

Performance yield components of sweet corn (*Zea mays* Saccharata (Sturt.)) Bailey and weed growth with treatment in different kinds of fertilizer

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Abstract

This study aims to determine the performance yield component of sweet corn and weed density due to different kinds of fertilizer treatments. This study uses a randomized complete block design (RCBD) in factorial patterns with two factors. The first factor is biofertilizer-Arbuscular mycorrhiza fungi (biofertilizer-AMF) which consists of four levels, namely without biofertilizer-AMF (A₀), biofertilizer-AMF 5 g/planting hole (A₁), biofertilizer-AMF 10 g/planting hole (A₂), biofertilizer-AMF 15 g/planting hole (A₃). The second factor is cow manure fermented consisting of three levels, namely without cow manure (B₀), cow manure 5 tons ha⁻¹ (B₁), cow manure 10 tons ha⁻¹ (B₂) with 3 replications so that there are 36 experimental units. The variables observed in this study were: cob length (cm), cob diameter (cm), number of seed rows, cob weight with husk (g), cob weight without husk (g) productivity of sweet corn plants (ton ha⁻¹) and kinds of weeds and their absolute density. The results showed that the highest average corn crop productivity was obtained in the treatment without biofertilizer-AMF and cow manure fermented 10 tons ha⁻¹ (A₀B₂) as 8.52 tons ha⁻¹. If the combination of treatments contained biofertilizer-AMF and cow manure fermented, the highest average productivity of sweet corn was obtained in the treatment of biofertilizer-AMF 5 g/planting hole and cow manure fermented 10 tons ha⁻¹ (A₁B₂) as 7.19 tons ha⁻¹. The highest weed density from broadleaf is *H.capitata* (34.167%), from grasses is *I.cylindrica* (32.432%) and from sedges is *Cyperus* sp (30.21%).

Keywords: Sweet Corn; Production Components; Biofertilizer; Arbuscular Mycorrhiza Fungi; Dugs Manure; Weeds

1. Introduction

Sweet corn is one type of plant that is widely cultivated in the tropics and harvested young which has high economic value because the price is quite expensive. According to [1] the advantage of producing sweet corn is a short harvest time and high selling prices. Sweet corn has relatively high nutritional and sugar content, so it is very popular with people both in rural and urban areas. The difference in taste between sweet corn and regular corn lies in the sugar content. [2], stated that sweet taste in sweet corn occurs because carbohydrates in corn kernels contain reducing sugars (glucose and fructose), sucrose, polysaccharides and starch.

The effort to cultivating sweet corn cannot be separated from obstacles which include limited soil fertility and the presence of weeds that grow in the planting area. Nutrient is an important factor that influences plant growth and

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development. The availability of nutrients in the soil due to intensive crop cultivation has caused the availability of these elements to be reduced, especially macro nutrients such as nitrogen, phosphorus and potassium due to transported yields [2]. Therefore, fertilization is needed to improve soil fertility.

The presence of weeds in the area of cultivated plants can cause competition with plants. The results of the study of [3] showed that competition of weeds with maize caused a decline in yield of 16-62%. The types of weeds that grow in the area of plants are very important to know in order to increase the ability of plants to compete with weeds. The one of method to increase the ability of plants to compete with weeds (competitive ability) is fertilization [4]. Result of research [5] showed that the application of Nitrogen (N) fertilizer with dosages as 200 kg ha⁻¹ can reduce weed density and increase weed dry weight when compared to without the application of nitrogen fertilizer.

The types of fertilizers that can be used are bio-fertilizer and organic fertilizer. The bio-fertilizer commonly used in corn plants is mycorrhiza fungi. [6] stated that the type of biological fertilizer containing solvent phosphate bacteria and arbuscular mycorrhiza fungi is more suitable for use in acidic soils. The results research [7] show that mycorrhiza fungi application can increase maize production ranging from 7.90 to 8.60 tons ha⁻¹ compared to not using mycorrhiza fungi as 5.50 tons ha⁻¹. Likewise the research results of [8] showed that the application of mycorrhiza fungi at a dose of 40 g/planting hole gave the best results on the growth and production of sweet corn in dry marginal land. While the use of organic fertilizer at a dose of 22.5 kg/plot gives the best results on the dry weight of corn plants [9] and causes a shift in the dominance of weed species [10]. This shows that the use of manure combined with arbuscular mycorrhiza fungi with a certain dose is able to provide a response to the growth and yield of corn plants to the fullest.

2. Material and methods

This research was conducted in the village of Rambu-Rambu Jaya, District of Ranomeeto Barat, South Konawe Regency, Southeast Sulawesi in November 2018 to April 2019. Land management and tillage was carried out using a hand tractor in an area of 50 m x 10 m. Then the soil is smoothed and leveled using a hoe. All weeds or vegetation roots that are above the soil surface are collected and removed to facilitate the creation of experimental plots. Each plot was made measuring 3 m x 2 m, drainage width between groups of 50 cm and width of drainage between plots in groups of 25 cm.

Application of cow manure fermented is carried out one week before planting corn by spreading the soil surface bag. To speed up the process of dissolving fertilizer into the soil, mixing is done with the soil using a hoe. The application of mycorrhiza fungi is carried out at the same time as planting sweet corn. The location of mycorrhiza fungi is under the seeds of sweet corn. Sweet corn is planted using hoe with a depth of ±10 cm, spacing as 40 cm x 70 cm.

This study uses a randomized complete block design (RCBD) in factorial patterns with two factors. The first factor is biofertilizer-Arbuscular mycorrhiza fungi (biofertilizer-AMF) which consists of four levels, namely without biofertilizer-AMF (A₀), biofertilizer-AMF 5 g/planting hole (A₁), biofertilizer-AMF 10 g/planting hole (A₂), biofertilizer-AMF 15 g/planting hole (A₃). The second factor is cow manure fermented consisting of three levels, namely without cow manure (B₀), cow manure 5 tons ha⁻¹ (B₁), cow manure 10 tons ha⁻¹ (B₂) with 3 replications so that there are 36 experimental units.

The variables observed in this study were: cob length (cm), cob diameter (cm), number of seed rows, cob weight with husk (g), cob weight without husk (g) productivity of sweet corn plants (ton ha⁻¹) and kinds of weeds and their absolute density at 28 day after planting (DAP). According to [11], to calculate the density of weeds used a formula:

Absolute weed density = number of individual species in the treatment plot. weed density, is the percentage of weed density growing from each different species in each sample plot, by comparing the number of individual species divided by the total number of all individual species in each sample plot times one hundred percent.

$$\text{weed density} = \frac{\text{number of individual species}}{\text{Total all species}} \times 100$$

Data on components of maize yields were analyzed according to the design of the study, if significant and very significant effect was followed by Duncan's Multiple Range Test (DMRT) at 95% confidence level, whereas the weeds data were tabulated simply.

3. Results

3.1. Recapitulation analysis variance for yield components

Table 1 Recapitulation of the variance analysis component production of sweet corn with treatment of biofertilizer-AMF and cow manure

No	Observation variable	Biofertilizer-AMF (A)	Cow manure (B)	Interaction (A*B)
1	Cob length(cm)	ns	ns	ns
2	Cob diameter (cm)	**	ns	*
3	Number of seed rows	ns	ns	ns
4	Cob weight with husk (g)	ns	ns	**
5	Cob weight without husk(g)	ns	*	**
6	Productivity (ton ha ⁻¹)	ns	*	**

Notes: ns= no significant, *= significant, **= very significant, AMF= Arbuscular Mycorrhiza Fungi

Table (1) showed that biofertilizer-AMF had no significant effect on all observations variable, except that it had a very significant effect on cob diameter. Cow manure has no significant effect on all observations variable, except it has a significant effect on the weight of the cobs without husk and productivity. The interaction between biofertilizer-AMF and cow manure had a very significant effect on the weight of cob with husk, the weight of cob without husk and productivity with had a significant effect on the cob diameter, but had no significant effect on the cob length and number of seed rows.

3.2. Yield components

The interaction of biofertilizer-AMF and cow manure has a significant effect on cob diameter, cob weight with husk (g) and cob weight without husk (Table 2).

Table (2) showed that the highest average of cob diameter was found in combination treatment of biofertilizer-AMF 10 g/planting hole and without cow manure (A₂B₀) as 4.44 cm which it was not significantly different from with other treatments. If the treatment combination is biofertilizer-AMF and cow manure, then the best average of cob diameter in the biofertilizer-AMF 10 g/planting hole and cow manure 6 ton ha⁻¹ (A₂B₂) as 4.30 cm. The average cob weight with husk and without husk highest were obtained in combination treatment of without biofertilizer-AMF and cow manure 3 ton ha⁻¹ (A₀B₁) respectively 336.67 g and 238.67 g, which were significantly different from the without biofertilizer-AMF and without cow manure (A₀B₀) with without biofertilizer-AMF and cow manure 6 ton ha⁻¹ (A₀B₂).

3.3. Productivity

Table (3) shows that the highest average productivity of sweet corn obtained at combination treatment of without biofertilizer-AMF and cow manure 6 ton ha⁻¹ (A₀B₂) as 8.52 tons ha⁻¹ which was significantly different from with the combination treatment without biofertilizer-AMF and without cow manure (A₀B₀), without cow manure and cow manure 6 ton ha⁻¹ (A₀B₂). If the combination of treatments contained biofertilizer-AMF and cow manure, the highest average productivity of sweet corn was obtained in the biofertilizer-AMF 5 g/planting hole and cow manure 6 ton ha⁻¹ (A₁B₂) as 7.19 tons ha⁻¹.

3.4. Weeds density

The results of observations of the density of each weed species at 28 day after planting (DAP) in the experimental plot on the combination treatment of the biofertilizer-AMF and cow manure are presented in (Table 4). The highest weed density of broadleaf are: *B. repens* as 7.3 - 22.9%, *H. capitata* as 14.5 - 34.3% and *L. crustacea* as 0.5 - 12.4%. The highest weed density of grass is: *I. cylindrica* as 0.5 - 32.4%. The highest weed density sedges are: *C. kyllingia* as 1.2-12.7%, *C. rotundus* as 1.3 - 41.8% and *F. miliaceae* as 1.3 - 30.3%.

Table 2 Effect of interaction between biofertilizer-AMF and cow manure on the yield component of sweet corn

Cow manure	Biofertilizer-AMF			
	Without biofertilizer-AMF (A ₀)	Biofertilizer-AMF 5 g/planting hole (A ₁)	Biofertilizer-AMF 10 g/planting hole (A ₂)	Biofertilizer-AMF 15 g/planting hole (A ₃)
	Average of cob diameter (cm)			
Without cow manure (B ₀)	3.83 b	3.62 b	4.44 a	4.18 a
	qr	r	p	pq
Cow manure 3 ton ha ⁻¹ (B ₁)	4.25 a	4.04 a	4.19 a	4.04 a
	p	p	p	p
Cow manure 6 ton ha ⁻¹ (B ₂)	4.14 ab	4.18 a	4.30 a	4.23 a
	p	p	p	p
DMRT 95%	2 = 0.35	3 = 0.37	4 = 0.38	
Cow manure	without biofertilizer-AMF (A ₀)			
	Without biofertilizer-AMF (A ₀)	Biofertilizer-AMF 5 g/planting hole (A ₁)	Biofertilizer-AMF 10 g/planting hole (A ₂)	Biofertilizer-AMF 15 g/planting hole (A ₃)
	Average of weight cob with husk (g)			
Without cow manure (B ₀)	180.17 c	247.33 a	289.17 a	252.50 a
	q	p	p	p
Cow manure 3 ton ha ⁻¹ (B ₁)	336.67 a	231.33 a	254.17 a	233.00 a
	p	q	q	q
Cow manure 6 ton ha ⁻¹ (B ₂)	244.50 b	268.00 a	267.00 a	270.00 a
DRMT 95%	2 = 50.12	3 = 51.80	4 = 53.32	
Cow manure	Without biofertilizer-AMF (A ₀)	Biofertilizer-AMF 5 g/planting hole (A ₁)	Biofertilizer-AMF 10 g/planting hole (A ₂)	Biofertilizer-AMF 15 g/planting hole (A ₃)
	Average of cob without husk (g)			
Without cow manure (B ₀)	130.33 b	163.83 b	208.50 a	180.83 a
	r	qr	p	pq
Cow manure 3 ton ha ⁻¹ (B ₁)	238.67 a	178.83 ab	193.50 a	170.83 a
	p	q	q	q
Cow manure 6 ton ha ⁻¹ (B ₂)	155.78 b	201.33 a	192.67 a	198.50 a
	q	p	p	p
DMRT 95%	2 = 37.17	3 = 39.03	4 = 40.18	

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

Table 3 Effect of interaction between biofertilizer-AMF and cow manure on the productivity of sweet corn (ton ha⁻¹)

Cow manure	Biofertilizer-AMF			
	Without biofertilizer-AMF (A ₀)	Biofertilizer-AMF 5 g/planting hole (A ₁)	Biofertilizer-AMF 10 g/planting hole (A ₂)	Biofertilizer-AMF 15 g/planting hole (A ₃)
Without cow manure (B ₀)	4.65 b	5.85 b	7.45 a	6.46 a
	r	qr	p	pq
Cow manure 3 ton ha ⁻¹ (B ₁)	8.52 a	6.39 a	6.91 a	6.10 a
	p	q	q	q
Cow manure 6 ton ha ⁻¹ (B ₂)	5.56 b	7.19 a	6.88 a	7.09 a
	q	p	pq	pq
DMRT 95%	2 = 1.33	3 = 1.39	4 = 1.43	

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

Table (4) shows that the number and species of weeds that grew in each trial plot varied in each combination treatment of biofertilizer-AMF and cow manure. The number of weeds that grow in combinations without biofertilizer-AMF and cow manure (A₀B₀, A₀B₁, A₀B₂) are 13-20 species, in a combination treatment of biofertilizer-AMF 5 g/planting hole and cow manure levels (A₁B₀, A₁B₁, A₁B₂) are 14-17 species, in a combination treatment of biofertilizer-AMF 10 g/planting hole and the level of cow manure (A₂B₀, A₂B₁, A₂B₂) are 13-14 species and at a combination treatment of biofertilizer-AMF 15 g/planting hole and the level of cow manure (A₃B₀, A₃B₁, A₃B₂) is 12-14 species. Weed species found in each experimental plot were broadleaves as 7-13 species, grasses as 1-3 species and sedges as 2-3 species. The average weed density of broadleaves as 67.33%, grasses as 13.15% and sedges as 19.3%.

Table 4 Weed density on each plot with treatment of biofertilizer-AMF and cow manure

No.	Kinds of weed	Family	Treatment											
			A0B0	A0B1	A0B2	A1B0	A1B1	A1B2	A2B0	A2B1	A2B2	A3B0	A3B1	A3B2
1	<i>Ageratum conyzoides</i> L.	Asteraceae	-3.08	0.31	0	0	0.44	0	0	0	0	0	0.72	0
2	<i>Borreria alata</i> (Aubl.) DC	Asteraceae	7.48	6.27	0.48	0	1.32	0	3.08	0	1.80	2.20	0	2.59
3	<i>Borreria repens</i> DC	Rubiaceae	22.43	12.54	9.09	19.55	11.84	17.57	18.46	15.43	8.56	29.67	17.99	29.31
4	<i>Cyperus kyllingia</i> Endl	Ciperaceae	5.61	4.70	11.48	0	2.63	0	13.85	5.56	2.70	1.10	5.04	0
5	<i>Cyperus rotundus</i> L.	Ciperaceae	0.93	1.57	11.48	3.76	8.33	2.03	0	2.47	5.41	3.30	3.60	5.17
6	<i>Cyperus</i> sp	Ciperaceae	0	8.15	6.70	16.54	16.67	23.65	0	12.35	25.68	14.29	3.60	6.03
7	<i>Digitaria ciliaris</i> (Retz.) Koel.	Ciperaceae	0.93	2.82	0	0	0	1.35	12.31	1.85	0	1.10	2.16	1.72
8	<i>Digitaria</i> sp	Ciperaceae	8.41	0	0	0.75	0	0	0	0	1.35	0	0	0
9	<i>Phyllanthus niruri</i> (Auct)	Phyllantaceae	2.80	3.45	7.66	6.77	5.26	2.70	3.08	3.70	1.35	0	1.44	4.31
10	<i>Eleusine indica</i> (L.) Gaertn	Poaceae	0	0.63	2.87	0	1.75	0.68	4.62	0	1.35	0	15.11	0
11.	<i>Eragrostis tenella</i> (L.) Beauv.ex R.&S.	Poaceae	0	0	0	0	11.40	0	1.54	0	0	0	0	0
12.	<i>Eriocaulon heterolepis</i> Steud.	Eriocaulaceae	0.93	0	0	0	0.88	0	0	0	1.35	0	0.72	1.72
13.	<i>Eupatorium odorata</i> L.	Asteraceae	0	7.21	4.78	0	2.19	0	1.54	0	0.45	0	7.19	0
14.	<i>Glinus oppositifolius</i> (L.) DC1	Glinus oppositifolius	0	0	0	0	0	0	0	0	0	0	0	0
15.	<i>Gomphrena celosioides</i> Mart.	Gomphrena celosioides	0	0	0.48	0	0.88	0	0	0	0	0	0	0
16.	<i>Hedyotis diffusa</i> Wild	Rubiaceae	4.67	24.76	16.27	16.54	0	7.43	13.85	14.20	7.21	8.79	0	5.17
17	<i>Hyptis capitata</i> Jacq	Lamiaceae	14.02	15.36	19.14	20.30	17.98	25	13.85	24.69	19.37	14.29	30.94	30.17

No.	Kinds of weed	Family	Treatment											
			A0B0	A0B1	A0B2	A1B0	A1B1	A1B2	A2B0	A2B1	A2B2	A3B0	A3B1	A3B2
19	<i>Lindernia antipoda</i> (L.) Alston	Linderniaceae	0	1.88	0	2.26	0.44	0.68	0	0	0	0	0	1.72
20	<i>Lindernia crustacea</i> (L.) F.v.M.	Linderniaceae	12.15	6.90	0.48	4.51	1.32	6.08	4.62	5.56	6.31	6.59	5.04	5.17
21	<i>Lindernia</i> sp	Linderniaceae	1.87	1.25	3.83	1.50	5.70	0	0	4.32	1.35	1.10	4.32	2.59
22	<i>Ludwigia hyssopifolia</i> (G.Don) Exell	Onagraceae	0	0.94	1.44	0	2.19	4.05	1.54	3.70	8.11	0	2.16	0
23	<i>Oxalis corniculata</i> L.	Oxalidaceae	0	-	0.96	0	0	-	-	0	0	0	0	0
	TOTAL		96.9231	100	100	100	100	100	100	100	100	100	100	100

Table 5 Weed density (%) for each combination treatment of biofertilizer-AMF and cow manure

No	Weeds	Combination treatment											Average	
		A0B0	A0B1	A0B2	A1B0	A1B1	A1B2	A2B0	A2B1	A2B2	A3B0	A3B1		A3B2
1	Broadleafes	7	11	11	7	13	7	9	7	9	6	8	8	8.58
2	Grasses	4	3	2	2	3	3	3	2	4	2	3	3	2.83
3	Sedges	2	3	3	2	3	2	1	3	3	3	3	2	2.50
	Total	13	17	16	11	19	12	13	12	16	11	14	13	
						Weed density (%)								
1	Broadleafes	65.42	80.88	64.59	71.43	60.96	63.51	61.54	71.60	54.50	62.64	69.78	81.03	67.33
2	Grasses	28.04	4.70	5.74	8.27	11.40	10.81	24.62	8.02	11.71	18.68	17.99	7.76	13.15
3	Sedges	6.54	14.42	29.67	20.30	27.63	25.68	13.85	20.37	33.78	18.68	12.23	11.21	19.53
	Total	100	100	100	100	100	100	100	100	100	100	100	100	

4. Discussion

4.1. Variance analysis for yields components:

The results showed that biofertilizer-AMF and cow manure were able to support the production component of sweet corn plants (Table 1). The interaction between biofertilizer-AMF and cow manure has a very significant effect on the cob length, cob diameter, number of seed rows, cob weight with husk, cob weight without husk and productivity. This shows that biofertilizer-AMF and organic fertilizer from cow manure can improve the yield component of sweet corn plants. The results research [9] showed that the combination of mycorrhiza fungi and organic fertilizer can improve the components of maize production in marginal dry land.

4.2. Yield components

The results showed that the highest average cob diameter was found in combination treatment of biofertilizer-AMF 10 g/planting hole and without cow manure (A_2B_0) as 4.44 cm which it was not significantly different from with other treatments. The highest weighted and non-bound ear cobs were obtained in the combination treatment of without biofertilizer-AMF and cow manure 3 tons ha^{-1} (A_0B_1) respectively 336.67 g and 238.67 g, which were significantly different from with without biofertilizer-AMF and without cow manure (A_0B_0) with without biofertilizer-AMF and cow manure 6 ton ha^{-1} (A_0B_2) (Table 2). This shows that mycorrhiza fungi greatly affect to cob diameter even though organic fertilizer is not given. [12], states that the role of mycorrhiza fungi for host plants is to enlarge the area of root hair uptake through the formation of mycelium around the roots. Meanwhile, if no mycorrhiza fungi are given, the application of organic fertilizer can affect the cob weight with husk and cob weight without husk. The result research [13], cow manure fertilizer contains a number of nutrients or organic matter that can improve the physical properties of the soil that affect the components of plant growth and yield.

4.3. Productivity

The highest average corn crop productivity was obtained at combination treatment of without biofertilizer-AMF and cow manure 6 ton ha^{-1} (A_0B_2) as 8.52 tons ha^{-1} which was significantly different from with combination treatment combination treatment without biofertilizer-AMF and without cow manure (A_0B_0), without cow manure and cow manure 6 ton ha^{-1} (A_0B_2) (Table 3). Interaction occurs because of the influence of the two treatments so that mycorrhiza fungi can associate with plant roots and develop in them in order to obtain nutrients to the host plant in the form of P nutrients so that it can expand the reach of plant roots and can take nutrients in the soil. [14] stated that the application of arbuscular mycorrhiza fungi without fertilization was not effective against corn plants on marginal dry land. To be effective, high manure must be applied with a dose of arbuscular mycorrhiza to increase plant growth and production. [15] said that the increase in ear production was thought to be related to the P element that contributed to generative growth, especially the formation of cob. [16] suggested that the P element plays an important role in the process of energy transfer and photosynthesis.

4.4. Weed density

Weed observations at 28 day after planting (DAP) were found in combination treatment of without biofertilizer-AMF and cow manure 3 tons ha^{-1} (A_0B_1) as 26 species consisting of 17 from broadleaf with different density levels, namely: *B.alata* (3.21%), *H.capitata* (18.21%), *B.repens* (15.36%), *L.crustacea* (7.14%), *H.diffusa* (25.36%), *T.procumbens* (0.00%), *Lindernia* sp (2.14%), *Ludwigia* sp (0.00%), *E.odorata* (1.430%), *A.conyzoides* (0.71%), *P.niruri* (4.29%), *L.hyssopifolia* (1.43%), *L.antipoda* (0.36%), *V.cinerea* (0.00%), *A.sessilis* (0.00%), *P.debilis* (0.00%). There are 6 kinds of weeds species from grasses in the treatment of biofertilizer-AMF 15 g/planting hole and without cow manure (A_3B_0) are: *I.cylindrica* (32.43%), *E.tenella* (0.00%), *E.indica* (0.00%), *D.ciliaris* (1.80%), *E.heteroleppis* (0.00%), *Digitaria* sp (0.00%). The are 3 species from sedges at the combination treatment of biofertilizer-AMF 10 g/planting hole and cow manure 6 ton ha^{-1} (A_2B_2) are: *C.rotundus* (5.53%), *C.kyllingia* (5.11%), *Cyperus* sp (30.21%). This shows that the application of biofertilizer-AMF and organic fertilizers from cow manure at various doses with the treatment of soil treatment before planting can influence the weed density. The incidence of seed dormancy is caused by an increase in soil temperature after the cleaning of vegetation by mechanical means followed by soil tillage [17]. The highest weeds density from broadleaf weeds is *H.capitata* (34.167%), grasses is *I.cylindrica* (32.432%) and sedges is *Cyperus* sp (30.21%). The high density of *H.capitata*, *I.cylindrica* and *Cyperus* sp thought to have something to do with the nature of seeds or weed vegetative development organs that do not experience dormancy. [17], indicates that the kinds of weeds that do not grow are still experiencing dormancy.

5. Conclusion

Based on the results and discussion it can be concluded as follows: the highest average productivity of corn plants obtained at combination treatment of without biofertilizer-AMF and cow manure 6 ton ha⁻¹ (A₀B₂) as 8.52 tons ha⁻¹, if the combination of treatments contained biofertilizer-AMF and cow manure, the highest average sweet corn productivity was obtained in the biofertilizer-AMF 5 g/planting hole and cow manure 6 ton ha⁻¹ (A₁B₂) as 7.19 tons ha⁻¹. The highest weed density from broadleaf is *H.capitata* as 34.167%, grasses is *I.cylindrica* as 32.432% and sedges is *Cyperus* sp as 30.21%.

Compliance with ethical standards

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Author's contribution

Halim and Fransiscus Suramas Rembon designed and performed the experiments and also wrote the manuscript. La Karimuna, Yulius Bara Pasolon and Sahta Ginting were reviewed the manuscript. Robiatul Adawiah, La Ode Santiadji Bande and Aminuddin Mane Kandari were collected the data, analyzed and interpreted the data. All authors read and approved the final version.

Disclosure of conflict of interest

All authors declared that present study was performed in absence of any conflict of interest.

References

- [1] Septian NAW, Nurul, A and Ninuk, H Effect of organik fertilizer on growth and yield of sweet corn (*Zea mays* Saccharata) in intercropping with kangkung (*Ipomea reptans*). Jurnal Produksi Tanaman, 2015; 3(2):141-148.
- [2] Kriswanto, H, Etty, S, Syamsul, B. Pemberian pupuk organik dan pupuk NPK pada tanaman jagung manis (*Zea mays* Saccharata Sturt.). Jurnal Klorofil 2016; XI (1):1-6.
- [3] Sasmita, ER, Hardiastuti, S and Dalia. The use of Paraquat herbicide in different system of soil tillage in soybean farm. Proceeding of the 16th National Conference of Weed Science Society of Indonesia (WSSI), July 2003; 15-17, Bogor Indonesia.
- [4] Mubarak, AFM, Eko, W and Husni TS Weed control on various levels of nitrogen fertilizati on growth and yield of Potato (*Solanum tuberosum* L.). Jurnal Produksi Tanaman, 2014; 2(7):542-551.
- [5] Chamanabad, HRM, Asghari, A, and Nateghi G. Effect of nitrogen rates on critical period for weed control in potato. Pak. J. Weed Sci. Res. 2011; 17(1):33-40.
- [6] Prihastuti and Purwanto. The assessment on the usage of commercial bio-fertilizer to peanut at acid dry soil, Lampung. Sains & Matematika, 2014; 3(1):7-12.
- [7] Halim. The role of indigenous mycorrhiza on maize and *Ageratum conyzoides* L. competitiv index. Berkala Penelitian Agronomi, 2012; 1(1):86-92.
- [8] Halim, Makmur, J.A., Fransiscus, S.R., Resman. Impact of mycorrhiza fungi from grassland rhizosphere and liquid organic fertilizer to the growth and yield of sweet corn on Ultisols in South Konawe, Indonesia. Agriculture, Forestry and Fisheries, 2015; 4(5):209-215.
- [9] Halim, Makmur, JA, Karimuna, L., Fransiscus, SR and Resman. Effect of mycorrhiza fungi propagules and bokashi fertilizer combination to weed density, growth and yield of maize (*Zea mays* L.) on marginal dry land in Regency of Kendari, Indonesia. International Journal of Development Research, 2016; 06(09):9568-9575.
- [10] Hutapea, C, Mirodi, S and Albertus, S Effect of different types of organic fertilizer on the invasive weed species. Jurnal AIP, 2015; 3(1):21-33.

- [11] Tjitrosoedirdjo, S, Utomo, IH dan J Wiroatmodjo, J Pengelolaan Gulma di Perkebunan. Gramedia Pustaka Utama. Jakarta. Indonesia. 1984;210p
- [12] Moelyohadi, Y, Harun, MU, Munandar, Hayati, R dan Gofar, N. The effect of the combination of organic and biological fertilizers on the growth and production of maize (*Zea mays* L.) strains resulting from nutrient efficient selection on marginal dry land. J.Land Suboptimal. 2013; 2(2):100-110.
- [13] Nugroho, YS Pengaruh dosis pupuk kandang sapi dan jenis cendawan mikoriza arbuskular terhadap pertumbuhan tanaman purwoceng (*Pimpinella pruatjan Molkenb*) di kecamatan Selo, Boyolali. Skripsi Fakultas pertanian. Universitas Sebelas Maret. Yogyakarta. Indonesia.2010.
- [14] Hasid, R, Wardiyati, T, Sastrahidayat IR, and Guritno, B. Utilization of arbuscular mycorrhizal rizosphere *Imperata cylindrica* to increase the yield of corn in podzolic soil: studi of arbuscular mycorrhizal diversity. International Journal of Biosciences. 2014; 5(8):101-107.
- [15] Hasanudin. Peningkatan ketersediaan dan serapan N dan P serta hasil tanaman jagung melalui inokulasi mikoriza, azotobacter dan bahan organik pada Ultisol. Jurnal Ilmu Pertanian Indonesia. 2003; 5(2):83-89.
- [16] Wijaya dan Wahyuni, S Respon tanaman jagung manis kultivar Hawaiian super sweet pada berbagai takaran pupuk kalium. Jurnal Agrijati 2007; 6(1):42-47.
- [17] Halim, Tresjia, CR, Sarawa, Muhidin, Abdul, M, Muhammad, T, Resman, Waode Siti, AH and Aminuddin, MK. Weed density, growth and yield of sweet corn (*Zea mays* Saccharata (Sturt.) Bailey) after treatment with mycorrhiza fungi on marginal dry land. Bioscience Research, 2018; 15(1):466-473.