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EFFECT OF STOCKING DENSITY ON SOME GROWTH PARAMETERS OF COMMON CARP FISH (*CYPRINUS CARPIO* L.) IN SEMI-CLOSED SYSTEM

Qusay Ali M. Ghulam* and Saeed Abdulsadda Kietan Al-Shawi

Department of Animal Production, College of Agriculture Engineering Sciences, University of Baghdad, Iraq.

Abstract

The current study was researched on the culture of three different densities of common Carp (*Cyprinus carpio*), in a semi closed culture system (dimensions 5 × 3 × 1.2 M) that is already located in the College of Agricultural Engineering Sciences at University of Baghdad for the period from 10/09/2019 till 20/11/2019 aiming to investigate the best density culture per cubic meter, 450 fish (juvenile). were distributed into three Treatment's with two replicates (100, 75 and 50 Fish/cubic meter) and with weight ranging between 44 and 44.6 gms. The mechanical and biological filters were made locally to filter out the suspended solid materials (faeces and non fed feeds) and gasses (NH_3, CO_2) excretal by the fish where total ammonia concentration was stable throughout the experiment (0.25 mg/l), all treatments recorded 100% survival, Results showed that T2 (75 Fish/M^3) significant differences ($P \geq 0.05$) from T1 (100 Fish/M^3) and T3 (50 Fish/M^3) which indicate that the best stocking density in a semi-closed system is 75 fish/m^3.

Key words: semi-closed system, stoking density, fish, carp

Introduction

The demand for fish increases every year and in order to maintain the current level of per capita consumption, fish production must nearly double during the next twenty years and this translates into approximately 40 million tons of fish in excess of the current production every year. (FAO, 2016), Aquaculture provides global food security, nutritional well-being, poverty reduction and economic development as it has begun to define aquaculture projects Fish farming projects are known as blue wealth, but this must be achieved with the least impact on the environment and the maximum benefit for society. Aquaculture is one of the investment projects with good economic returns in countries that own water resources and even desert ones, and it is one of the ways to cover the increasing need for animal protein. To keep pace with the population increase in addition to the employment of the labor force (FAO, 2010).

The gap between food production and consumption is one of the most important challenges facing the process of economic and social development in Iraq, as the persistence of this gap means continued dependence on the outside, which constitutes a burden on the Iraqi budget, Iraq's need of fish amounts to 150,000 tons, while it produces 63,000 tons and represents 42% of its total need, which requires importing 87,000 tons to meet its fish needs. (Iraqi Ministry of Agriculture, 2016). The method of raising fish in a closed system is one of the best methods of raising fish at the present time due to the scarcity of water in Iraq in addition to the increase in population growth and the requirements for providing food, so it was necessary to keep pace with the development in fish farming and to search for a better method than the old methods of breeding Such as (traditional mud ponds) that consume large quantities of water in addition to large areas of land and other requirements, including manpower and others. Therefore, raising fish in a closed system is the best way to breed in our country, so the Ministry of Agriculture and researchers in the field of fish farming have worked to Encouraging fish farmers to culture in cages and in a closed rotating system. (SALIH. 2015), The current study aims to derive the best culture density (number of fish/m^3) for common carp in the semi-closed system in order to encourage the people of Iraq to raise fish in a simple, inexpensive semi-closed system and improve their standard of living, in addition to the

***Author for correspondence :** E-mail : qa_mg@yahoo.com

contribution of breeders to the production of animal protein. The fish production also aims to study the productive characteristics and the economic cost of the project. The spread of such projects and their beginnings require a lot of studies and research necessary to identify their problems under the Iraqi circumstance and work to develop them, such as the best densities used for a unit size.

Materials and methods

Site of the study

This study was conducted at Research Station (Animal field) of the College of Agricultural Engineering Sciences/University of Baghdad/Al-Jadriyah From September to November 2019 on The semi-closed system has dimensions of 3m × 5m × 1.2m local made, The semi-closed system was supplied with water from the nearby Tigris River using the main university pump.

Fish experiment

After reaching the stage of filling the system with water and running the filters. common carp were obtained from a fish farm south of Baghdad, the fish were transported from the farm to the University of Baghdad by pickup equipped with a pump to circulate the water with the placing of ice to cool the water and reduce its temperature and reduce stress on fish , then the fish were selected at a rate of 44.3 and 44.6 g/fish using an electronic scale stayed in the tank for 10 days For acclimatization, after which the fish were placed in semi-closed system.

The design of experiment

The experimental fish were distributed at a weight of 44-46 gm/fish, as the fish were placed in the three treatments by stocking densities: 100, 75 and 50 fish/m^3.

The studied traits of fish productivity

1. Total Weight Gain (TWG) (Uten, 1978)

T.W.G. = Final weight – Initial weight

2. Specific Growth Rate (SGR) (Brown, 1957)

$S.G.R. = \{(Ln\ W_2 - L\ n\ W_1)/(T_2 - T_1)\} \times 100$

4. $R.G.R. = \{(W_2 - W_1)/W_1\} \times 100$ (Uten, 1978)

5. Survival rate % (Carlos, 1988)

Survival rate% = (number of fish at the end of the experiment/number of fish at the beginning of the experiment) × 100.

Statistical analysis

Complete Randomized Design (CRD) was used to analyze the effect of experimental coefficients on the studied traits and used the Statistical Analysis System (SAS), (2012) to analyze the results and the significant differences between the mean traits averages were examined using the Duncan´s polynomial test Multiple Range Test (Duncan, 1955) at the level of significance (0.05) and (0.01) according to the following mathematical model equation:

$$Yij = \mu + Ti + Eij$$

Results and Discussion

The initial weights of common carp (*Cyprinus carpio* L.) fish cultured in semi-closed system with three different stocking densities 100, 75 and 150 fish/cubic meter showed clear convergence for the three treatments and was 44.3, 44.4 and 44.6 gm/fish respectively, and with the progress of the experiment period differences emerged in the weight rates of the stocked fish, as they showed the second treatment fish with the lowest stocking density (75 fish/m^3) clearly outperforms the third treatment (50 fish/m^3) and the first treatment (100 fish/m^3) for the final weight ratio attribute, as the second treatment recorded 76.93 gm/fish and the third treatment is 69.4 gm/fish and first treatment 69.8 gm/fish after 70 days of culturing the fish in semi-closed system. The effect of different levels of stoking densities on growth, and some other biological indices of common carp juvenile rearing for seventy days are shown in table 1 showed the growth and survival and other of juvenile in terms of final weight , Statistically no significant difference was observed in the initial weight of cages stocked in all experimental cages. Specific growth rate (SGR) was higher in treatment group that has (75 fish/m^3) in comparison to those in treatment group

Table 1: Effect of different stocking densities on final weight, Growth relative rate, Specific growth rate , Food conversion ratio and survival rate of common carp cultured in semi-closed system. (mean ± standard error).

Traits Treatments	Initial weight /gm/fish	Final weight /gm/fish	Relative growth rate (RGR)	Specific growth rate (SGR)	Weight gain /gm/fish	Survival rate %
T1 (100 fish/m^3)	44.6± 0.1 a	69.8± 0.2 b	56.4± 0.9b	0.64±0.01b	25.15±0.3 b	100.00 a
T2 (75 fish/m^3)	44.4± 0.1 a	76.93± 0.7a	73.07±0.2a	0.78±0.005a	32.56±0.2 a	100.00 a
T3 (50 fish/m^3)	44.3± 0.1 a	69.4± 2.2 b	56.7±4.6b	0.64±0.04b	25.1±2.1 b	100.00 a

The different letters vertically indicate that there are significant differences between the averages of the studied trait, while the similar letters vertically indicate the absence of significant differences between the averages of the same trai

that has 100, 50 fish/m^3. Therefore, this superiority for the second treatment over the third and first treatments continued for growth relative rate (R.G.R) characteristic during the experiment period. The second, third and first transactions recorded a (RGR) of 73.07, 56.7 and 56.4 % respectively, for a period of 70 days. The best weight gain ratio (WGR) was observed in treatment group with 75 fish/m^3 (32.56) compared to the other treatment its which was reflected in the weight gain rate as the results of the current study showed that there were highly significant differences between experimental treatments with different stocking densities, as the second treatment showed significant superiority ($p < 0.01$) and recorded 32.56 gm/fish over the first treatment that it reached 25.15 gm/fish, then the fourth which was 25.1 gm/fish. further, The change survival rate was also non observed in all treatment as all of them recorded a survival rate of (100%). table 1.

Stocking density is one of important factors in aquaculture because it directly influences Growth, survival behavior, health, feeding and production of fish under farmed conditions, (Mensah *et al.,* 2013). From the review of the results of fish growth traits in the current study it is clear that there is an increase in fish weights rates in all studied treatments with the progress of the experiment period taking advantage of the food provided and good water that provides an environment suitable for fish culture. Results showed the effect of common carp stocking with different densities in semi-closed system 100, 75, 50 fish/m^3 the superiority of the second treatment (75 fish/m^3) on first treatment (100 fish/m^3) and third (50 fish/m^3) in the traits of : average weight fish, Final weight rate. Growth relative rate, Specific growth rate, Either in Food conversion ratio was the superiority of the two treatment first and third on share of the second treatment (75 fish/m^3) in the second treatment fish with medium stocking density may be due to the access of the fish of this treatment to the food the review of the results of growth traits in the current study it is clear that there is an increase in fish weights rates in all studied treatments with the progress of the experiment period taking advantage of the food provided and most importantly, there is an honest competition that motivates the fish to eat the feed better. As we find that there is no significant affect due to different stoking densities on survival rate which is supported with (Mohamed *et al.,* 2016), generally, the study find some significant different among the means of different stoking densities in some growth parameters as final weight and survival which is agree with some studies. The results of the present study differed with the study, (Adang *et al.,* 2018) on the effect of culture density on the growth parameters of snakehead *C. striata* in the absence of significant differences between the different densities of cultured fish (1, 2, 3) fish/liter in a closed system. The specific growth rate is affected at a given culture density and is not influenced by very low and unreasonably high culture density, as confirmed by *et al.,* Sánchez (2013). Likewise, the relationship between rate and efficiency of feed conversion and culture densities is inversely related (Gomes *et al.,* 2016) and fish are more efficient for feed conversion at lower culture densities. In other side, the study showed that the medium stocking density (75 fish/m3) may be the ideal compared to higher and lower stocking densities.

Conclusion

The study concluded the possibility of applying system fish culture common carp (*Cyprinus carpio* L.) in semi-closed system in Iraq with stocking density of 50, 100 and 75 fish/m^3, optimum stocking density is 75 fish/m^3, which gave the best survival rate and growth criteria, as this system of culture is a safe and environmentally friendly as the possibility of producing fish two to three times per year through cultivation in a semi-closed system. The possibility of using semi-closed systems for the cultivation of fish in homes, orchards and agricultural lands with a cultivation density of 75 fish/m^3 due to the high survival rate, growth parameters and its impact on production and profitability. Reducing unemployment and improving the standard of living for citizens.

References

Adang Saputra, Tatag Budiardi, Reza Samsudin and Naufal Dwi Rahmadya (2018). Growth performance and survival of snakehead. *Channa striata* juvenile with different stocking density reared in recirculation system. *Jurnal Akuakultur Indonesia,* **17(2):** 104-112.

Brown, M.E. (1957). Experimental studies on growth. In: Brown, M.E. (ed.) *The Physiology of Fishes,* **1:** Academic Press, New York, pp. 361–400.

Carlos, M.H. (1988). Growth and survival of bighead carp (*Aristicthys nobilis*) fry, different intake levels and feeding frequencies. *Aquaculture,* **68:** 267-276.

Duncan, D.B. (1955). Multiple Rang and Multiple F-test. Biometrics. 11.

FAO (2010). The state of World fisheries and Aquaculture FAO. fisheries Report. Rome. p. 204.

FAO (2016). The state of world fisheries and aquaculture. Contributing of food security and nutrition for all, 200pp.

Gomes, L.C., E.C. Chagas, H.M. Junior, R. Roubach, E.A. Ono and J.N. Lourenço (2006). Cage culture of tambaqui (*Colossoma macropomum*) in a central Amazon floodplain lake. *Aquacul. Bra.,* **253:** 74–384.

Iraqi Ministry of Agriculture (2016). Public Authority for Fish Resources. Development. Annual statistics For fish farms, a report submitted by the Public Authority for Fish Resources Development in Iraq, 1 page.

Mensah, E.T., F.A. Attipoe and M.A. Johnson (2013). Effect of different stocking densities on growth performance and profitability of *Oreochromis niloticus* fry reared in hapa-in-pond system. *Int. J. of Fish and Aqua.,* **5(8):** 204-209.

Mohamed, A.H. (2016). Effects of varying stocking densities and temperature on growth performance of Nile tilapia (*Oreochromis niloticus*) fingerlings cultured in semi closed system. ResearchGate Apps. King Abdullah university of science and Technology.

Salih, M.A.A., T.E. Elinor and A.H. Mohamed (2016). Effects of varying stocking densities and temperature on growth performance of Nile tilapia (*Oreochromis niloticus*) fingerlings cultured in semi closed system. *Journal of Advanced Sci. and Research,* **1(11):** 19-23.

Sánchez, P., P.P. Ambrosio and R. Flos (2013). Stocking density affects Sene- galese sole (*Solea senegalensis*, Kaup) growth independently of size dispersion, evaluated using an individual photo-identification technique. *Aquacult. Res.,* **44(2):** 231–241.

Uten, F. (1978). Standard methods and terminology in finfish nutrition. proc. *World sump. on fin fish nutrition and fish feed technology,* **11:** 20–23. Berlin, June, 1979.