CARCASS AND MEAT QUALITY OF *CLARIAS GARIEPINUS* AND *ICTALURUS PUNCTATUS* FED DIETS WITH DIFFERENT PROTEIN CONTENT

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Keywords: Clarias gariepinus, Ictalurus punctatus, meat quality, pH, meat composition

Background

Claras gariepinus (*C.g.*) pssesses several preferences in becoming an interesting species for fish meat production. It is marked by a good fattening performance, it does not possess any intramuscular bones and scales, it is able to utilize atmospheric oxygen and, therefore, compared with other fish species reared in water circulating systems, *C.g.* can be reared in a relatively high density without hygienic risks. Ictalurus punctatus (*I.p.*), mainly reared in ponds, is also a member of Siluroidea and production of this species yields several hundred thousand tons per year. As protein supply plays an important role for fattening performance and simultaneously nitrogen compounds are determinant factors for water quality, protein content of diets is a main aspect in fish production.

Objectives

For feeding diets with different protein content to *C.g.* and *I.p.* reared simultanously in the same water circulating system, investigations on carcass and meat characteristics between species and between protein supplementation should be carried out.

Material and Methods

C.g. and *I.p.* were reared in 12 glass basins (150 l) from about 30 g live weight onwards. At the beginning, each basin was issued with 40 fingerlings. At about 200 g, 400 g and 600 g live weight, up to 10 fishes were removed to keep a steady fish:water ratio. 3 basins of both species obtained diets based on maize-soy with 24 % (1.30 % lysin and 0.41 % methionine) or 38 % crude protein (2.29 % lysin and 0.61 % methionine) at 12.3 MJ/kg DE. As fat component, fish oil at 2.3 % and 1.0 % was used and fat content was 6.1 % and 3.6 %. Before slaughtering, fishes were fasted for 24 hours and stunned by using Ethylenglycolmonophenylether. All fishes were eviscerated, filleted and skinned by the same person to avoid differences in cutting-techniques. Measuring of pH-values were carried out 5 min, 45 min, and 24 h post mortem (p.m.) using a WTW 522 pH-meter with an Ingold electrode. Measuring points were in the upper and cranial half of the left muscle, directly behind the head bone. Length was defined as distance from mouth to end of tail fin, circumference was measured directly behind the breast fin. Fillet length and width were defined to be measured at the maximum value. Corpulence factor is the ratio of live weight (g) x 100/length (cm)^3. Abdominal fat and fillet are expressed as percentage of live weight Fillets were packed in synthetic bags and stored in a refridgerator at 10°C until the next day. As fattening performance of *C.g.* was better than of *I.p.*, *C.g.* reached a live weight of 189 g, 346 g, and 654 g after 89, 138 and 189 days, whereas *I.p.* showed an average weight of 166 g and 328 g at day 110 and 181, when the experiment stopped. Carcass quality was compared when reaching the same live weight (slaughter day 1 and 2), whereas fillet composition was compared at about the same age. For determination of dry matter and crude fat, fillets of fishes of one basin were commonly analysed to obtain sufficient material. Depending on equal or unequal cell sizes, differences between mean values were tested by using Tukey-test or LS Means procedure of the SAS Version 6.

Results and Discussion

Differences between species were very much larger than between protein levels (Tab. 1 and 2). A different fattening performance of those species reared in warm-water circulation systems feeding the same diet was documented as significantly different "specific growth rate" (1) which was 1.84±0.09 and 1.64±0.16 for *C.g.* and 1.43±0.09 and 1.26±0.03 for *I.p.* on slaughter day 1 and 2. Whereas live weight between species was nearly the same on both slaughtering days as was planned, length was significantly different, whereas circumference of both species was nearly identical. This resulted in a significantl different corpulence factor in which case higher values of *I.p.* expressed their more compact body type. Based on equal live weight of both species, weight of fillets and fillet-percentage were also nearly the same. But owing to the longer body of *C.g.*, also length of fillets was significantly higher, whereas *I.p.* showed a significantly broader fillet shape. In *C.g.*, pH 5 min p.m. was significantly higher and pH 24 h p.m. lower than values of *I.p.* Therefore, pH significantly decreased during the first 24 h p.m. with 1.2 units in *C.g.*, whereas pH level of *I.p.* decreased only little. These results confirmed data former investigations which also showed significant differences in meat pH p.m. between both these species (2). Differences between protein levels mainly concerned live weight, consequently body and fillet size as well as abdominal fat parameters. The difference in live weight between protein levels is nearly exclusively caused by *C.g.* whereas *I.p.* had not been influenced by protein level, which is in contrast to results of other authors (3, 4). Live weight of *C.g.* with low protein supply was 87 % on the 1st, 71 % of the 2nd and 68 % of the 3rd slaughtering day, whereas live weight of *I.p.* was about 97 % on both days. This showed that *C.g.* reacted

Table 1. Carcass and meat quality of Clarias gariepinus and Ictalurus punctatus fed diets with different protein content

	Slaughter day 1				Slaughter day 2			
Species	C. gariepinus		I. punctatus		C. gariepinus		I. punctatus	
Protein content, %	38.0	24.0	38.0	24.0	38.0	24.0	38.0	24.0
n	35	40	35	40	34	36	34	36
Live weight,g	189 ± 76 +	166 ± 43	183 ± 68	172 ± 55	346 ± 135	328 ± 77	368 ± 115 *	307 ± 96
Length, mm	279 ± 38 ***	266 ± 22	282 ± 37	280 ± 32	365 ± 44 ***	329 ± 23	356 ± 43 *	338 ± 33
Circumf., mm	124 ± 18	120 ± 11	123 ± 15	121 ± 15	148 ± 22	153 ± 13	157 ± 16 **	144 ± 174
Corpulence f.	0.68 ± 0.04 ***	86 ± 0.06	0.79 ± 0.11	0.76 ± 0.11	0.68 ± 0.06 ***	0.91 ± 0.07	0.81 ± 0.14	0.78 ± 0.13
Abdom. fat, g	2.5 ± 1.6 ***	5.5 ± 2.6	2.7 ± 1.8	5.0 ± 2.8	3.6 ± 3.1 ***	8.1 ± 4.1	3.9 ± 2.5 ***	7.8 ± 4.7
-, %	1.3 ± 0.8 ***	3.4 ± 1.3	1.7 ± 1.2	2.9 ± 1.5	1.1 ± 0.8 ***	2.5 ± 1.3	1.1 ± 0.7 ***	2.5 ± 1.4
F. weight, g	60.2 ± 24.8	53.7 ± 16.0	58.7 ± 23.6	55.4 ± 18.8	114 ± 46.5	112 ± 27	124 ± 37 *	104 ± 33
- %	31.8 ± 1.7	32.6 ± 3.3	32.1 ± 3.4	32.2 ± 1.8	33.4 ± 2.7	34.0 ± 1.7	33.7 ± 1.8	33.7 ± 2.6
F. lenght, mm	164 ± 22 ***	131 ± 16	143 ± 26	150 ± 23	190 ± 29 **	171 ± 19	188 ± 27 **	174 ± 21
F. width, mm	40 ± 7 ***	51 ± 6	47 ± 8	45 ± 9	54 ± 8 ***	62 ± 5	60 ± 6 **	56 ± 9
pH 5 min	7.1 ± 0.5 ***	6.6 ± 0.1	6.8 ± 0.3	6.9 ± 0.6	7.3 ± 0.1 ***	6.6 ± 0.2	6.9 ± 0.4	6.9 ± 0.4
- 45 min	1) ± 1)	6.6 ± 0.1	6.6 ± 0.1 +	6.5 ± 0.1	7.2 ± 0.2 ***	6.3 ± 0.2	6.8 ± 0.5	6.7 ± 0.5
- 24 h	6.0 ± 0.1 ***	6.5 ± 0.1	6.3 ± 0.3 **	6.2 ± 0.2	6.1 ± 0.1 ***	6.4 ± 0.1	6.3 ± 0.2 ***	6.2 ± 0.2
pH-difference	-1.1 ± 0.5 ***	-0.1 ± 0.1	-0.5 ± 0.5	-0.7 ± 0.7	-1.2 ± 0.1 ***	-0.2 ± 0.2	-0.6 ± 0.5 *	-0.8 ± 0.5

1) values not available +,*,**,***: p<0.1, <0.05, <0.01, <0.001

very well on the higher protein level whereas *I.p.* did not. This might indicate that *I.p.* had not been reared under optimal conditions (but stocking density and diets of (3) were almost the same) or that they had already reached their maximum performance even on the low protein level, as *I.p.* of (3) reached nearly identical fattening performance. As also in (5) higher protein level resulted in lower abdominal fat percentage, consequently meat composition was also influenced. Both, the influence of species as well as of protein level is proved by a very high difference in dry matter and fat content between the high (21.8±0.5 % and 1.6±0.6 %) and low protein level (23.6 %±0.4 and 3.3±0.9 %) and fillet-meat of *I.p.* consisted of significantly more dry matter (23.0 ±0.9 %) and crude fat (3.0±1.2 %) than that of *C.g.* (22.4±1.14 % and 1.8±0.9 %).

Table 2. Carcass and meat quality of Clarias gariepinus fed diets with different protein content

	Slaughter day 3		
Species	C. gariepinus		
Protein content, %	38.0	24.0	
n	18	18	36
Live weight,g	780.4 ± 279 **	527 ± 233	654 ± 280
Length, mm	490 ± 58 **	421 ± 61	455 ± 68
Circumference, mm	198 ± 25 *	178 ± 26	188 ± 27
Corpulence factor	0.64 ± 0.06	0.68 ± 0.06	0.66 ± 0.06
Abdominal fat, g	3.0 ± 2.0 **	9.3 ± 6.6	6.1 ± 5.8
-, %	0.4 ± 0.2 ***	1.7 ± 0.6	1.0 ± 0.8
Fillet weight, g	255 ± 90 **	172 ± 72	214 ± 91
- %	32.9 ± 2.1	32.7 ± 2.5	32.8 ± 2.3
Fillet lenght, mm	248 ± 30 **	209 ± 35	228 ± 38
Fillet width, mm	70 ± 12 *	61 ± 10	66 ± 12
pH 5 min	7.2 ± 0.2 *	7.3 ± 0.1	7.2 ± 0.2
- 45 min	7.1 ± 0.2	7.2 ± 0.1	7.1 ± 0.2
- 24 hs	6.0 ± 0.1 *	5.9 ± 0.1	6.0 ± 0.1
pH-difference	-1.2 ± 0.2 **	-7.4 ± 6.0	-8.5 ± 5.7

+,*,**,***: p<0.1, <0.05, <0.01, <0.001

Conclusions

Under the same environmental and management conditions in water circulating systems, *C.g.* are able to reach an higher performance level than *I.p.*, and by increasing protein supply, *C.g.* grow even better than *I.p.*, thus, *C.g.* is a species of great promise. The difference in body appearance is so enormous that fillets of *C.g.* are significantly lon-ger and less broad than those of *I.p.*, whereas live weight, fillet percentage and fillet weight are near-ly identical. As fat content of fillets was higher in *I.p.* than in *C.g.* and with decreasing protein supp-ly *I.p.* deposited even more fat in fillets than *C.g.*, consumers asking for eat low-calory food might prefer C.p.. Whether the mark-ed pH difference at absolute level and relative decrease p.m. between both species influence meat quality and to which extent they influence sensorical characteristics should be examined in further investigations.

Pertinent literature

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