Note: Means with a common superscript letter in the same column were not significantly different (P> 0.05) by Duncan's test

The effect of giving fermented *Lemna* sp. meal on the daily growth rate of catfish and tilapia were analyzed using the F Test at 95% confidence level. The F test shows a significantly different result. The addition of higher percentage of Lemna sp to the feed causes a decrease in the value of the daily growth rate in catfish and tilapia. Likewise, food habit differences affect the growth rate, several behavioral responses, feeding habits, frequency of feeding, food detection mechanisms, and food preferences (Santosh and Tibbetts, 2009). Table 2 shows that the growth rate of tilapia is higher compared to catfish at the same dosage of *Lemna* sp. In treatments A and B were significantly different from treatments C and D but treatment A was not significantly different from treatment B. Duncan's test result shows that the administration of 50% *Lemna* sp in feed significantly reduced the growth rate of catfish and tilapia. However, based on the value of the growth rate above, it indicates that the feed provided during the study can be utilized for fish's growth. This can be seen based on the increasing value of the length and weight of the fishes during cultivation.

The level of feed utilization by fish is influenced by the quality of feed ingredients used. The fermentation process in *Lemna* sp. is known to reduce crude fiber content and improve the quality and digestibility. This can be seen in Saputra's (2017) study that the administration 40% of unfermented *Lemna* sp. in artificial feed generate a daily growth rate of 0.30%. While the addition of 40% of fermented *Lemna* sp. Meal in commercial feed generate a daily growth rate of 1.04%. The low value of the growth rate with the addition of non-fermented *Lemna* sp. due to the high content of crude fiber and vegetable protein in feed can inhibit the daily growth rate and cause more energy to be used to digest feed.

The *Lemna* sp in this study was fermented first, so there was an increase in protein content and a decrease in crude fiber, which caused an increase in the daily growth rate of fish (Table 1). This is in line with Handajani (2007) who stated that the advantage of the fermentation process is including an increase in nutrition and storing power, because the fermentation process will remodel complex compounds into simpler compounds, so that they are easily absorbed by the body.

Rostika et al (2017) studies showed that 30 % and 40% administration of *Lemna* sp. Resulted in daily growth rate of 1.10% and 0.83%. While this study proved that with the administration 30% and 40% of fermented *Lemna* sp. Fermentation in artificial feed resulted in daily growth rate of 1.12 and 1.04%. This shows that the value obtained in this study is better than that of Rostika et al (2017). These results may be caused by differences in probiotics used in the fermentation process of *Lemna* sp. in this study. Aquasimbad probiotics were used for fermentation while in Rostika et al (2017) EM4 was used as a probiotic in the fermentation process; Where the number of microbial colonies in Aquasimbad probiotics is more than that of EM4 probiotics. The number of microbial colonies in Aquasimbad probiotics was 10^8-10^9 while probiotics EM4 had 10^7 microbial colonies (Merdana 2016).

Survival Rate

Fish survival is influenced by factors such as age and adaptability to the environment while external factors including abiotic conditions, competition between species, and high density of fingerlings during cultivation. The following is the survival value of Siamese catfish and Nile tilapia in each treatment with cultivation period of 40 days.

Tabel 1. Survival Rate

Treatment	Average of Daily Growth Rate (%)	
	Catfish	Nile Tilapia
A (30)	100,00a	82,22 ± 13,88a
B (40)	100,00a	75,56 ± 10,18a
C (50)	100,00a	77,78 ± 13,88a
D (60)	100,00a	75,56 ± 10,18a

Note: Means with a common superscript letter in the same column were not significantly different (P> 0.05) by Duncan's test

Based on the data obtained, the survival rate of Siamese catfish from all treatments was 100%, while the survival of tilapia is the highest in the addition of 30% Lemna sp (82.22%). Compared with the results of a study by Rostika et al (2017), the administration of 40% of fermented Lemna sp. on commercial feed provides a survival value of 72-84% in tilapia fingerlings. Suhendar's (2017) study showed that the administration of 40% of fermented Lemna sp. in Tawes fish meal resulted in survival rate of 93.94%. Thus the result of administration of fermented Lemna sp. in artificial feed shows that it has no negative effect on fish survival.

The high survival rate of fish is influenced by a number of external factors, such as the environmental conditions. Once a day, the aquariums were syphoned before giving food to ensure that the quality of water during cultivation is always well maintained. Khairuman and Suhenda (2002) supported the claim that good water quality during cultivation provided wellbeing for the fish. According to Effendi (2006), good water quality will affect fish life and fish growth

Water Quality

The water quality parameters observed during the study were temperature, dissolved oxygen and pH. The following is the water quality data obtained during the study (Table 4).

Table 2. Water Quality

Treatment	Start and End		
	Temperature (ºC)	DO (mg/L)	pH
A (30%)	28,7-30,1	4.3-6,1	7,45-7,67
B (40%)	29,2-30,3	5,4-6,1	7,35-7,58
C (50%)	29,6-30,2	4.3-5.9	7,44-7,67
D (60%)	28,9-30,4	4.4-6,2	7,35-7,56

Based on the data from the measurement of water quality during the study, the temperature range obtained from all treatments was not much different, ranging from 28.4ºC-30.4ºC. Heater was added to keep the temperature stable. This result is in accordance Susanto's (2009) statement that stated that the optimal temperature range for fish growth is 25ºC-30ºC.

The pH range obtained during the study was 7.25-7.68. These results are still within the pH tolerance limit for catfish, because according to Kordi (2007) fish growth will be hampered and fish are very sensitive to bacteria and parasites at pH 5 - 6.5. Meanwhile at pH 7-8 new fish can grow optimally. This is in accordance with Susanto's statement (2009) that the optimum pH range that is suitable for catfish is around 6.7-8.6.

Oxygen content is in the range of 4.3-6.2 mg / L. The results obtained are still within tolerance limits based on SNI for fish farming in fresh water. According to SNI (2000) Dissolved oxygen for fish should be more than 4 mg / L. The dissolved oxygen content is quite good due to the addition of an aeration installation which can increase the dissolved oxygen content in the maintenance media. If the dissolved oxygen content is low, it will cause decreased appetite which will affect the growth rate of fish.

CONCLUSION

Based on the results of the research that has been done, it can be concluded that 30% administration of fermented *Lemna* sp. in artificial feed provides the best growth rate value for herbivorous and carnivorous fish. The highest growth rate in catfish is 1.12% and tilapia is 1.40%. While the survival of catfish is 100% and tilapia is 82.22%.

References

[1] Abun. 2010. Efek Fermentasi Ampas Umbi Garut *(Maranta Arudinacea)* Dengan *Asperigillus niger* Terhadap Nilai Kecernaan Ransum Ayam Pedaging. *Artikel Ilmiah*. Fakultas Peternakan. U niversitas padjadjaran. Jatinangor.

[2] Ahmad, M, 2004. Pengaruh Tepung Rumput Laut Sebagai Bahan Perekat Pakan Buatan Terhadap Pertumbuhan dan Sintasan Juvenil Ikan Bandeng, (*Chanoschanos Forsska)*. *Laporan Penelitian*. Jurusan Perikanan. Falkultas Ilmu Kelautan dan Perikanan. Universitas Hasanudin. Makassar

[3] Alexsander M. 1997. *Introduction to Soil Microbiology*, 2nd Edition. New York. USA: John Willey and Sons

[4] Andriani, Y., R. Rostika, K. Haetami dan dan U. Subhan. 2016. *Nutrisi Ikan* Bandung Unpad Press. Bandung

[5] Bairaqi, K. Sarkar Ghosh., SK. Sen., and A.K. Ray. Duckweed *(Lemna polyrhiza)* leaf meal as a source of feedstuff informulated diets for rohu *(Labeo rohita Ham.)* fingerlings after fermentation with a fish intestinal bacterium. Bioresource Technology 85 (2002) 17–24.

[6] Effendi, I. 2006. Pengaruh Padat Penebaran Terhadap Kelangsungan Hidup dan Pertumbuhan Benih Ikan Gurami *(Osphronemus gouramy). Jurnal Akuakultur Indonesia,* 5 (2): 127-135 (2006). Bogor

[7] Handajani, H. 2007. Peningkatan Nilai Nutrisi Tepung azolla Melalui Fermentasi *Artikel Ilmiah*. Jurusan Perikanan Universitas Muhammadiyah. Malang.

[8] Indriati, S. 2005. Efektivitas Pakan Komersial yang Diperkaya Probiotik Aqua Simba –D terhadap Pertumbuhan Benih Ikan Nila Merah *(Oreochromis niloticus)*. Skripsi. Fakultas Pertanian. Universitas Padjajaran

[9] Kordi, M. G. H. K, 2005. *Budidaya Ikan Patin*, Biologi, Pembenihan Dan Pembesaran. Yayasan Pustaka Nusantara. Yogyakarta.

[10] Lall, S., and P.L, SM.Tibbetts. 2009. Nutrition,Feeding, and Behavior of Fish. Vet Clin Exot Anim 12 (2009) 361–372

[11] Mahyuddin, K. 2010. *Panduan Lengkap Agribisnis Patin*. Penebar Swadaya. Jakarta.

[12] Merdana, L. M. dan I. W. Sudira. 2016. Tinjauan Keamanan *Effective Microorganism*-4 (EM4) yang diberikan pada Tikus Putih *(Rattus norvegicus)*

[13] Secara Per Oral. *Karya Ilmiah.* Fakultas Kedokteran Hewan Universitas Udayana. Denpasar.

[14] Nopriani, U., Karti PDMH dan I. Prihantoro. (2014). Produktivitas Duckweed *(Lemna* sp.*)* Sebagai Hijauan Pakan Alternatif Ternak pada Intensitas Cahaya yang Berbeda. JITV 19 (4) 272-286.

[15] Putra, A.M., Eriyusni, dan I. Lesmana. 2014. Pertumbuhan Ikan Patin *(Pangasius Sp.)* Yang Dipelihara Dalam Sistem Resirkulasi. *Jurnal Fakultas Pertanian*, Universitas Sumatera Utara, Program Studi Manajemen Sumberdaya Perairan.

[16] Rostika, R., Y. Andriani., A. H. Abram dan A. Vinasyiam. 2017. Laju pertumbuhan benih ikan nila *Oreochromis niloticus* yang diberi pakan mengandung tepung *Lemna* sp. fermentasi. *Jurnal Akuakultur Indonesia* 16 (1), 101–106.
[17] Santoso, U dan I. Aryani. (2007). Perubahan Komposisi Kimia Daun Ubi Kayu yang Difermentasi oleh Em4. *Jurnal Sain Peternakan Indonesia* 2 (2).
[18] Saputra, E, D. 2017. Pengaruh Pemberian *Lemna* sp. Sebagai Pakan Dalam Budidaya Ikan Tawes (*Barbodes gonionotus*). Skripsi. Fakultas Perikanan dan Ilmu Kelautan. Universitas Padjadjaran. Bandung.
[19] Sari, D, N., H Setiyatwan dan Abun. Pengaruh fermentasi oleh *Basillus licheniformis* dilanjutkan oleh *Saccharomyces cerevisiae* pada limbah udang terhadap kandungan protein dan glukosa produk. *Students e-Journal* Vol 5, No 4 (2016).
[20] Suhenda, N., L. Setijaningsih dan Y. Suryanti. 2005. Pertumbuhan Benih ikan Patin Jambal *(Pangasius djambal)* Yang Diberi pakan Dengan Kadar Protein Berbeda. *Jurnal Balai Riset Perikanan Budidaya Air Tawar*. Berita Biologi. 7 (4).