhiza fungi 10 g/planting hole and the cow manure fertilizer with different doses (A_2B_0, A_2B_1, A_2B_2) was 13-14 species, and combination treatment of mycorrhiza fungi 15 g/planting hole and the manure fertilizer with different doses (A_3B_0, A_3B_1, A_3B_2) was 12-14 species. The weed species found in each experimental plot were 7-13 broadleaf species, 1-3 grasses species, and 2-3 sedges species.

The weed species density from broadleaf found in all combinations of different doses of mycorrhiza fungi and cow manure fertilizer were *B. repens* with range 7.3-22.9%, *H. capitata* with range 14.5-34.3%, and *L. crustacea* with range 0.5-12.4%. The weed species the highest density were were *I. cylindrica* with a range of 0.5-32.4%, *C. kyllingia* with a range of 1.3-41.8%, *C. rotundus* with a range of 1.3-30.3%, and *F. miliaceae* as 1.2-12.7%. The highest growth rate of broadleaf weed found in *B. repens* with a range of 16.66%. This is in line with the opinion of Palijama et al. (2012), that broadleaf weeds absorb more nitrogen (N) and use more water so their growth is faster. Nitrogen is the main nutrient for weed growth, which is very necessary for the formation or growth of vegetative parts such as leaves, stems and roots. According to Patti et al. (2013), the function of the nitrogen element in plants is to increase the vegetative growth of plants.

The density of broadleaf weed species in all combinations treatment with different doses of the mycorrhiza fungi and cow manure fertilizer averaged 57.56%, grasses as 13.16% and sedges as 29.29% (Table 8). This shows that the treatment of mycorrhiza fungi can suppress the growth of weeds by increasing plant growth so that plants close the growing space on weeds, while the treatment of cow manure fertilizer can increase weed growth. According to Efthimiadou et al. (2012), indicated that the cow manure treatments promoted weed and sweet maize growth.

Based on the results of the study, it can be concluded as follows: the best average height of sweet corn plant at 42 DAP was obtained in the treatment of cow manure 6 kg/plot (B_2) as 111.6 cm. The highest average diameters of sweet corn 14 DAP in the treatment cow manure fertilizer 6 kg/plot (B_2) as 0.40 cm. The average leaf area of sweet corn plants at the age of 28 DAP was highest in the combination treatments of cow manure fertilizer 6 kg/plot without mycorrhiza fungi (A_0B_2) as 894.5. The weeds density of the highest weeds, namely *I. cylindrica* as 0.5-32.4%, *C. kyllingia* as 1.3-41.8%, *C. rotundus* as 1.3-30.3% and *F. miliaceae* as 1.2-12.7%.

Table 7. Weeds density for each weeds species at the combination treatment of mycorrhiza fungi and cow manure fertilizer

Kinds of weed	Family	A_0B_0	A_0B_1	A_0B_2	A_1B_0	A_1B_1	A_1B_2
Ageratum conyzoides (L.)	Asteraceae	0	0	0	0	1.49	1.19
Bacopa procumbens (Mill.) Greenm	Scrophulariaceae	0	0	0	0	0	0.60
Bidens pilosa (L.) Var. Minor (Bl.) Sherff	Asteraceae	0	0	0.09	0	0	0.60
Borreria alata (Aubl.) DC	Rubiceae	6.67	10.42	0	0	5.22	4.76
Borreria laevis (Lamk.) Griseb	Rubiceae	0	2.08	0	0	0	0
Borreria repens DC	Rubiaceae	10	20.83	11.36	22.22	13.43	3.57
Cleome rutidospermae DC	Capparaceae	0	0	0	0	0	0.60
Cyperus iria (L.)	Ciperaceae	3.33	0	0	0	7.46	7.74
Cyperus kylingia Endl	Ciperaceae	0	0	11.36	0	11.19	7.14
Cyperus pygmaeus Rottb	Ciperaceae	0	0	0	0	0	1.19
Cyperus rotundus (L.)	Ciperaceae	3.33	6.25	18.18	11.11	10.45	13.10
Cyperus sp	Ciperaceae	0	4.17	0	0	0	0
Digitaria ciliaris (Retz.) Koel	Gramineae	0	0	2.27	0	0	0
Digitaria sp	Gramineae	0	0	0	0	0	0
Eleusine indica (L.) Gaertn	Gramineae	0	0	0	0	0	0
Eleutheranthera ruderalis (Sw.)Sch. Bip	Astereceae	0	0	0	0	0	0
Emilia sonchifolia (L.) DC.ex Wight	Gramineae	0	0	0	0	0	0
Eriocaulon heterolepis Steud.var. nigricans Koern	Gramineae	0	2.08	9.09	5.56	1.49	0.60
Eupatorium odorata L.	Asteraceae	3.33	2.08	2.27	5.56	0	0.60
Fimbristylis tomentosa Vahl	Ciperaceae	16.67	8.33	0	22.22	8.96	15.48
Hedyotis diffusa Wild	Rubiceae	13.33	12.50	9.09	5.56	5.22	5.36
Hyptis capitata Jacq	Laminaceae	20.00	2.08	11.36	16.67	6.72	11.90
Imperata cylindrica (L.)	Gramineae	16.67	8.33	2.27	5.56	16.42	22.02
Lantana camara (L.)	Verbenaceae	0	2.08	0	0	0	0
Lindernia crustacea (L.) F.v.M	Linderniaceae	6.67	4.17	0	0	2.24	0.60
Lindernia sp	Linderniaceae	0	0	0	0	2.24	0.60
Ludwigia hyssopifolia (G.Don) Exell	Onagraceae	0	0	2.27	0	2.99	1.79
Mitracarpus villosus (Sw.) DC	Rubiceae	0	4.17	0	0	0	0
Mundannia nudiflora (L.) Brenan	Commelinaceae	0	0	0	0	0	0
Paspalum conjugatum Berg	Gramineae	0	2.08	0	0	0.75	0
Phylanthus niruri (Auct)	Phyllanthaceae	0	6.25	2.27	5.56	1.49	0.60
Polygala paniculata (L.)	Polygalaceae	0	0	0	0	0	0
Sacciolepis interrupta (Wild.) Stapf	Gramineae	0	2.08	0	0	0	0
Scoparia dulcis (L.)	Plantaginaceae	0	0	0	0	0	0
Torenia violacea (Azaola) Pennell	Lindermiceae	0	0	9.09	0	2.24	0
Tridax procumbens (L.)	Asteraceae	0	0	0	0	0	0

Continued Table 7.

Kinds of weed	Family	A_2B_0	A_2B_1	A_2B_2	A_3B_0	A_3B_1	A_3B_2
Ageratum conyzoides (L.)	Asteraceae	0	0	0	0	1.49	1.19
Bacopa procumbens (Mill.) Greenm	Scrophulariaceae	0	0	0	0	0	1.08
Bidens pilosa (L.) Var. Minor (Bl.) Sherff	Asteraceae	0	9.41	0	0	0	0
Borreria alata (Aubl.) DC	Rubiceae	2.08	0	0	1.80	4.08	1.61
Borreria laevis (Lamk.) Griseb	Rubiceae	0	1.18	0	0	0	0
Borreria repens DC	Rubiaceae	16.67	20.00	15.05	12.61	59.18	23.12
Cleome rutidospermae DC	Capparaceae	0	0	0	0	0	0
Cyperus iria (L.)	Ciperaceae	0	5.88	0	0	0	2.69
Cyperus kylingia Endl	Ciperaceae	0	2.35	0	0	0	27.42
Cyperus pygmaeus Rottb	Ciperaceae	0	0	0	0	0	0
Cyperus rotundus (L.)	Ciperaceae	6.25	14.12	8.60	18.02	6.12	5.91
Cyperus sp	Ciperaceae	0	0	0	0	0	0
Digitaria ciliaris (Retz.) Koel	Gramineae	2.08	0	0	0	0	0.54
Digitaria sp	Gramineae	2.08	0	5.38	0.90	0	0
Eleusine indica (L.) Gaertn	Gramineae	0	0	0	0	0	0.54
Eleutheranthera ruderalis (Sw.)Sch. Bip	Astereceae	2.08	0	0	0	0	0
Emilia sonchifolia (L.) DC.ex Wight	Gramineae	0	0	1.08	0	0	0
Eriocaulon heterolepis Steud.var. nigricans Koern	Gramineae	0	0	0	0	0	0
Eupatorium odorata L.	Asteraceae	4.17	3.33	0	0	0	2.15
Fimbristylis tomentosa Vahl	Ciperaceae	8.33	15.29	30.11	15.32	4.08	11.83
Hedyotis diffusa Wild	Rubiceae	13.33	12.50	9.09	5.56	5.22	5.36
Hyptis capitata Jacq	Laminaceae	29.17	1.18	4.30	24.32	10.20	5.38
Imperata cylindrica (L.)	Gramineae	0	0	9.68	8.11	4.08	2.15
Lantana camara (L.)	Verbenaceae	0	0	0	0.90	0	0.54
Lindernia crustacea (L.) F.v.M	Linderniaceae	4.17	0	7.53	1.80	8.16	2.69
Lindernia sp	Linderniaceae	0	1.18	0	0.90	0	0
Ludwigia hyssopifolia (G.Don) Exell	Onagraceae	0	1.18	0	0	0	0
Mitracarpus villosus (Sw.) DC	Rubiceae	6.25	0	0	0	0	0
Mundannia nudiflora (L.) Brenan	Commelinaceae	0	1.18	0	0	0	0
Paspalum conjugatum Berg	Gramineae	0	0	0	2.70	2.04	0.54
Phylanthus niruri (Auct)	Phyllanthaceae	6.25	4.71	1.08	0.90	2.04	3.76
Polygala paniculata (L.)	Polygalaceae	0	0	0	5.41	0	0
Sacciolepis interrupta (Wild.) Stapf	Gramineae	10.42	0	0	0	0	1.08
Scoparia dulcis (L.)	Plantaginaceae	0	0	1.08	0	0	0
Torenia violacea (Azaola) Pennell	Lindermiceae	0	12.94	0	0	0	2.69
Tridax procumbens (L.)	Asteraceae	0	0	2.15	0	0	0
Total		100	100	100	100	100	100

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Table 8. Weeds density at the combination treatment of mycorrhizal fungi and cow manure fertilizer

Broadleaves	6	10	8	5	10	12	8	11	9	9	5	10	8.58
Grasses	1	4	3	2	3	2	3	0	2	3	2	5	2.50
Sedges	3	3	2	2	4	5	2	4	2	2	2	4	2.92
Weeds density (%)													
Total	10	17	13	9	17	19	13	15	13	14	9	19	
Broadleaves	60	66.67	56.82	55.56	43.28	32.74	70.83	62.35	46.24	54.95	83.67	47.31	57.56
Grasses	16.67	14.58	13.64	11.11	18.66	22.62	14.58	0.00	15.05	11.71	6.12	4.84	13.16
Sedges	23.33	18.75	29.55	33.33	38.06	44.64	14.58	37.65	38.71	33.33	10.20	47.85	29.29
Total	100	100	100	100	100	100	100	100	100	100	100	100	

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