Slovenian Presidency 20–21

6th Forum
of the EU Strategy for the Adriatic and Ionian Region
Along the coasts of the shared sea
Izola, 11–12 May 2021

Interreg ADRION ADRIATIC-IONIAN
European Regional Development Fund - Instrument for Pre-Accession II Fund
EUSAIR FACILITY POINT

European Commission

EU Strategy for the Adriatic and Ionian Region
EUSAIR

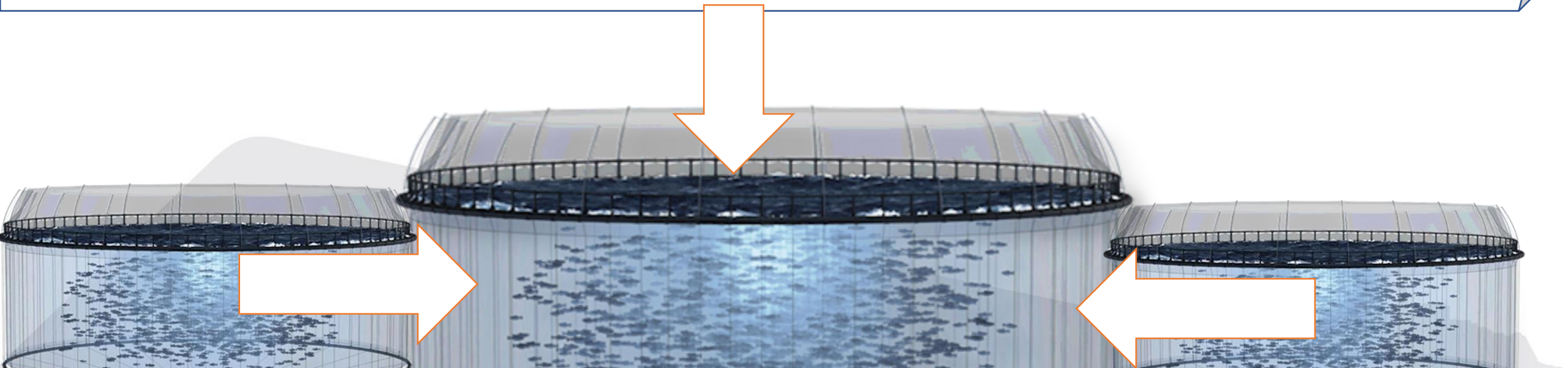
USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio)*, REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

MSc IRINA MANEVSKA
INSTITUTE OF ANIMAL SCIENCES-FISHERY DEPARTMENT
Univesity “St. Cyril and Methodius”-Skopje
Republic of North Macedonia

Acumulation cage system of freshwater fishes rearing…….

Is a recent and contemporary intensive technology of rearing……which makes it more market demanded and more competitive, compared to fish reared in conventional fish ponds as extensive method of rearing.

…….rearing of freshawater fish in acumulations into cages made from various materials and surrounded from each side……recently, it is a technology delivering more demands for increasing production, meat quality and fish health. Novel research and scientific surveys present new alternative methods for advancing and improvement of fish feeding, commercial performances as well as fish healt and environment. Feed aditives and supplements as current application tools in aquaculture are proved as succesfull and sustainable in fish production.



Slovenian Presidency 20–21

6th Forum

of the EU Strategy for the Adriatic and Ionian Region
Along the coasts of the shared sea
Izola, 11–12 May 2021

Interreg ADRION ADRIATIC-IONIAN
European Regional Development Fund - Instrument for Pre-Accession II Fund
EUSAIR FACILITY POINT

European Commission

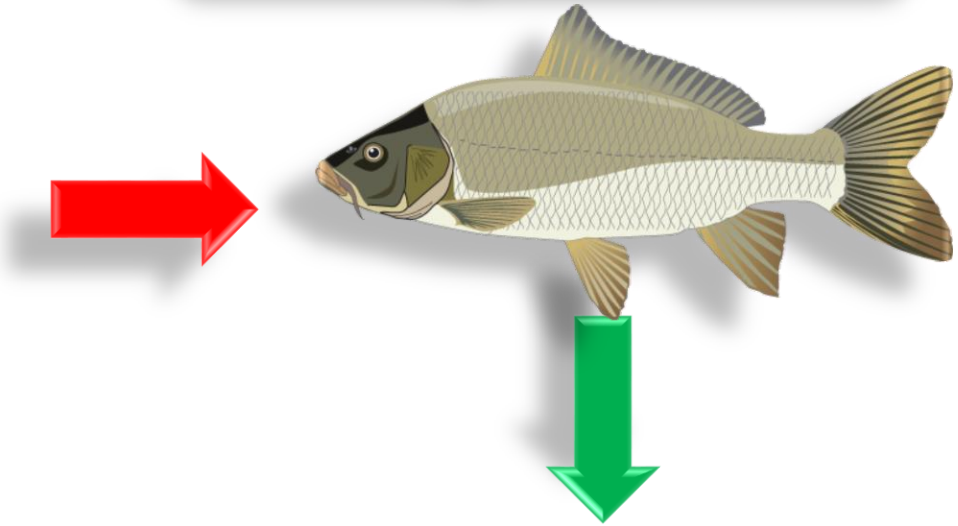
EU Strategy for the Adriatic and Ionian Region
EUSAIR

Probiotics in Aquaculture

application of probiotics in carp food is novel alternative feeding method in intensive aquaculture production

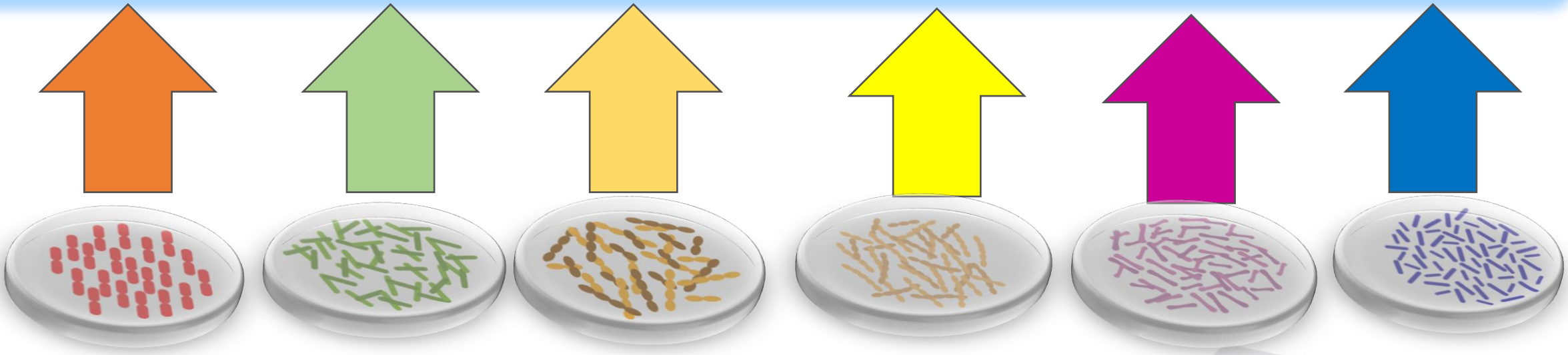
What are probiotics?

“bio-friendly” agences

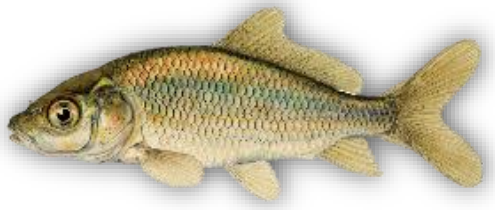


With positive influence of the host’s health

……Resistent on physical and ambiental influences and factors such as heat, dessication, UV radiation…..into proceedings of pelleting, keeping and food storage and manipulation…….



In the frame of intensive cage carp production technology they have positive influence on commercial parameters and carp's immune system



МИНИСТЕРСТВО ЗА ЗЕМЈОДЕЛСТВО, ШУМАРСТВО И ВОДОСТОПАНСТВО
на Република Македонија

Cage culture rearing in Republic of North Macedonia has a long tradition, based on several technology advances such as: high densities rearing, increased fish production, easy manipulation and possibilities for automatization.

Carp production reared in intensive cage aquaculture is about 500-1000 tonnes/year

Accumulation “TIKVES”

21 aquaculture capacity (cages), with annual carp production of 400 tonnes

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

Accumulation “Mantovo”

With registered 3 aquaculture capacities, with annual production of 48 tonnes

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

Acumulation “KOZJAK”

Registered one aquaculture capacity with annual production of 60 tonnes

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE STEM IN ACCUMULATION KOZJAK

Research goal

…….for the first time in the Republic of North Macedonia was made an attempt of intensive cage system carp rearing, without use of antibiotics and chemical treatments, carp production i.e. carp feeding with probiotic application…….

<u>…..as well as delivering a healthy and eco product……</u>

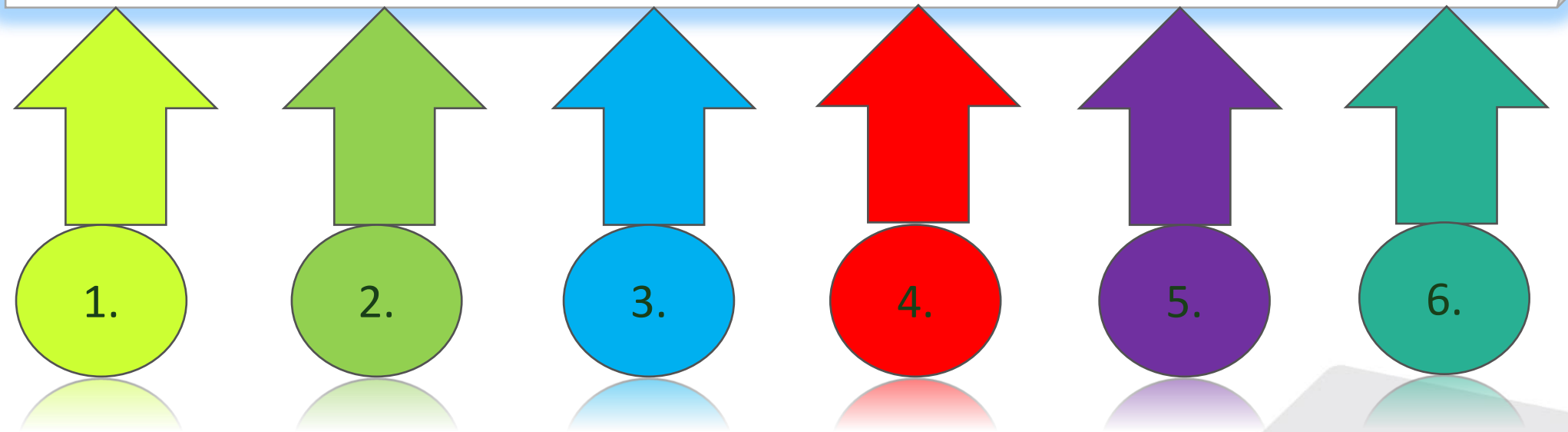
USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

Probiotic application carp food on the intensive cage farm in open water KOZJAK

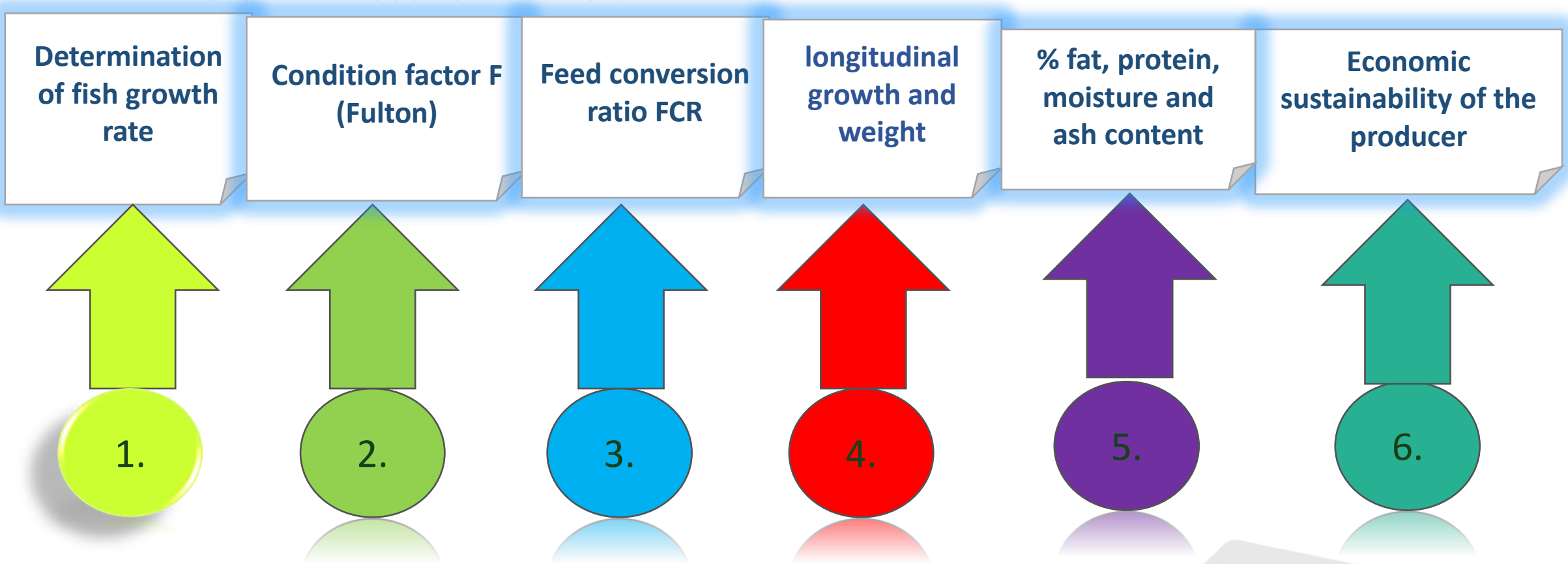
This research project was funded by Ministry of Agriculture, Forestry and Water economy-Republic of North Macedonia

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

For the goal assessment, six tasks were set such as

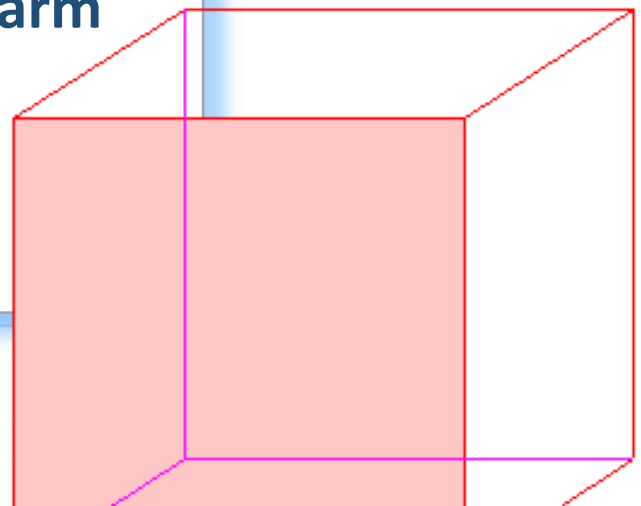


USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK



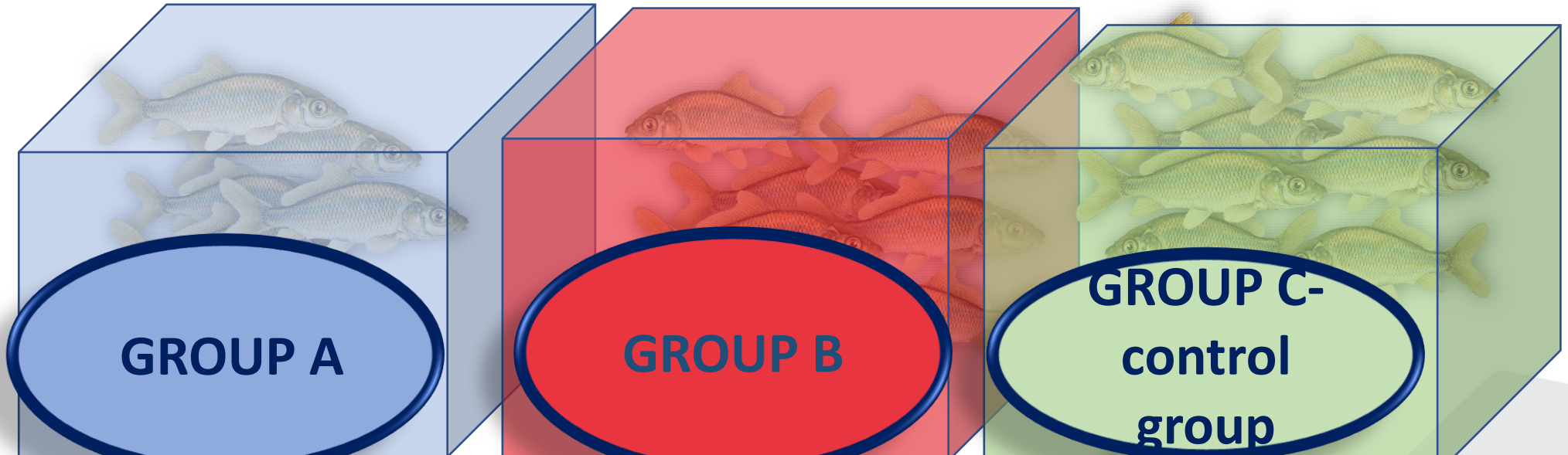
USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

For the purpose of the experiment 3 cages were installed with dimensions of 5x5x5m, i.e. 3x125 m3 volume of the fish farm



USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

Into each cage were set the same number of carp individuals, with the initial mean weight of 170 g



USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio)*, REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

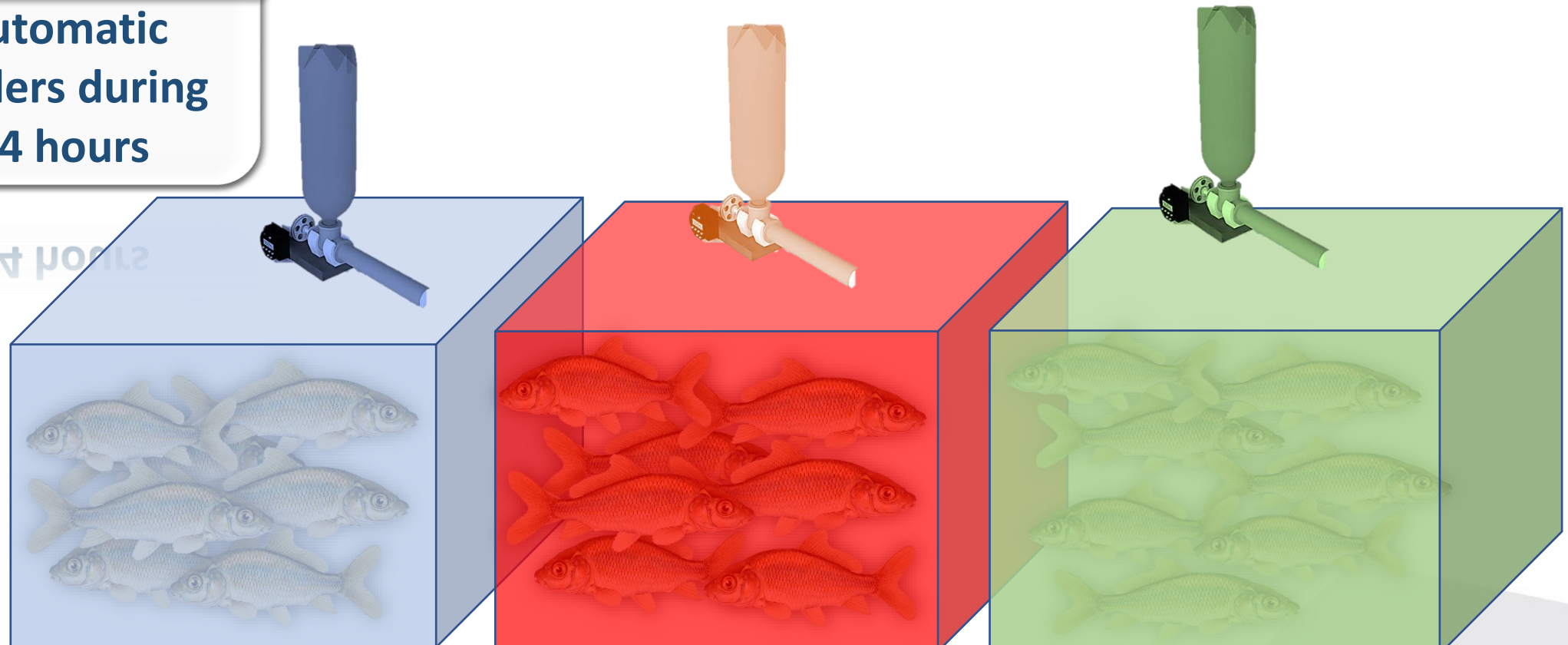
GROUP A — LOWER PROBIOTIC CONCENTRATION ADDED IN FOOD

GROUP B — HIGHER PROBIOTIC CONCENTRATION ADDED IN FOOD

GROUP C — COMMERCIAL FOOD WITHOUT PROBIOTIC ADDED

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

Automatic feeders during 24 hours



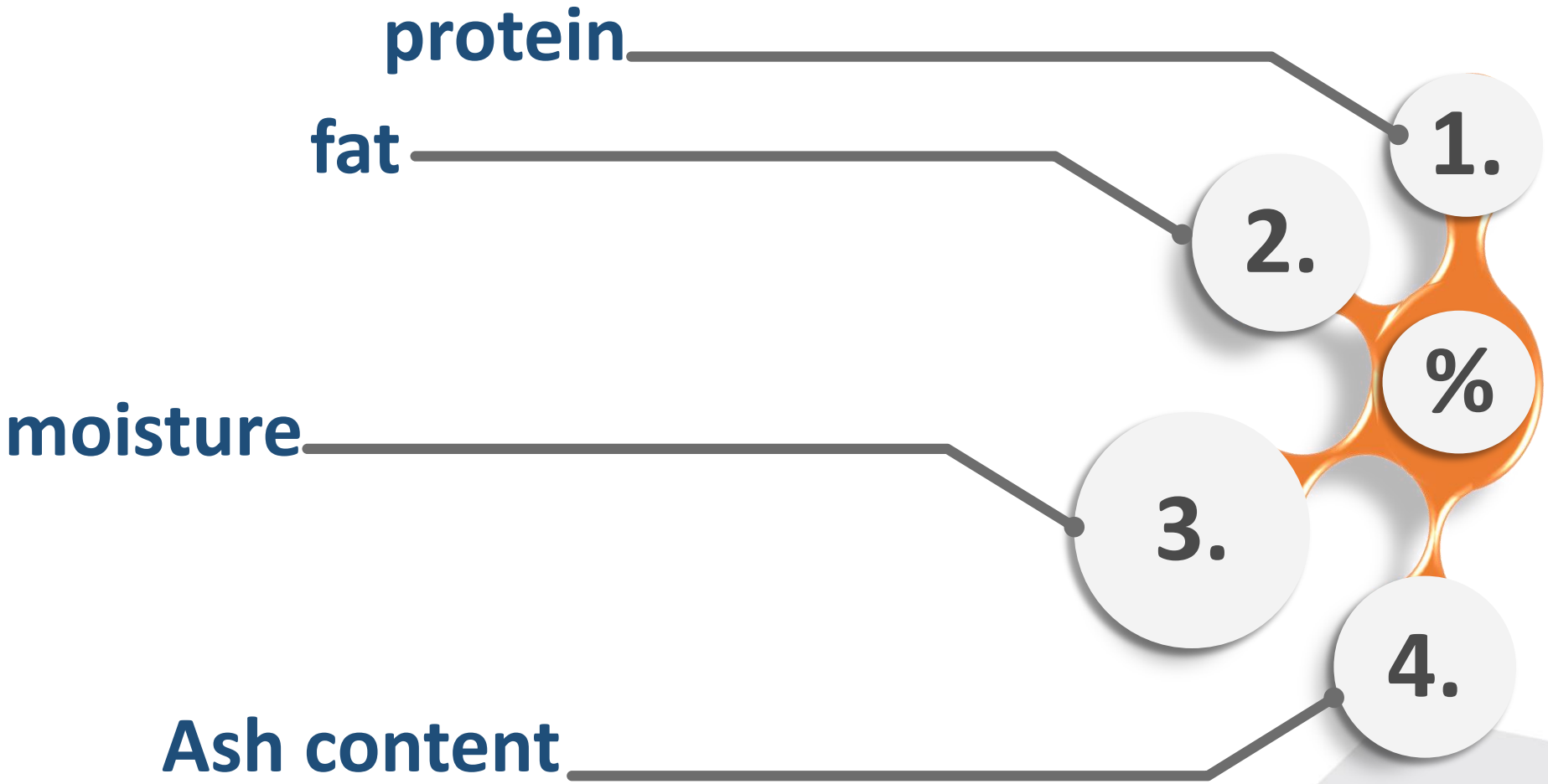
Slovenian Presidency 20–21

Along the coasts of the shared sea
Izola, 11–12 May 2021

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

CHEMICAL ANALYSIS OF THE CARP MEAT

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK



USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

Data statistical analysis

A | B | C

Statistical methods

descriptive statistics

central tendency

dispersion

multivariant statistics

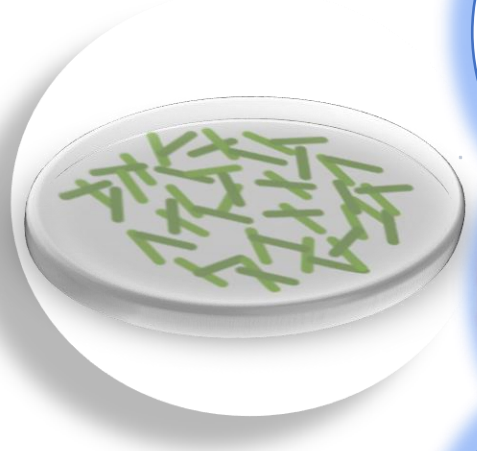
ANOVA

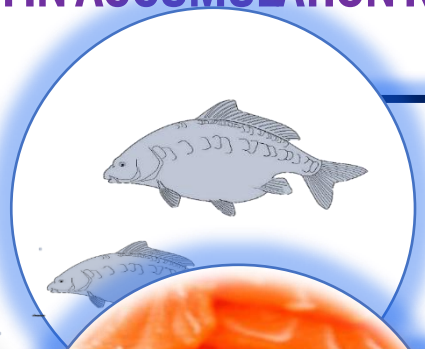
PCA

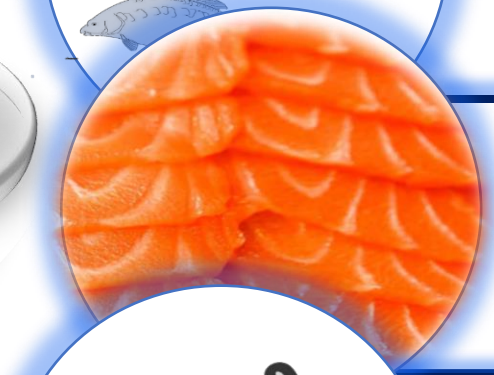
USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

RESULTS

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK







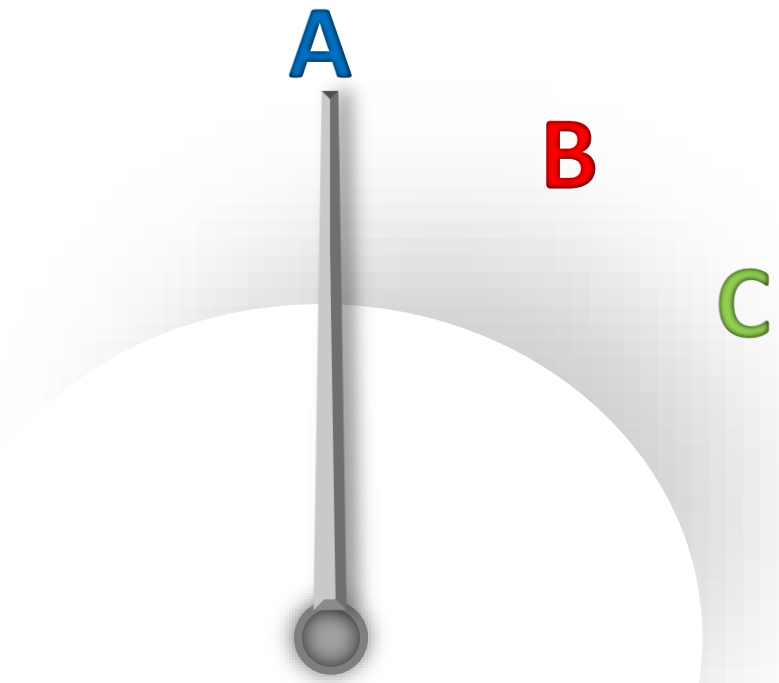
PRODUCTION PARAMETERS

CHEMICAL COMPOSITION

ECONOMIC SUSTAINABILITY

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

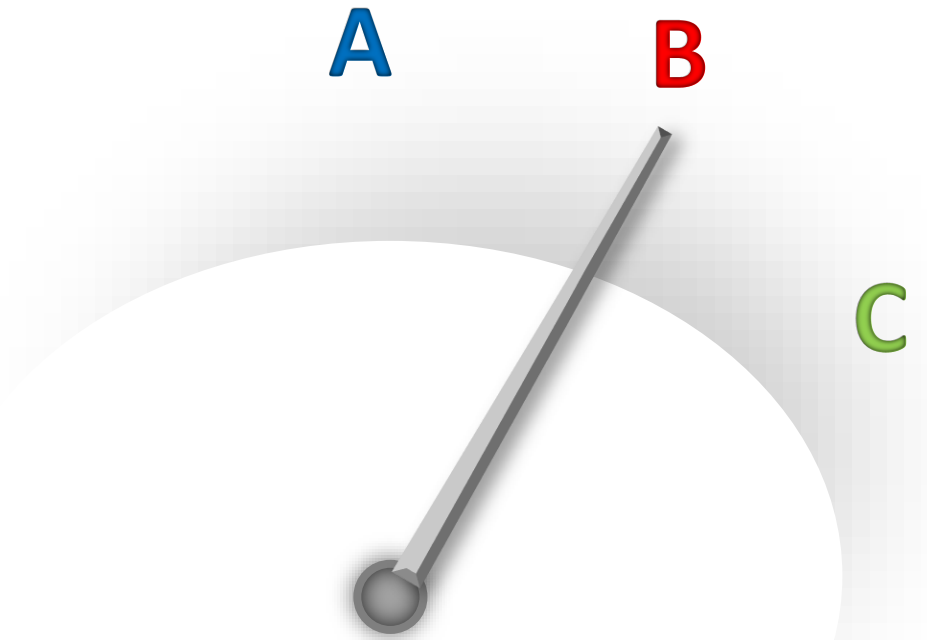
Total weight gain	Total food	FCR
262912 g	362500 g	1,4



USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

Total weight gain	Total food	FCR
262912 g	362500 g	1,4

Total weight gain	Total food	FCR
241800 g	362500 g	1,5

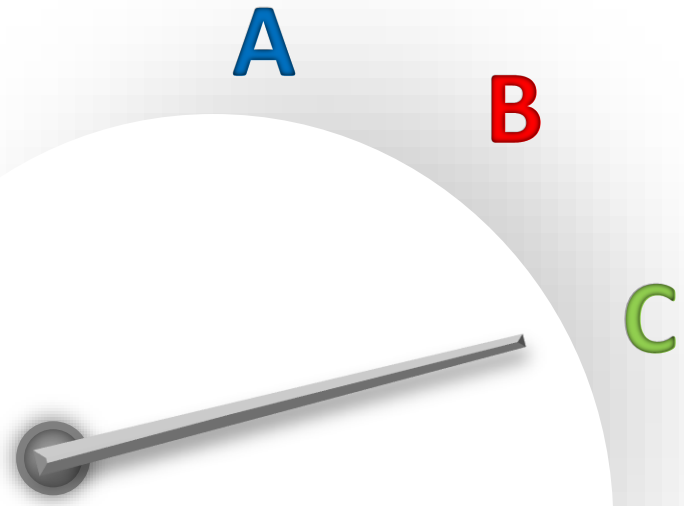


USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

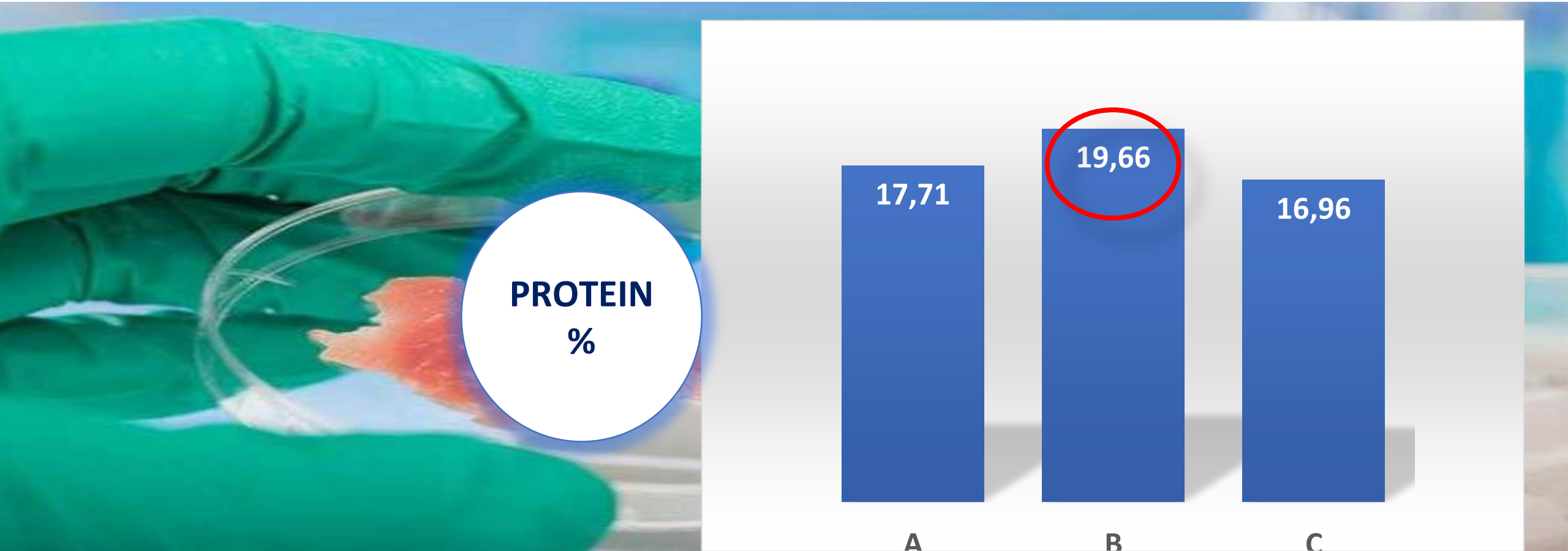
Total weight gain	Total food	FCR
262912 g	362500 g	1,4

Total weight gain	Total food	FCR
241800 g	362500 g	1,5

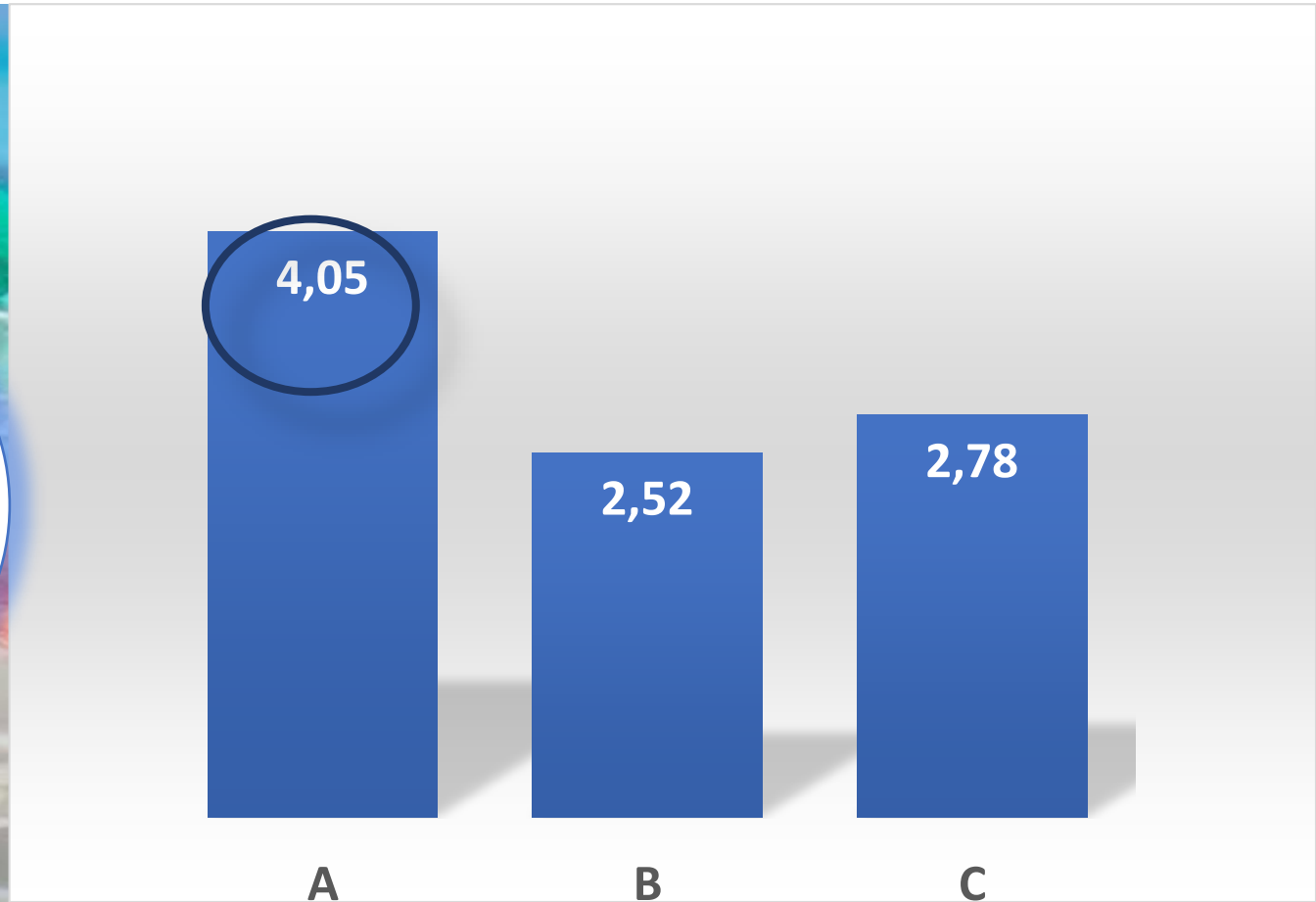
Total weight gain	Total food	FCR
207600 g	362500 g	1,7



USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK



USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

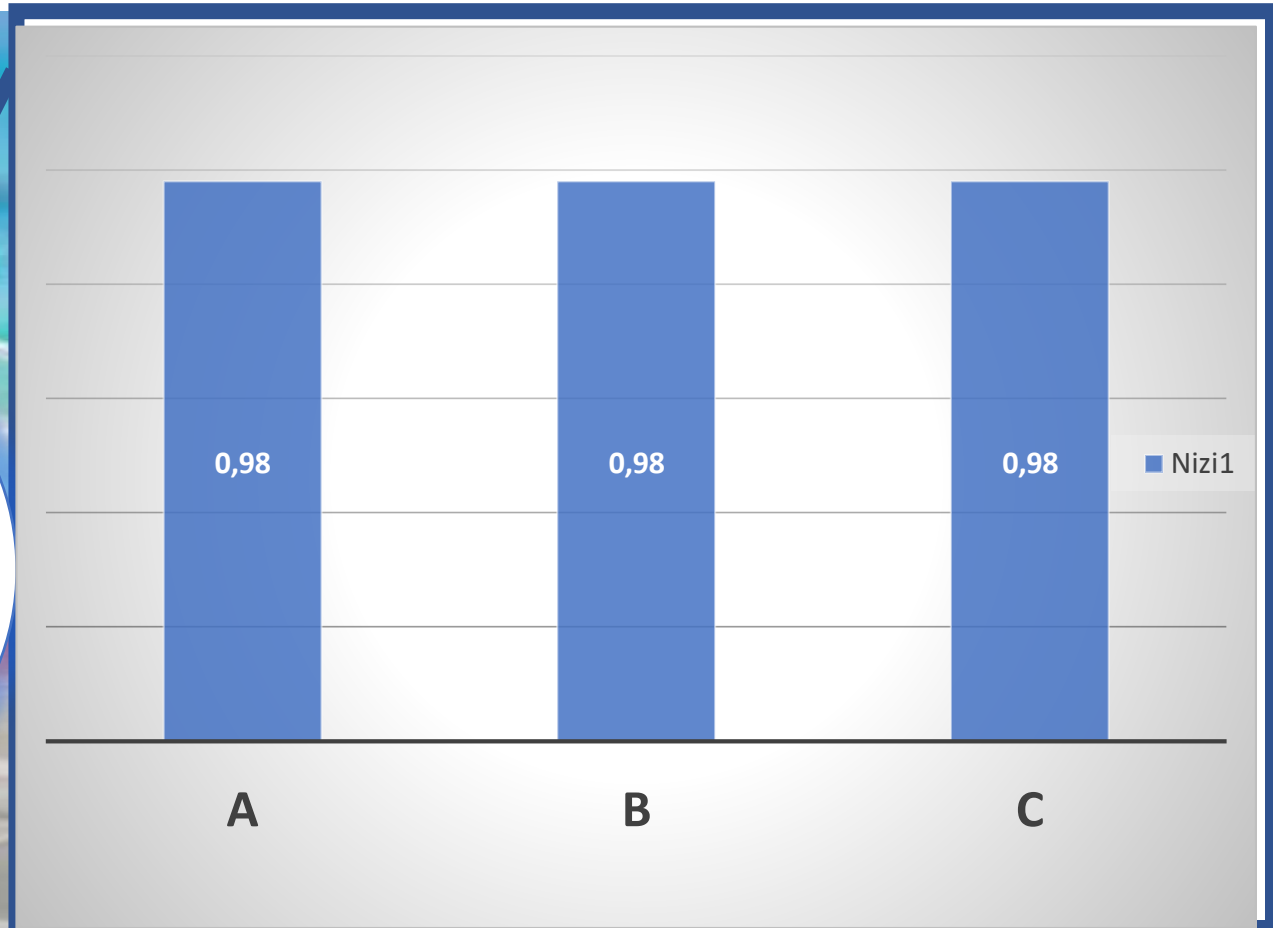


USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

MOISTURE %

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

ASH %



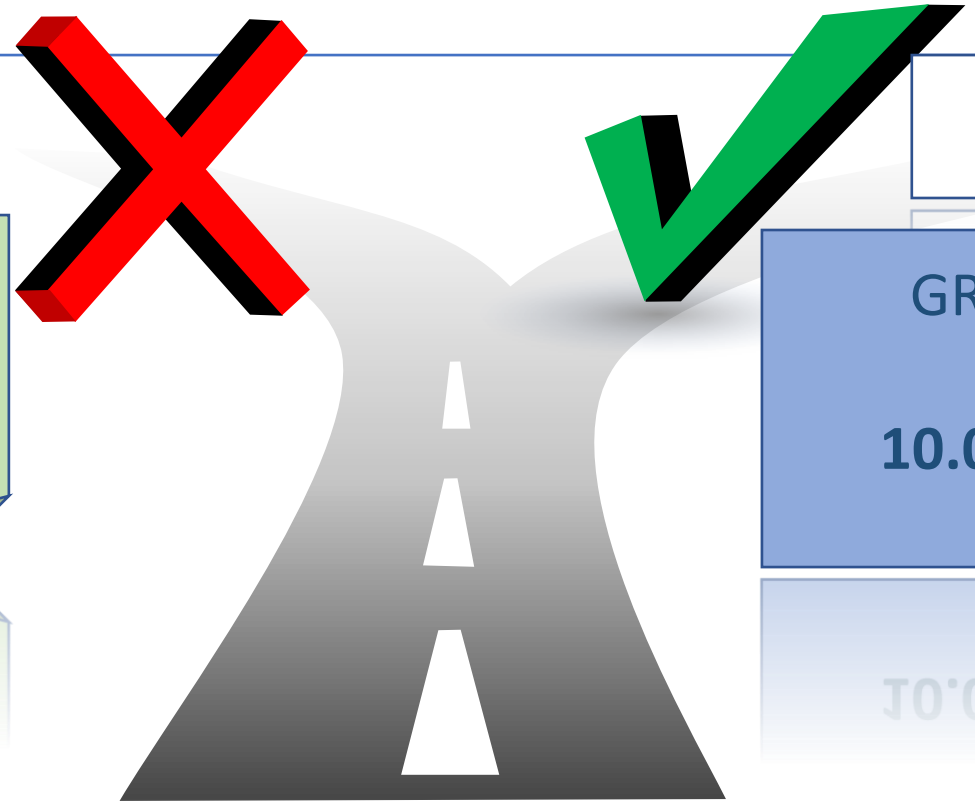
USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

ECONOMIC SUSTAINABILITY

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

BUDGET VARIANCE FOR THE PRODUCER

Projected for total production on the fish farm for 50 tonnes of consume carp



Without probiotic use
70.000 EUR

With probiotic use

GROUP A
10.000 EUR

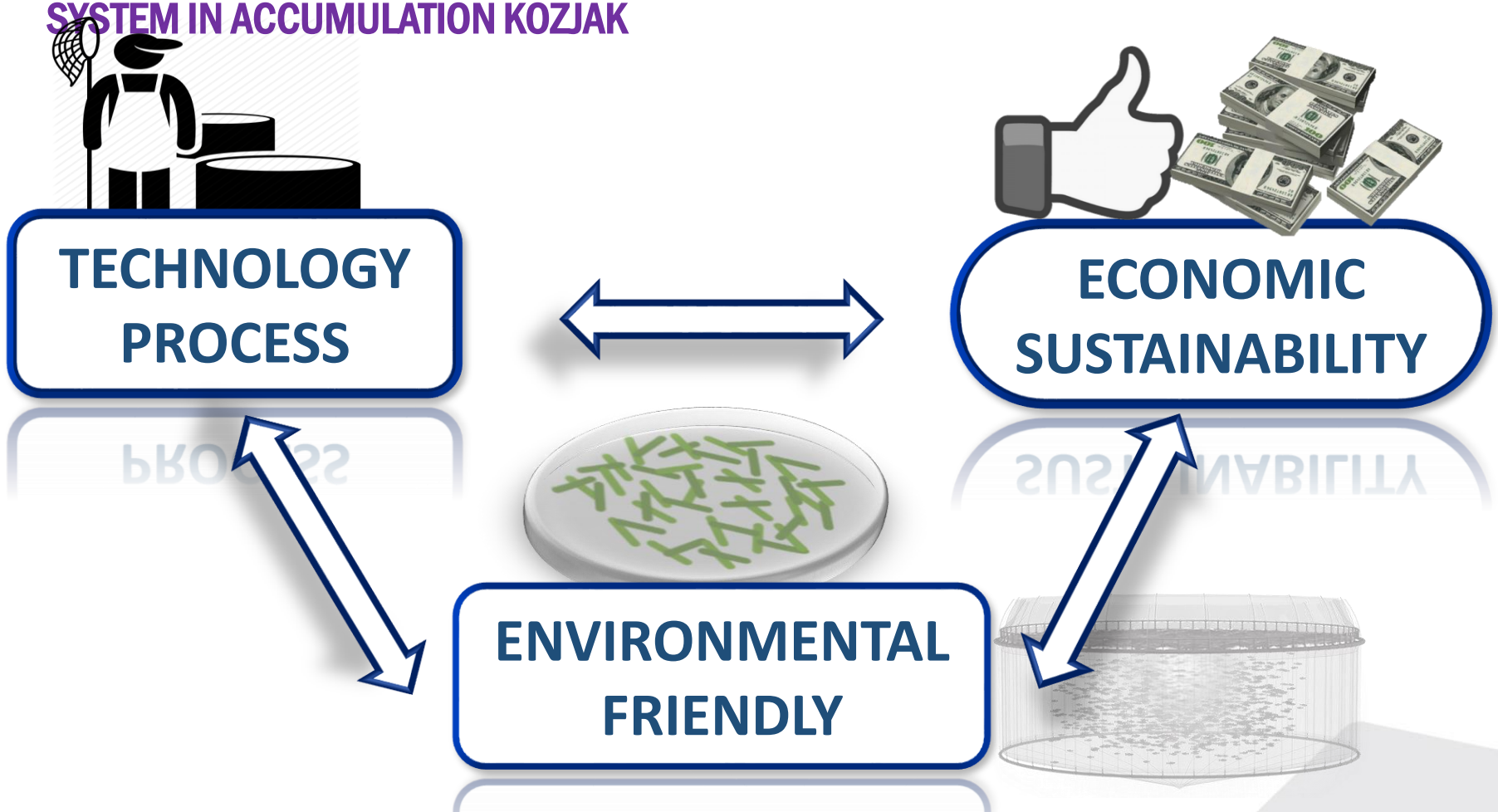
GROUP B
6000 EUR

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

CONCLUSIONS

1. Mean weight in A group presented a significant higher values ($p<0,05$), comparing to the control group C, as in second phase with 29,58% between A and C group.
2. Individual (daily) growth of the carp individuals from group A, presented higher values, compared to control group C (34,15%) in the first phase and (40,39%) difference in the second phase of th experiment.
3. FCR in group A during the first phase presented lower values (1,6), compared to control group C (2,3), as in the second phase with significant lower values (1,4 in group A amd 1,7 in control group)
4. Condition factor (F) in group A, presented significant higher values in individuals in group A 1,89 ($p<0,05$), compared to control group (1,49)
5. It could be concluded that the lower probitic concentration added in food, presented higher fat content in carp meat.
6. Economic sustainability is much more effective in lower probiotic concentration added in carp feed. Probiotic use in carp feed in intensive cage system aquaculture technology is profitable and plausible.

USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK



USE OF PROBIOTIC ADDED IN FOOD FOR CARP *(Cyprinus carpio),* REARED IN INTENSIVE CAGE SYSTEM IN ACCUMULATION KOZJAK

Slovenian Presidency 20–21

Along the coasts of the shared sea
Izola, 11–12 May 2021

EU Strategy for the Adriatic and Ionian Region
EUSAIR

REPUBLIC OF SLOVENIA

European Commission

Interreg ADRION ADRIATIC-IONIAN
European Regional Development Fund · Instrument for Pre-Accession II Fund
EUSAIR FACILITY POINT

Občina · Comune di IZOLA · ISOLA

ADRIATIC & IONIAN INITIATIVE

Co-funded by
the European Union

Slovenian Presidency 20–21

Along the coasts of the shared sea
Izola, 11–12 May 2021

Slovenian Presidency 20–21

6th Forum

of the EU Strategy for the Adriatic and Ionian Region
Along the coasts of the shared sea
Izola, 11–12 May 2021

Interreg ADRION ADRIATIC-IONIAN
European Regional Development Fund - Instrument for Pre-Accession II Fund
EUSAIR FACILITY POINT

European Commission

EU Strategy for the Adriatic and Ionian Region
EUSAIR

Title

Subtitle

Slovenian
Presidency
20–21

Along the coasts of the shared sea
Izola, 11–12 May 2021