COMPARISON OF GROWTH, SURVIVAL RATE, AND NUMBER OF MARKETABLE FISH PRODUCED OF KOI CARP, *CYPRINUS CARPIO* L., IN OUTDOOR EARTHEN PONDS WITH ENDOGENOUS CULTURE OF *MOINA* SP. OR *DAPHNIA* SP. AND EXOGENOUS SUPPLY OF MIXED PLANKTON

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POREĐENJE RASTA, STOPE PREŽIVLJAVANJA I KOLIČINE KOI ŠARANA, *CYPRINUS CARPIO* L., PROIZVEDENOG ZA TRŽIŠTE, U SPOLJNIM ZEMLJANIM JEZERIMA SA ENDOGENOM KULTUROM *MOINA* SP., ILI *DAPHNIA* SP. I EKZOGENOM SNABDEVANJEM MEŠAVINOM PLANKTONA

Apstrakt

U ovom radu ispitan je efekat različitih sistema upravljanja na rast i preživljavanje koi šarana, *Cyprinus carpio* L. u bazenima. Riblje larve (0.14 ± 0.015 g) gajene su 3 meseca (od 5. jula do 3. septembra 2011.). Postojala su četiri tretmana/načina gajenja: ribe su nasađene u spoljnim bazenima i gajene sa: endogenom kulturom *Moina* sp. (P1), *Daphnia* sp. (P2), egzogeno dodatom mešavinom planktona (P3) i kontrolom u kojoj je korišćena komercijalna peletirana hrana (Tokyu Corp., Japan; koja sadrži 32% sirovog proteina) (P4). Svaki tretman rađen je u triplikatu. Riba je hranjena dnevno, sa nešto više hrane u grupi P3 i P4, da bi se eliminisala mogućnost da nedostatak hrane bude ograničavajući faktor za rast. Bazeni su pokriveni jednim slojem plastike za zaštitu od ptica. Stalni nivo vode u bazenima je održavan periodičnim dodavanjem podzemne vode, da bi se nadoknadio gubitak usled isparavanja. Oko 1000 litara viška vode otpušteno je iz bazena P3 svakog dana dok je trajalo uvođenje vode sa živim planktonom.

Vrednost rastvorenog kiseonika bila je najviša u P3 bazenu ($p<0.05$). Tretman P4 pokazao je najvišu provodljivost, NH_4^-N, NO_2^-N, NO_3^-N, PO_4^-P, i bikaronatnu alkalnost, koje su bile znatno više ($p<0.05$) nego kod drugih tretmana. Krajnja telesna težina koi šarana varirala je od 4.25 do 8.52 g kod različitih tretmana. Pri izlovu, najveći prirast dostignut je u grupi P3, zatim P2, P1 i P4 ($p<0.05$). Značajna razlika ($p < 0.05$) se pokazala u preživljavanju među tretmanima, od 71.12% (P4) do 94.12% (P3). Da bi se ustanovila količina ribe za

tržište, procenjen je procenat i broj ribe koja je prevazilazila ukupnu težinu od 5g. Procena je izvršena raspodelom frekvencije veličine na kraju ispitivanja. Količina ribe koja se mogla plasirati na tržište bila je znatno veća u grupi P3 ($p < 0.05$) neko kod drugih tretmana. Iz ovog istraživanja može se zaključiti da egzogeno snabdevanje mešavinom planktona predstavlja bolju alternativu od gajenja sa endogeno gajenim *Moina* sp. ili *Daphnia* sp.

Abstract

The effect of different management systems on the growth and survival of koi carp, *Cyprinus carpio* L. in ponds was investigated. Fish larvae (0.14 ± 0.015 g) were cultured for three months (5 July to 3 September' 2011). There were four treatments: fish were stocked in outdoor ponds under endogenous culture of *Moina* sp. (P1), *Daphnia* sp. (P2), exogenous supply of mixed plankton (P3) and a control treatment where a commercial pellet (Tokyu Corp., Japan; containing 32% crude protein) was applied as food (P4). There were three replicates for each treatment. The fish were fed daily slightly in excess of satiation in P3 and P4 to eliminate the possibility of food supply being a limiting factor to growth. A single layer of plastic bird netting was used to cover the ponds. Constant water levels were maintained in the ponds by supplying ground water periodically to compensate for loss due to evaporation. Approximately 1000 l of excess water was discharged from the P3 ponds every day during the introduction of live plankton-water.

Values of dissolved oxygen were highest in the P3 ($p<0.05$). The P4 treatment showed the highest concentrations of conductivity, NH_4^-N, NO_2^-N, NO_3^-N, PO_4^-P, and bicarbonate alkalinity, which were significantly higher ($p<0.05$) than the other treatments. The final body weight of the koi carp ranged from 4.25 to 8.52 g in the different treatments. At harvest, maximum weight gain was achieved in the P3, followed by P2, P1 and P4 in decending order ($p<0.05$). There was a significant difference ($p < 0.05$) in the survival of koi carp among the treatments, ranging from 71.12% (P4) to 94.12% (P3). To determine the output of marketable fish, the percentage and number of fish exceeding a total weight of 5 g was estimated from the size-frequency distribution at the end of the study. The number of marketable fish was significantly higher in P3 ($p < 0.05$) than other treatments. From the present investigation, exogenous supply of mixed plankton appeared to be a better alternative to culturing koi carp in ponds under endogenous culture of *Moina* sp. or *Daphnia* sp.