THE GROWTH OF WEIGHT AND BODY LENGTH OF YOUNG RAINBOW TROUT (*ONCORHYNCHUS MYKISS WAL.*) ORIGINATING FROM DIFFERENT BROODSTOCK

NEBOJŠA SAVIĆ, DRAGAN MIKAVICA, BILJANA ROGIĆ
Faculty of Agriculture University of Banja Luka, Bulevar vojvode Petra Bojovića 1A, Banja Luka, Republic of Srpska, Bosnia and Hercegovina

RAST MASE I DUŽINE TIJELA MLAĐI DUŽIČASTE PASTRMKE (*ONCORHYNCHUS MYKISS* WAL.) PORIJEKLOM OD RAZLIČITIH MATIČNIH JATA

Apstrakt

Eksperiment analize karakteristika rasta mase i dužine tijela mlađi dužičaste pastrmke (*Oncorhynchus mykiss* Wal.), porijeklom od različitih matičnih jata, realizovan je u salmonidnom mrestilištu Klašnik - Banja Luka u trajanju od 134 dana (od 05.7.2012. do 16.11.2012.) i dio je istraživanja kojim su obuhvaćeni izbor matičnog jata, mrijest, analiza embrionalnog razvoja i karakteristika rasta dužičaste pastrmke do devet mjeseci starosti. U eksperimentu je korišćena dužičasta pastrmka starosti pet mjeseci porijeklom od pet različitih matičnih jata, a karakteristike rasta su praćene do uzrasta od devet mjeseci. Temperatura vode tokom realizacije eksperimenta prosječno je iznosila 10,93^{o}C, rastvoreni kiseonik u vodi 10,39 mg/l, zasićenje vode kiseonikom 94,8% i pH 7,57. Koeficijent kondicije (CF) analizirane mlađi dužičaste pastrmke uzrasta od devet mjeseci je u porastu, a stopa rasta (SGR) je u padu u svim eksperimentalnim grupama, dok koeficijent rasta za termičku jedinicu (TGC) ukazuje na različite tendencije. Dobijeni rezultati ukazuju na izraženu heterogenost karakteristika rasta mlađi dužičaste pastrmke porijeklom od pet različitih matičnih jata.

Ključne riječi: rast, dužičasta pastrmka, matično jato.
Keywords: growth, rainbow trout, broodstock

INTRODUCTION

Water potential of Republic of Srpska, Bosnia and Herzegovina is a great, especially if you take into account the fact that these are the waters of I and II class quality which is a fundamental prerequisite for successful fish farming. Territory of the Republic of Srska characterized predominantly commercial cultivation of rainbow trout (*Oncorhynchus mykiss*, Wal.), for favorable conditions, the quality and quantity of available water. In addition to the initial assumptions (the quality and quantity of water), it is important to take into account the choice of broodstock in order to obtain offspring with good production characteristics, disease resistance and utilization of nutrients. It is certainly important that the establishment of quality broodstock of rainbow trout adequate disease resistance and good growth characteristics with optimum utilization of food, in addition to the application of appropriate technological measures, one of the objectives whose fulfillment can improve production.

The characteristic of growth weight and body length young rainbow trout have been the subject of numerous studies (Uysal, 2002; Guzel and Arvas, 2011; Richardson, 2011; Kizak et al., 2011; Sevgili et al., 2012). Previous research in this area in our regions is symbolic, and their results are not widely applied in practice.

Understanding the importance of the broodstock in order to improve the production, we started investigation that included the tour fishpond of rainbow trout, the choice of broodstock which differed in origin and the conditions in which they are grown (temperature etc.), spawning selected broodstock, monitoring embryonic development and analysis of growth characteristics of rainbow trout to the 9 age of months under the same conditions for all experimental groups in the salmonid hatchery Klasnik - Banja Luka. Results embryonic development and characteristics of growth to 5 age of months indicate significant differences between rainbow trout from different fishponds (Savić et al., 2012, 2013).

The aim of this study was to analyze the characteristics of growth mass and the body length of rainbow trout (*Oncorhynchus mykiss* Wal.) age 5 to 9 months under the same environmental conditions and requirements dietary, originating from the 5 selected broodstock to determine difference characteristics of growth.

MATERIALS AND METHODS

The experiment was carried out for a period of 134 days (from 05.7.2012. to 16.11.2012.) in salmonid hatchery Klasnik - Banja Luka. Rainbow trout originating from five different broodstock is the populated in the 50 l tank with 100 fish in each experimental group.

Water temperature (^{o}C), content of dissolved oxygen (mg/l) and water oxygen saturation (%) were analyzed by digital oxy-meter Oxi 330i/SET 2b20-0011 WTW, and the pH value of a digital pH-meter pH 330i/SET WTW 2A20-1011 (Germany).

During the experimental period were followed characteristic growth of body mass (the scale Denver DL-501 payload 0.5 kg) and body length (ichtyo-meter). Useful volume of water in tanks, which were placed in the rotary pool and covered with a net to prevent fish jumping, was 50 l/tank with steady flow of water (roundabout) in all tanks.

Mass and body length were determined on a sample of 30 fish/exp group. On the basis of absolute indicators of mass and body length were calculated condition factor, specific growth rates and thermal-unit growth coefficient. Condition factor (CF) was

calculated according to the formula: CF = (BW/L^3) x 100, where CF - condition factor; BW – body weight (g): L - length of fish (mm). A specific growth rate was calculated according to the formula: SGR = ((ln FBW – ln IBW) / D) * 100, where FBW - final body weight (g), IBW - initial body weight (g), ln - natural logarithm; D - days. Thermal-unit growth coefficient is calculated according to the formula: TGC = [$FBW^{1/3}$ – $IBW^{1/3}$] / Σ [TxD] x 100, where TGC- thermal-unit growth coefficient; FBW - final body weight (g), IBW - initial body weight (g), T - temperature (°C), D - days. Feed conversion ratio (FCR) was calculated according to the formula: FCR = F / G, where the F - food consumption, G - realized weight gain.

RESULTS AND DISCUSSION

The water temperature during the realization of the experiment averaged was it 10,93°C, content dissolved oxygen in water 10.39 mg / l, saturation water oxygen 94.8%, and pH 7.57. Table 1 show the average mass and total body length analyzed rainbow trout of different origin, standard deviation (SD) and coefficient of variation weight and body length, condition factor (CF), specific growth rates (SGR) and thermal-unit growth coefficient (TGC), rainbow trout aged between 5 and 9 months (05.7.2012. - 16.11.2012., 134 days).

Table 1. Growth performance rainbow trout from five different parent flock the same age and rearing under the same condition (age 5 to 9 months).

Age	Parameter	Experimental group (n = 30)				
		1	2	3	4	5
~ 5 months	Days post-hatch	161	154	154	153	149
	W±SD (g)	11,07±1,87	6,37±1,56	9,43±3,04	6,47±1,68	5,90±1,81
	CV W	16,94	24,57	32,19	25,92	30,63
	L±SD (cm)	9,77±6,00	8,07±6,00	9,01±8,73	8,24±7,16	7,96±7,00
	CV L	6,15	7,43	9,68	8,69	8,80
	CF	1,19	1,21	1,29	1,16	1,17
	SGR	2,44	1,64	3,08	1,69	1,84
	TGC	0,148	0,086	0,173	0,089	0,093
Days between 5 and 9 age months		134	134	134	134	134
~ 9 months	Days post-hatch	295	288	288	287	283
	W±SD (g)	57,13±9,62	39,57±5,97	42,60±18,64	49,20±9,56	46,23±9,44
	CV W	16,84	15,09	43,75	19,44	20,41
	L±SD (cm)	16,13±10,74	14,21±7,48	14,33±21,24	15,51±11,68	15,10±10,33
	CV L	6,66	5,26	14,82	7,53	6,84
	WG (g)	46,07	33,20	33,17	42,73	40,33
	LG (cm)	6,36	6,14	5,32	7,27	7,14
	FCR	0,81	1,15	1,00	0,76	0,85
	CF	1,36	1,38	1,45	1,32	1,34
	S G R	1,22	1,36	1,13	1,51	1,54
	T G C	0,109	0,105	0,093	0,121	0,120

W – body weight (g); CV W – coefficient variation of body weight; L– body lenght (cm); CV L – coefficient variation of body lenght; WG – weight gain (g); LG – length gain (cm); FCR – feed conversion ratio; FE – feed efficiency; CF – condition factor; SGR – specific growth ratio; TGC – thermal-unit growth coefficient.

There has been a decline in the coefficient of variation final weight in relation to the initial weight of the body, excluding the experimental group 3 in which the apparent pronounced variations. Similar trends are present in the case of variation of body length.

Condition factor at the start is lower and there are no significant differences between the analyzed groups, in contrast to the condition set forth in the final measurement where the more noticeable values of all analyzed groups, unlike SGR which is in decline in all analyzed groups in relation to the initial state, according to Uysal and Alpbaz (2002) that the SGR is not a constant value, in the early stages of development is higher but with increasing body size decreases.

The most significant decline SGR is present in groups 3 and was 1.13, although is to fifth month this age group recorded the highest growth rate of 3.08. Specific growth rates (SGR) analyzed fish is higher than quotation Richardson (2011) which states that the growth rate of rainbow trout aged 8 months in the control group (different spawning periods, September - December) 0.742 and 1.022, which is directly related to the actual higher body mass (73.1 g - 133.5 g) to 8 months of age, and the fact that with increasing size of fish growth rate declines, while Guzel and Arvas (2011) reported a similar growth rate with significantly greater body weight rainbow trout of the same age. On the other side Sevgili et al. (2012) and Kizaki et al. (2011) reported significantly higher SGR and body weight rainbow trout age of 5 months, which can be attributed primarily to the selection of broodstock, environmental conditions and the effects of feed (Savic et al., 2012, 2013).

In groups 1 and 3 is the highest growth SGR and TGC to 5 months of age, while those at the age of nine months have lower, and in experimental groups 2, 4 and 5 SGR is in decline, while TGC growing until the age of 9 months, which can be explained by compensation of growth, although all the experimental groups been in the same environmental conditions and on the same nutrition regime. In the groups 2, 4 and 5 the TGC have the growing trend while is in groups 1 and 3 in a significant decline. Based on the analysis of growth characteristics of rainbow trout originating from different broodstock, ntil the age of 9 months, is evident significant differences between the analyzed group, which indicates the heterogeneity of the analyzed broodstock, and the need for further research on the selection rainbow trout and improve sustainable cultivation.

CONCLUSION

The results showed significant heterogeneity of broodstock from selected fishpond. Future research should provide evidence of genetic variability of broodstock which together with these results, can be used as the basis for a serious approach to the selection of rainbow trout, which would certainly have a great impact on the improvement of production, the characteristics of growth rainbow trout and production results.

REFERENCES

Guzel, S., Arvas, A. (2011): Effects of different feeding strategies on the growth of young rainbow trout (*Oncorhynchus mykiss*). African Journal of Biotechnology Vol. 10(25), pp. 5048-5052.

Sevgili, H., Hoşsu, B., Emre, Y., Kanyılmaz, M. (2012): Compensatory growth after various levels of dietary protein restriction in rainbow trout, *Oncorhynchus mykiss*. Aquaculture 344-349; p 126-134.

Kizak, V., Guner, Y., Turel, M., Can, E., Kazim, M. (2011): Comparison of the survival and growth performance in rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta fario*) fry. African Journal of Agricultural Research Vol. 6(25), pp. 5672-5674.

Richardson, C. (2011): The impact of a cyclic feeding regime on the expression of genes involved in appetit regulation and lipid metabolism in rainbow trout (*Oncorhynchus mykiss*). Master thesis. University of Guelph, Ontario, Canada.

Uysal, I., Alpbaz, A. (2002): Comparison of the Growth Performance and Mortality in Abant Trout (*Salmo trutta abanticus* Tortonese, 1954) and Rainbow Trout (*Oncorhynchus mykiss* Walbaum, 1792) under Farming Conditions. Turk J. Zool, 26, 399-403.

Savić, N., Mikavica, D., Rogić, B. (2012): Embryonic development and growth characteristics grown the younger rainbow trout (*Oncorhynchus mykiss* Wal.) originating from five different parent flocks. Agro-knowledge Journal, 13(3), 407-419.

Savić, N., Mikavica, D., Rogić, B. (2013): The growth characteristics of rainbow trout fry (*Oncorhynchus mykiss* Wal.) from different localities. II International symposium and XVIII Scientific Conference of Agronomists of Republic of Srpska, Trebinje, 157.