MAPPING OF SEX DETERMINATION REGIONS IN CHITRALADA HYBRID STRAIN TOWARDS ALL-MALE FRY PRODUCTION

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Effective farming of tilapia requires all-male culture, characterized by uniformity and high growth rate. This is currently achieved by larval masculinization using steroid hormones or by crossbreeding *Oreochromis niloticus* females with *O. aureus* males. While the first technique has severe environmental impacts and has been banned in Europe, the second has low yields due to a reproductive barrier related to sexual behavior differences between the parental species. Moreover, pure bred brood stocks are prone to contamination by hybrids. Several breeding programs demonstrated higher growth rates of crossed strains as compared to pure bred local varieties. However, hybridization leads to segregation of a larger number of sex determining factors and thus complicates the genetic control of sex determination (SD). We performed a genome wide association study by applying genotyping-by-sequencing technique for a selected full sub family of the Chitralada hybrid strain (parents, 14 males and 79 females). The seven most significant associations based on 1,956 informative SNP markers were also validated by analysis of microsatellite markers located in the relevant regions. Microsatellite markers in linkage groups (LGs) seven and fifteen supported the association of these newly discovered regions for SD. Together with the previously described SD effect on LG23, these three loci provided good explanation for SD in the analyzed tilapia family. Analysis of the effect of each of these loci allowed constructing specific breeding scheme for all male fry production in the Chitralada hybrid strain.

BIOGRAPHY

Andrey Shirak has his expertise in animal genetics; detection and investigation of mechanisms underlying the inheritance of categorical and quantitative traits; and implementation of scientific finding in the improvement of animal production. His hypothesis is that overcoming the behavioral barrier between different tilapia species is a key step for mass production of all-male tilapia, through manipulation of sex determination by species hybridization. Following 8 years of experimentation, his hypotheses gain support from the actual determination and localization of the genetic loci that are involved in sex determination and in reproductive communication, including the discovery of male-specific AMH duplication. The Chief Scientist (Israeli ministry of agriculture) and ISF (Israeli Science Foundation) have supported the present study over this period, allowing implementation of knowledge from different disciplines of genomics, and aquaculture in development of intensive technology for tilapia production.

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