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Presence of Lactic Acid Bacteria in the Intestinal Tract of the Mediterranean Trout (*Salmo macrostigma*) in Its Natural Environment

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Abstract: Knowledge of the composition of the gut microbiota in freshwater fish living in their natural habitat has taxonomic and ecological importance. Few reports have been produced on the composition of the gut microbiota and on the presence of LAB in the intestines of freshwater fish that inhabit river environments. In this study, we investigated the LAB community that was present in the gastrointestinal tract (GIT) of Mediterranean trout (*Salmo macrostigma*) that colonized the Biferno and Volturno rivers of the Molise region (Italy). The partial 16S rRNA gene sequences of these strains were determined for the species-level taxonomic placement. The phylogenetic analysis revealed that the isolated LABs belonged to seven genera (*Carnobacterium, Enterococcus, Lactobacillus, Lactiplantibacillus, Vagococcus, Lactococcus,* and *Weissella*). The study of the enzymatic activities showed that these LABs could contribute to the breakdown of polysaccharides, proteins, and lipids. In future studies, a greater understanding of how the LABs act against pathogens and trigger the fish immune response may provide practical means to engineer the indigenous fish microbiome and enhance disease control and fish health.

Keywords: lactic acid bacteria; gut microbiota; Mediterranean trout; river environment

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Supplementary Materials:

Table S1. List of the isolates LABs with corresponding GenBanK (NCBI) accession numbers and the taxonomic references.

ID Bacterial Strains	Taxonomic Reference	Accession Number (GenBank)
L1	*Carnobacterium maltaromaticum*	MZ452146
L2	*Carnobacterium maltaromaticum*	MZ452147
L3	*Carnobacterium maltaromaticum*	MZ452148
L5	*Carnobacterium maltaromaticum*	MZ452149
L9	*Carnobacterium maltaromaticum*	MZ452150
L11	*Carnobacterium maltaromaticum*	MZ452151
L13	*Carnobacterium maltaromaticum*	MZ452152
L14	*Carnobacterium maltaromaticum*	MZ452153
L18	*Carnobacterium maltaromaticum*	MZ450132
L20	*Carnobacterium maltaromaticum*	MZ450133
B5	*Carnobacterium maltaromaticum*	MZ450134
B7	*Carnobacterium maltaromaticum*	MZ452154
M21C	*Carnobacterium maltaromaticum*	MZ452155
M21CR	*Carnobacterium maltaromaticum*	MZ452156
2CR	*Carnobacterium maltaromaticum*	MZ452157
2ACR	*Carnobacterium maltaromaticum*	MZ452158
11V	*Carnobacterium maltaromaticum*	MZ452159
12V	*Carnobacterium maltaromaticum*	MZ452160
18V	*Carnobacterium maltaromaticum*	MZ452161
25V	*Carnobacterium maltaromaticum*	MZ450135
42V	*Carnobacterium maltaromaticum*	MZ452162
43V	*Carnobacterium maltaromaticum*	MZ452163
45V	*Carnobacterium maltaromaticum*	MZ452164
46V	*Carnobacterium maltaromaticum*	MZ452165
1T	*Carnobacterium maltaromaticum*	MZ452166
2T	*Carnobacterium maltaromaticum*	MZ452167
3T	*Carnobacterium maltaromaticum*	MZ452168
4T	*Carnobacterium maltaromaticum*	MZ452169
B2	*Lactiplantibacillus plantarum*	MZ452091
23V	*Lactiplantibacillus plantarum*	MZ452092
33V	*Lactiplantibacillus plantarum*	MZ452093
36V	*Lactiplantibacillus plantarum*	MZ452094
37V	*Lactiplantibacillus plantarum*	MZ452095
38V	*Lactiplantibacillus plantarum*	MZ452096
63V	*Lactiplantibacillus plantarum*	MZ452097
64V	*Lactiplantibacillus plantarum*	MZ452098
65V	*Lactiplantibacillus plantarum*	MZ452099
66V	*Lactiplantibacillus plantarum*	MZ452100
67V	*Lactiplantibacillus plantarum*	MZ452101
68V	*Lactiplantibacillus plantarum*	MZ452102
73V	*Lactiplantibacillus plantarum*	MZ452103
6T	*Lactiplantibacillus plantarum*	MZ452104
3V	*Lactobacillus acidophilus*	MZ452105
L8	*Lactiplantibacillus pentosus*	MZ452106
L10	*Lactococcus lactis*	MZ452076

L12	*Lactococcus lactis*	MZ452077
L14B	*Lactococcus lactis*	MZ452078
L19	*Lactococcus lactis*	MZ452079
B6	*Lactococcus lactis*	MZ452080
B34	*Lactococcus lactis*	MZ452081
L4	*Enterococcus faecalis*	MZ452069
2V	*Enterococcus faecalis*	MZ452070
4V	*Enterococcus faecalis*	MZ452071
7V	*Enterococcus faecalis*	MZ452072
31V	*Enterococcus faecalis*	MZ452073
32V	*Enterococcus faecalis*	MZ452074
34V	*Enterococcus faecalis*	MZ452075
15V	*Vagococcus fluvialis*	MZ451958
39V	*Weissella paramesenteroides*	MZ451959
57V	*Weissella paramesenteroides*	MZ451960
61V	*Weissella paramesenteroides*	MZ451961