

Genetic Similarity and Variation in the Cultivated and Wild *Carassius carassius* Estimated with Random Amplified Polymorphic DNAs

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ABSTRACT

RAPD analysis based on numerous markers have been used to investigate patterns of genetic differentiation among and within two cultured and wild populations represented by the species crucian carp (*Carassius carassius*). From RAPD analysis using five primers, a total of 442 polymorphic bands were obtained in two populations and 273 were found to be specific to a wild population. According to RAPD-based estimates, average number of polymorphic bands in wild population was approximately 1.5 times as diverse as that in cultured. The average level of bandsharing values was 0.40 ± 0.05 in wild population, but was 0.69 ± 0.08 in cultured population. With reference to bandsharing values and banding patterns, wild population was considerably more diverse than cultured population. Knowledge of the genetic diversity of crucian carp should help in formulating more effective strategies for managing this aquacultural fish species.

INTRODUCTION

As a consequence of the rapid increase in hatchery-reared crucian carp production, there is a need to understand the genetic composition of natural crucian carp (*Carassius carassius*) populations in order to evaluate the potential genetic effects induced by hatchery operations. In spite of their economic and scientific importance, little information is available on the genetic relationships among a few of crucian carp populations in Korea. RAPDs are among the most frequently used molecular markers for taxonomic and systematic analyses of organisms (Bartish et al., 2000). Therefore, the purpose of this study was to determine a preliminary genetic analysis of

population structure, such as genetic similarity and diversity, and to assess the utility of DNA-based molecular assays in further studies of of crucian carp for two populations by random amplified polymorphic DNAs.

MATERIALS AND METHODS

Crucian carp (*Carassius carassius*) DNA samples were obtained from a few of lakes and aquaculture facilities in the periphery of Kunsan in Korea. RAPD analysis was performed on genetic DNA samples from a total of 100 crucian carp using twelve different random primers. Amplification was performed in a DNA Thermal Cycler with highest quality reagents to achieve reproducible results. Amplification products were separated by electrophoresis in 1.4% agarose gels with TBE and detected by staining with ethidium bromide. The gels were illuminated with UV light and taken photographs by photoman direct system. Bandsharing calculation of DNA sequences was somewhat modified the formula of Jeffreys and Morton (1987). If the comparison between the three lanes, the formula would be: $BS = 3(Nabc) / (Na + Nb + Nc)$ and so on.

RESULTS AND DISCUSSION

The few DNA changes observed by PCR-RAPD method were detected in both wild and cultivated crucian carp (*Carassius carassius*). For RAPD analysis five primers were used generating a total of 1084 reliable bands, which ranged in size from approximately 120 to 4270bp. The common bands from 0.31 to less than 0.60kb were present in every individuals. As compared to banding patterns observed in the wild population, an average of 11.5 banding

Table 1. Bandsharing(BS) within the crucian carp from wild and cultured populations (mean or mean±S.E)

Primers no	Total of polymorphic bands		Average number of polymorphic bands		BS values	
	Wild	Cultured	Wild	Cultured	Wild	Cultured
OPA-2	86	14	8.8	1.3	0.45	0.92
OPA-3	41	34	3.7	3.1	0.51	0.67
OPA-5	63	26	5.7	2.6	0.38	0.81
OPA-7	46	57	3.8	5.2	0.21	0.43
OPA-12	37	38	3.4	3.5	0.46	0.64
Total	273	169	25.4	15.7	2.01	3.47
Average	54.6	33.8	5.1	3.1	0.40±0.05*	0.69±0.08*

patterns per lane in cultured were observed, giving a total of 617 different fragments, and there were identified the range from 9.0 to 15.4 fragments in cultured. The average level of bandsharing values was 0.40 ± 0.05 in wild population. The RAPD profiles obtained from individuals DNA between two populations were fairly different for reference to bandsharing value. The average of percentage of polymorphic markers was much higher in the wild population, when the wild population and cultured were compared, although the total and average of band numbers were generally much more in the cultured. According to RAPD-based estimates, average number of polymorphic bands in wild population was approximately 1.5 times as diverse as that in cultured. Accordingly, wild population was considerably more diverse than cultured.

REFERENCES

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