Jurnal Peternakan Integratif

Effect of Eco Enzymes Concentration on Growth and Production of Kembang Telang Plant*(Clitoria ternatea L.)* as Animal Feed

S. D. B. J. Sembiring[1], N. Ginting[1*], S. Umar[1], and S. Ginting[2]

[1]Animal Production Program Study, Faculty of Agriculture, University of North Sumatera, Padang Bulan, Medan 20155, Indonesia
[2] Research Centre for Goat And Forages, Sei Putih, Galang, Sumatera Utara
** Correspondent author: nurzainahginting@gmail.com*

Abstract : KembangTelang plant is a legume that contains high protein for animal feed.This research aim to investigate the effect of giving Eco Enzymes (EE) at different concentration on the growth and production of KembangTelang plant *(Clitoria ternatea L.)* and it was conducted at the Compost Center, Faculty of Agriculture, University of North Sumatra from October to December 2020. Research design was used a completely randomized design with two factors, namely Eco Enzymes concentration and watering application using plant infusion which was regulated by dropping rate. There were 3 treatments and 3 replications. The first factor were the concentration of Eco Enzymes, i. e K1=1% , K2=0,5%, K3=0,33%. The second factor were watering with a plant infusion system or a regulated dropping rate, T1= slow drop, T2= medium drop, and T3= quick drop. The parameters observed were plant height, number of leaves, number of branches, stem diameter, leaf width, production of fresh matter and production of dry matter.

The results showed that the concentration of Eco EnzymesK1 1% gives a very real effect (P< 0.01) on the parameters of plant height, number of leaves, number of branches, and production of fresh matter, while on the parameters of stem diameter gives a real influence (P<0.05), and gives an unreal influence (P>0.05) on the parameters of leaf width, dry matter production and the use of plant infusion. The best response of Eco Enzymes administration was of 1% concentration.

Key words : *clitoria ternatea L.*, concentration, droplet, eco enzymes

Received [8 April2021] | Revised [25 April 2021] | Accepted [12 May 2021]

1. Introduction

Organic waste in Indonesia is currently available abundance, and has not been used properly, and has even caused various problems to the environment. Most of agricultural waste comes from vegetable and fruit waste. About 60% of urban organic waste is vegetables and the rest is fruit waste[1]. Market waste, such as vegetables and fruit is relatively uniform in type, mostly in the form of organic waste so that it is easier to handle [2]. Waste originating from residential areas is generally very diverse, but in general, at least 60% consists of organic waste and the rest is inorganic waste [1]. For that an effort in the management of organic waste through the manufacture of Eco Enzymes (EE) from organic waste is needed.

Eco Enzymes is a solution of complex organic substances produced from the fermentation process of organic waste, sugar and water. Eco Enzymes liquid has a dark brown color and strong sour / fresh aroma [3]. Eco Enzymes can accelerate biochemical reactions in nature . The composition of organic matter in Eco Enzymes produces a chain of complex proteins, hormones, organic acids, enzymes, and mineral salts[4]. Eco Enzymes has a pH of 3.5 [5] and EE have been utilized to increase crop production even though Eco Enzymes are not fertilizers but biocatalysts. Eco Enzymes applications are generally done manually [6].

Provision of water and nutrients to plants can be done either manually or using drip irrigation by utilizing plant infusions on its application. Drip irrigation is a way of giving water a little at a time. Provision of water through drip irrigation can provide water slowly so that it can be absorbed more optimally for plants. Drip irrigation is a way of providing water and nutrients by dripping water through pipes or channels around plants or along plant lines according to plant needs[7].

2. Research Methods

2.1. Materials

The materials used were seeds of kembang telang plant *(Clitoria ternatea* L.), Eco Enzymes, polybags, plant infusion, camera, gauges, and growing media (soil, water).

2.2. Methods

This research used a completely randomized design(CRD). The treatments used in this research were:

Treatment A

K1 :Concentration 1%

K2 :Concentration 0,5%

K3 :Concentration 0,33%

Treatment B

T1 :Slow drop (12 drops / minute)

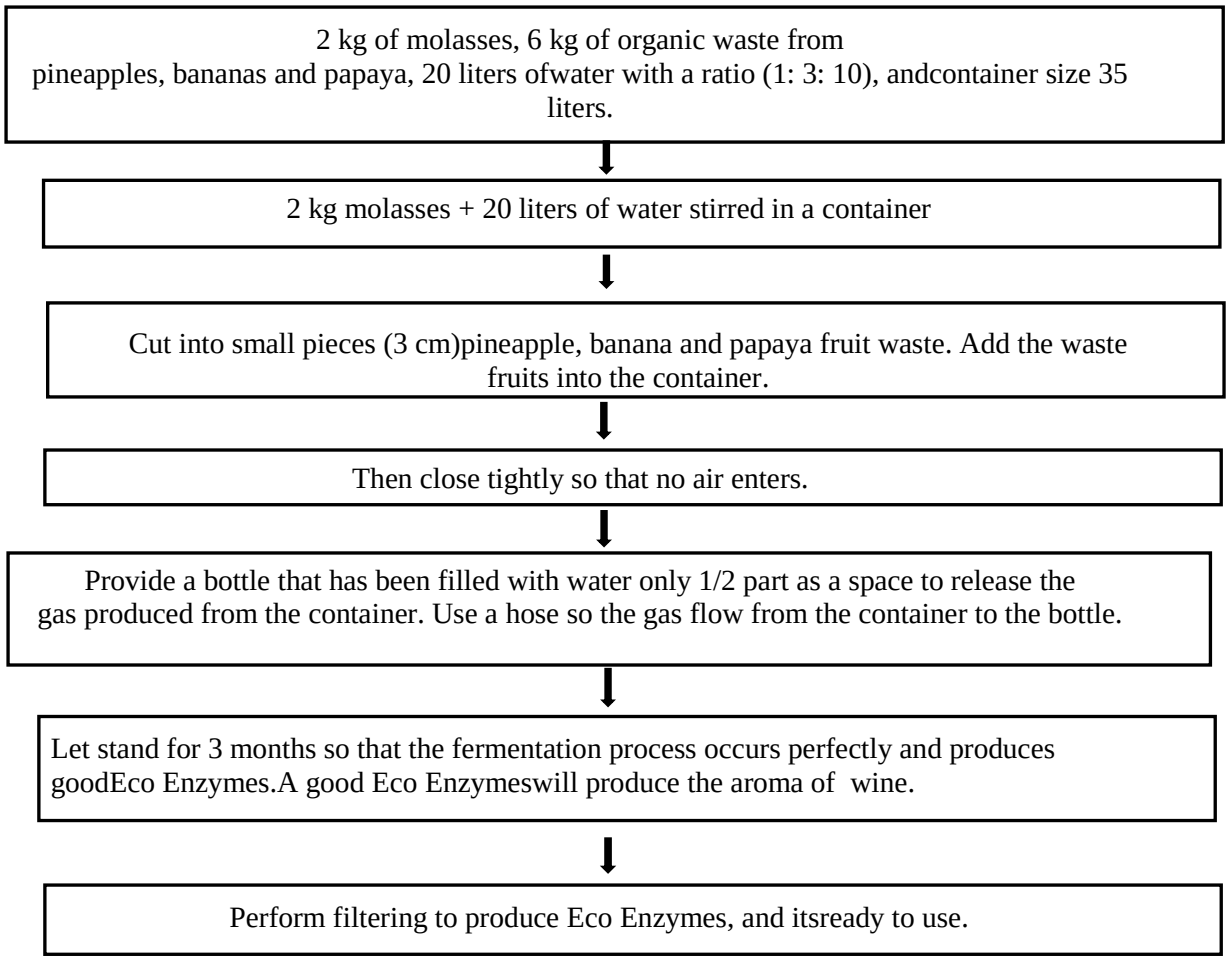
T2 : Medium Drop (20 drops / minute)

T3 : Quick Drop (60 drops / minute)

Kembangtelang plant was planted in polybag capacity 5 kg. Watering was conducted everyday using plant infusion in accordance with the specified field capacity which was 360 ml/polybag.

2.3 Research Implementation

2.3.1 Making of Eco Enzymes



2.3.2 Research Parameters.

Plant height (cm)

Plant height is measured from the base of the stem just above the soil surface to the end of the growing point of the plant.

Number of leaves

The number of leaves from each treatment was obtained by counting the fully developed leaves.

Number of branches

The number of branches from each treatment can be calculated by counting the fully developed branches.

Stem diameter

Measurement of stem diameter is carried out 5 cm above the soil surface by pinching the plant stems using a caliper.

Width of leaf

Leaf width is obtained by measuring the widest leaf in each treatment using a tape measure.

Production of fresh ingredients

The production of fresh materials is obtained by weighing the forage in fresh form without the drying process.

Dry matter production

The dry matter production is obtained from the fresh ingredients of the kembangtelang plant after weighing, then oven at 600C for 24 hours, then the dry weight of the forage is weighed.

3. Result and Discussion

3.1. Plant height (cm)

The results of the study by giving the concentration of Eco Enzymesand using infusion on the height of the kembangtelang plant *(Clitoriaternatea* L.) is presented in "Table 1"

Table 1. Plant Height (cm) of KembangTelang plant *(Clitoriaternatea L.)*

Treatments	Drops			Means
	T1	T2	T3	
K1	250,00	245,67	257,67	$251,11^{C}$
K2	225,67	233,33	234,00	$231,00^{B}$
K3	195,17	196,33	198,67	$196,72^{A}$
Means	$223,61^{tn}$	$225,11^{tn}$	$230,11^{tn}$	

Note : Different superscripts in the same column show very significant differences (P <0.01), tn = not significant

In the study, an analysis of the content of Eco Enzymes was carried out at the Laboratory of Soil Science, University of North Sumatera, and the content nutrition of C-Organic = 0.38%, N = 0.05%, P = 6.13 ppm, K = 0.91 ppm, and pH = 4.26.The provision of Eco Enzymes concentrations significantly affected the height of the Kembang Telang plant *(Clitoriaternatea* L.) as shown in "Table 1" where the plant height growth for each treatment showed different plant height yields. Giving the concentration of Eco Enzymes at K1 1% showed more effective results than other concentrations. Plant growth is influenced by internal and external factors. One of the internal factors that affect plant height nutrition includes hormones. Referring to this, EE contain nutrition. As K1 has the highest concentration on nutrition thus affect the height of Kembang Telang. EE contains internal elements such as hormones. In K1 treatment, the hormone produced was known to be more due to the more Eco Enzymes that were given. "Table 1" shows the highest average plant height found in treatment K1 1%, which is 251.11

cm. This is because the D1 treatment produces thicker leaves than the other treatments. Thick leaves and the use of crutchcause the main stem to be covered and cause sunlight not to be directly exposed to the main stem, and this condition cause stem grow longer. Connection with internal plant factors, namely hormones, stems that are not exposed to sunlight will be more active to produce the auxin hormone which can accelerate plant height growth. This is in accordance with [8] whom states that sunlight is destructive to auxins, so it will be more in plants that receive less light and result in faster stem elongation. The low intensity of light received by the stem causes auxin in the semi apical part to be more active because high auxin levels are present in growing tissues, for example in meristem tissue.

3.2. Number of Leaves

Giving EE with a concentration of 1% (K1) gave a very real effect on the leaf of KembangTelang plant.

Table 2. Average Number of KembangTelang plant Leaf *(Clitoriaternatea L.)*

Treatments	Drops			Means
	T1	T2	T3	
K1	997,33	1170,00	1020,67	$1062,67^{B}$
K2	857,33	911,33	964,33	$911,00^{A}$
K3	744,00	775,67	922,67	$814,11^{A}$
Means	$866,22^{tn}$	$952,33^{tn}$	$969,22^{tn}$	

Note : Different superscripts in the same column show very significant differences (P <0.01), tn = not significant.

The growth and development of leaves is closely related to the process of cell division, cell extension and cell formation. This process is influenced by compounds such as protein and carbohydrates. Protein is an important element in leaf development, because nitrogen plays a role in the formation of protein. With the increase in the results of photosynthesis, the amount of chlorophyl in the leaves will also increase, where chlorophyll is obtained from the element nitrogen. This is in accordance [9] statement which states that nitrogen plays a role in the formation of leaf green matter (chlorophyl) which is very useful for helping the photosynthesis process and increasing the number of leaves. Leaves are one of the important plant organs as a place for the photosynthesis process to occur.

3.3. Number of branches

Based on “Table 3” it can be seen that giving EE at concentration 1% (K1) has a very significant effect on the number of branches.

Tabel 3. Average number of branches of KembangTelangplant*(Clitoriaternatea* L.)

Treatment	Drops			Means
	T1	T2	T3	
K1	81,33	66,33	76,33	$74,67^{B}$
K2	61,67	69,00	67,33	$66,00^{B}$
K3	52,67	53,00	60,67	$55,44^{A}$
Means	$65,22^{tn}$	$62,78^{tn}$	$68,11^{tn}$	

Note: Different superscripts in the same column show very significant differences (P <0.01), tn = not significant

One of the nutrients contained in EE is nitrogen.The Eco Enzymes in K1 contains higher nutrients compared to other treatments.This element affects plant growth in kembang telang.This element is obtained by plants from the Eco Enzymes that is applied and the soil as the growing medium.This is in accordance with the statement [10]that the availability of nitrogen in the soil can increase the availability of nitrogen for plants which plays a role in the formation of leaf green matter (chlorophyll) for photosynthesis as a process of cooking food in leaves through the help of sunlight, and requires carbon (C), and nitrogen (N) as the main material to produce photosynthate which is needed for the growth of branches, stems, leaves and roots.Sufficient amount of photosynthate in the vegetative phase will cause the emergence of new shoots in plant organs.

4.4. Stem Diameter

In "Table 5", it is known that giving Eco Enzymes at concentration of 1% has a significant effect on stem diameter parameters.

Table 4. Average Stem Diameter of KembangTelangplant (mm)

Treatments	Drops			Means
	T1	T2	T3	
K1	4,97	4,77	4,73	$4,82^{b}$
K2	4,73	4,63	5,03	$4,80^{b}$
K3	4,47	4,13	4,67	$4,42^{a}$
Means	$4,72^{tn}$	$4,51^{tn}$	$4,81^{tn}$	

Note : Different superscripts in the same column show significant differences (P <0.05), tn = not significant.

One of the factors that influence stem diameter is the element nitrogen (N) which acts as an important substance in plants. Nitrogen compounds are used by plants to form amino acids which will be converted into proteins.Nitrogen is also needed to form important compounds such as chlorophyll, nucleic acids and enzymes.Nitrogen is needed in large quantities at every stage of plant growth, especially vegetative growth such as shoot formation or stem and leaf

development [11].

3.5. Leaf Width

For the growth of leaf width, a very significant effect was obtained at a concentration of 1% (K1).

Table 5. Average Width of KembangTelang plant leaf (cm) by application of different concentration of EE

Treatments	Drops			Means
	T1	T2	T3	
K1	2,47	2,47	2,57	2,50^{tn}
K2	2,30	2,40	2,30	2,33^{tn}
K3	2,30	2,37	2,30	2,32^{tn}
Means	2,36^{tn}	2,41^{tn}	2,39^{tn}	

Note :tn= not real

The results showed that D1 and D3 showed a difference in leaf width growth of the kembang telang plant*(Clitoria ternatea L.).*This is due to the difference in the concentration of a given nutrient, the higher the nutrient given can affect the growth and development of the plant, however, giving excess nutrients can cause the plant to wither.Environmental factors are also closely related to the nutrients absorbed by plants, and the photosynthate yield of each plant affects the amount of nitrogen which will affect leaf area which is closely related to the relative growth rate of plants [12].In addition, leaf area is the main determinant of plant growth speed because the wider the leaves, the more plant metabolism will be obtained from photosynthesis so that it is able to meet the plant's needs for growth [13].

3.6. Production of fresh ingredients

The effect of giving EE with different concentrations on the production of fresh matter of KembangTelang plant *(Clitoriaternatea L.)* is presented in “Table 6”

Table 6. Average of Fresh Material Production ofKembangTelang plant (g).

Treatments	Drops			Means
	T1	T2	T3	
K1	208,00	214,33	210,67	211,00^{B}
K2	162,33	179,33	190,33	177,33^{A}
K3	158,00	150,67	179,67	162,78^{A}
Means	176,11^{tn}	181,44^{tn}	193,56^{tn}	

Note: Different superscripts in the same column show very significant differences (P <0.01), tn = not significant.

Giving different concentrations of Eco Enzymes to the kembangtelang had a significant effect

on the production of fresh ingredients. The highest average fresh matter production was found in K1 (1%) which is 211,00 g, and the lowest was in K3 (0,33%) which is 162,78 g, because there are more nutrients in K1. In accordance with the statement [14] which states that with the availability of nutrient needs in plants, both macro and micro nutrients, plant development and productivity will be more effective because organic waste can increase plant growth, but in high concentrations to obtain optimal results. In addition, organic matter can bind C Organic in the soil so that nutrients such as N, P, K, Ca, Mg, and S can be available in the process of plant growth and production.

Nutrient N has an important role in growth, especially in the vegetative phase, which helps in the formation of photosynthate which is then used to form new cells, cell elongation and tissue thickening. Cell division and tissue elongation will run fast in accordance with the increasing supply of carbohydrates, so that stem growth, both plant height, number of leaves and leaf area will run well. So that it can increase plant fresh weight [15].

3.7. Dry Matter Production

The effect of giving EE concentration 1% (K1) on the dry matter production of KembangTelang plant *(Clitoriaternatea* L.).

Table 7. Average Dry Material Production ofKembangTelang plant (g) is presented in "Table 7"

Treatments	Drops			Means
	T1	T2	T3	
K1	21,87	21,77	21,78	$21,81^{tn}$
K2	21,74	21,68	21,77	$21,73^{tn}$
K3	21,81	21,85	21,82	$21,83^{tn}$
Means	$21,81^{tn}$	$21,76^{tn}$	$21,79^{tn}$	

Note :tn = not real.

In "Table 7", the average dry matter production in plants with different concentrations does not have a significant effect on dry matter production. This is presumably due to the influence of rainfall during the study so that it absorbs into the soil and does not have a significant effect on the concentration of Eco Enzymes on dry matter so that the dry matter production in plants is relatively the same in the given treatment. This is in accordance with the statement[16], crop production is also influenced by solar radiation and environmental factors. The factors that influence the dry matter production of the forage include: the type of plant, the growth phase, the time of cutting, ground water, and soil fertility. The dry matter production of plants in the rainy season is relatively low due to faster plant growth, adequate water and humid environmental conditions so that transpiration is reduced.

In accordance with the statement [17] stated that the production of dry matter from forages depends on the availability of soil moisture, plants that grow, and the amount of radiation

obtained. Availability of ground water depends on the amount of rainfall that occurs, the season and the type of soil. The quality of the forage in the rainy and dry season is different. The dry matter content in the rainy season generally has a lower value. This is because irrigation during the rainy season causes the plants not to experience a water crisis and plant growth will be better because the water content in the plants will increase so that the dry matter content from the forage is low.

3.8. Effect of Plant Infusion

In this study, there was no difference in the application of droplets, presumably due to the effect of rainfall, so that the droplet velocity did not affect each treatment. However, the use of plant infusions plays an important role in maintaining soil moisture in each treatment. Drip irrigation is a way of providing water by dripping water or nutrients around the plant. In this case the roots in the plant will be wetted and water will be absorbed quickly in conditions of low soil moisture. The advantage of using drip irrigation is very efficient use of water [18]

Watering applications using an infusion hose are very useful for plant water needs that will be used by plants in metabolic processes. Drip irrigation is the distribution of water and nutrients from sources to plants. In its application, the drip irrigation system has many benefits, including being easier and more efficient in providing water to plants, as well as saving labor. In addition, setting the drip rate in drip irrigation is also beneficial in maintaining soil moisture. In accordance with the statement [19] which states that drip irrigation is a method of providing water to plants directly, both in the root area of plants and on the soil surface through continuous and slow droplets. Efficiency of water use with a drip irrigation system can reach 80-95% [20].

4. Conclusions

Based on the research it was known that the administration of Eco Enzymes in K1 with a concentration of 1:100 (3.6 ml EE: 360 ml of water) gave a very real influence ($P<0.01$) on the parameters of plant height, the number of leaves, the number of branches, and the production of fresh matter, while in the diameter of the stem had a real effect ($P<0.05$). But the administration of Eco Enzymes in K1 with a concentration of 1:100 gave an unreal influence ($P>0.05$) on the parameters of leaf width, dry matter production, as well as the regulation of plant drops. In the results of this study showed that there was no interaction between the two treatment factors, namely concentration and regulation of plant drops.

REFERENCES

[1]Pramono,J. 2004. KajianPenggunaanBahanOrganikPadaTanaman. Agrosains. 6 (1): hal 11-

14

[2] NyimasSepti. 2016. StudiTimbunanSampahPerumahandan Non Perumahan di Kota Palembang, Cantileve, 5 (2), 19-23

[3] Helamatha M dan P. Visantini. 2020. Potential use of eco enzyme for the treatment of metal based effluent. IOP Conf. Series : Materials Science and Engineering 716, 1-6

[4] Palanisamy S and Palani. 2017. Optimization of Lipase Production From Organic Solid Waste By Anerobic Digestion And Its Application In Biodiesel Production. Fuel Process Technol

[5] Tang EE and CW Tong. 2011. A study of the garbage enzymes effect in domestic waste water. World Academy of Eng and Tech 60 1143-48

[6] Marpaung, R. 2013. Estimasi Nilai Ekonomi Air dan Eksternalitas Lingkungan pada Penerapan Irigasi Tetes dan Alur di Lahan Kering Desa Pejarakan Bali. Jurnal 42 Vegetalika.Sosial Ekonomi Pekerjaan Umum, 5(1): 65-75

[7] Muhammad A. 2002. PengaruhLajuIrigasi Serta DosisBahanPengkondisi Tanah Terhadap Tingkat PenahananLengas Tanah Dan ProduksiTanamanPangan Dan HortikulturaPada Tanah Pasir, Bul.Agron. 30(2):31-38

[8] Nurul Hidayah, 2008. Respon Pertumbuhan Stek Salam *(Eugenia polyanta*) Terhadap Lama Penyungkupan Dan PemberianAuksin.Skrispi.JurusanAgronomi. FakultasPertanian. IPB. Bogor. Hal 22

[9] Pranata A.S. 2010. Meningkatkan Hasil Panen Dengan Pupuk Organik. Agromedia Pustaka. Jakarta. Hal 51

[10]Widiana. 2002. Pengaruh Efektif Mikroorganisme (EM4) Terhadap Pertumbuhan dan Produksi Tanaman. Universitas Nasional

[11]Erawan, D., W.O. Yani, dan A. Bahrun.2013. Pertumbuhan Dan Hasil Tanaman Pada Berbagai Dosis Pupuk Urea.Agroteknos 3 (1) : 19-25

[12] Mangoendidjojo, W. 2003. DasarPemuliaanTanaman. PenerbitKanisius, Yogyakarta

[13] Rudi.2002. KacangKupu*(Clitoriaternatea*) LeguminosaHerba Alternative UntukSistem Usaha TaniIntegrasi Sapid AnJagung Di Pulau Timor. Wartazoa 19 (1) : 43-51

[14] Rismunandar. 2003. IlmuKesuburan Tanah. Kanisius, Yogyakarta

[15] Fauzi. 2016. Kombinasi Berbagai Sumber Bahan Organik dan Arang Terhadap Efisiensi Pemupukan Tanaman Bawang Merah di Tanah Pasir Pantai Samas Bantul. Universitas Muhammadiyah Yogyakarta

[16] Gulim. 2007. Sifat Kimia Inceptisol PadaSistem Pertanian Organik. Jurnal Ilmu PertanianVol 10 No. 2, 2003 : 63-69

[17] Williamson and Payne. 2001. DasarPengetahuanIlmuTanaman. Bandung :Angkasa

[18] Prastowo. 2010. IrigasiTetes, TeoridanAplikasi, IPB Press. Bogor.

[19] Hadiutomo. 2012. Pemgaruh Interval Waktu Dan Tingkat Pemberian Air Terhadap Pertumbuhan Dan Hasil Tanaman Kedelai (Glycine max L.).Jurnal Produksi Tanaman. 2

(7) : 552-559

[20] Haryati, U.2014. Teknologi Irigasi Suplemen untuk adaptasi perubahan ilkim pada pertanian lahan kering. Jurnal Sumber daya Lahan 8 (1) : 43-57