

EVALUATION OF DIETARY INCLUSION OF INSECT MEAL AND POULTRY BY-PRODUCT MEAL IN COMBINATION TO PLANT PROTEIN-RICH INGREDIENTS ON STRESS RESPONSE AND NUTRITIONAL STATUS OF RAINBOW TROUT *Oncorhynchus mykiss*

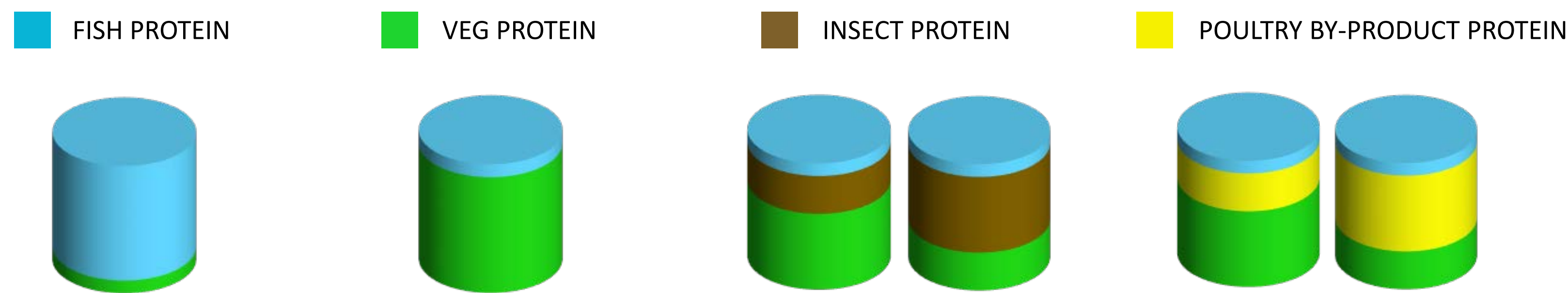


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EXPERIMENTAL DIETS

SIX EXTRUDED ISOPROTEIC (42% DM) AND ISOLIPIDIC (24% DM) DIETS



CF - control fish diet with 90:10 and 80:20 ratios between fish and a vegetable mix derived proteins and lipid, respectively

CV - control vegetable mix diet with inverted ratios respect to CF diet (10:90 and 20:80 respectively)

IM30-IM60 - two insect meal (*Hermetia illucens* larvae) based diets with 30% and 60% replacement of vegetable protein

PBM30-PBM60 - two poultry by-product meal based diets with 30% and 60% replacement of vegetable protein

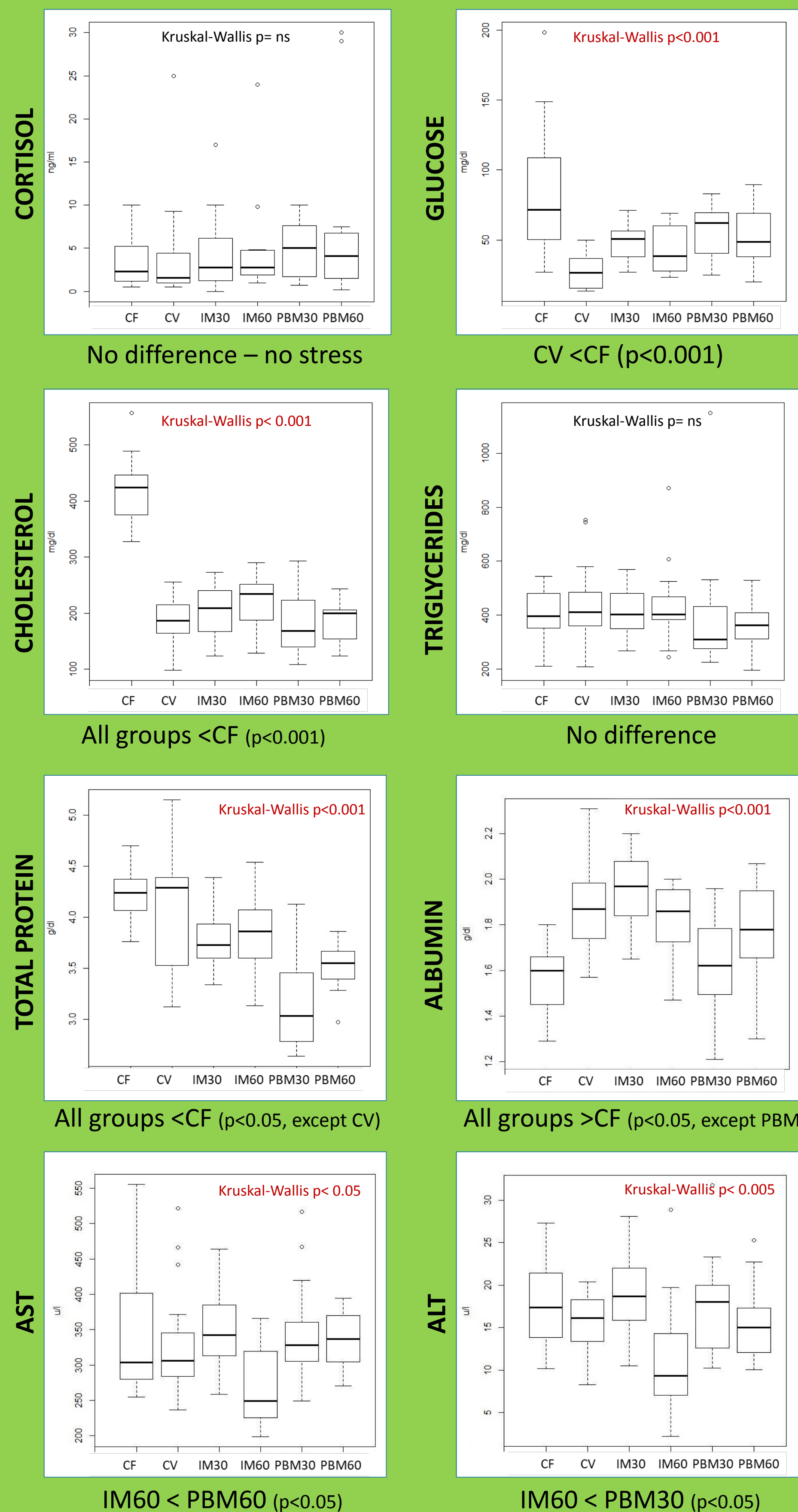
FEEDING TRIAL

EXP DESIGN: 6 diets in triplicate
FISH: 54.2±1.45 g BW
TANKS: 1600 l flow-through
TEMPERATURE: 13°C
FEEDING: twice a day/6 days a week
DURATION: 13 weeks



ANAESTHESIA: 100 mg/l MS 222
BLOOD SAMPLING: caudal withdrawal
FISH: 5x3 fish for each diet
BLOOD PARAMETERS: COR, GLU, CHO, TAG, TP, ALB, AST, ALT
METHODS: chemiluminescence immune assay, spectrophotometric tests¹

PHYSIOLOGICAL RESPONSE



GROWTH

no significant difference respect to ingredients and inclusion levels;
SGR and FCR are better in IM and PBM groups than in CV group

PHYSIOLOGICAL RESPONSE

Irrespective of the diet fed, cortisol and metabolites are within the normal range, suggesting that fish are unstressed and in a good nutritional and welfare status^{2,3}

DIET INGREDIENTS

Replacing up to 60% vegetable protein in the diet by protein supplied by INSECT or POULTRY by-product meals is suitable for the rainbow trout.

Further long lasting feeding trials are needed to refine estimates of optimal inclusion levels of both test ingredients in diets low in fish protein.

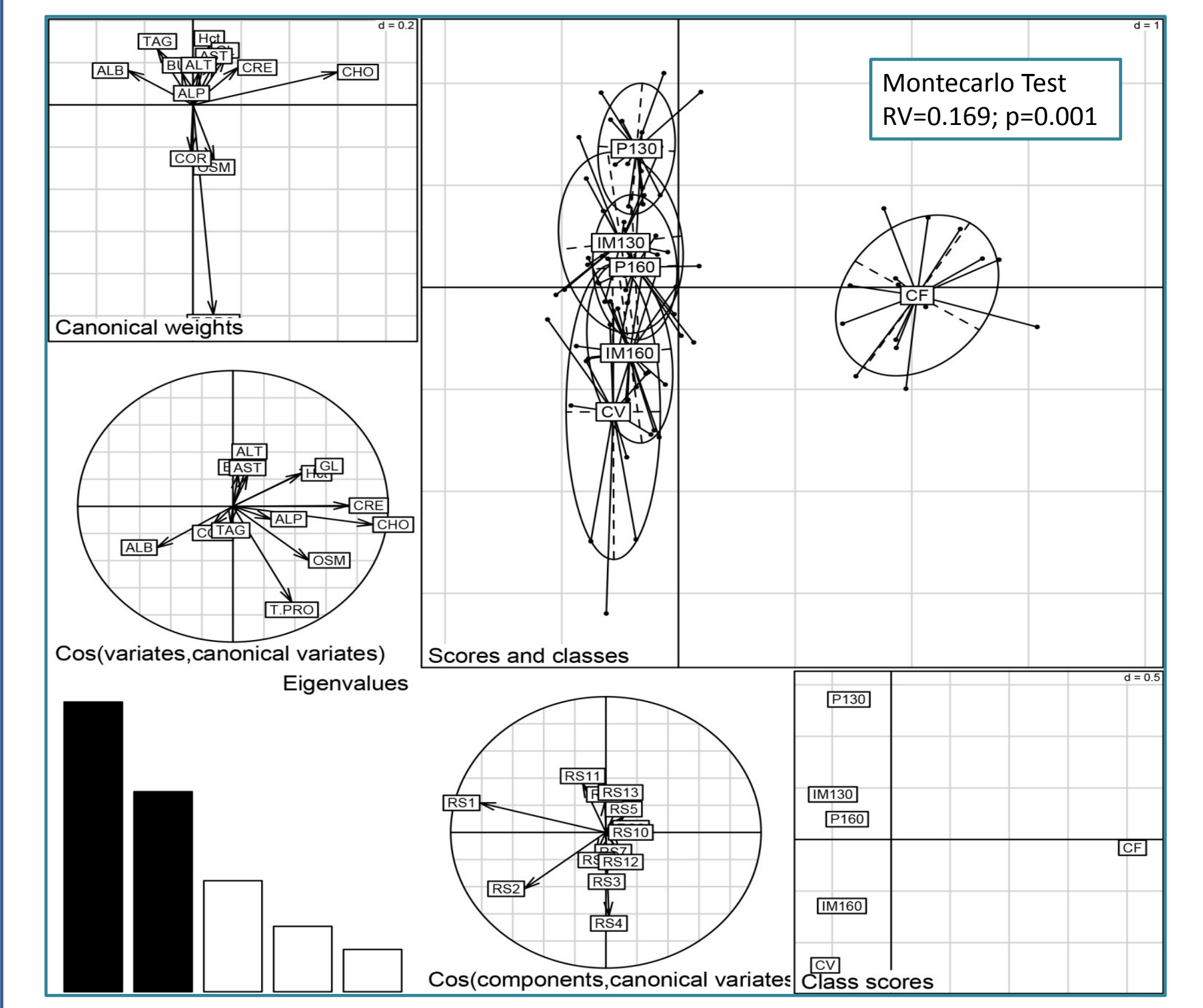
GROWTH PERFORMANCE

	FBW	SGR	FI	FCR	HSI
CV	227.9±3.4	1.57±0.01 ^a	2.02±0.02	0.80±0.01 ^a	1.28±0.13 ^a
IM30	239.1±2.3	1.63±0.01 ^{bc}	2.04±0.02	0.76±0.01 ^b	1.27±0.15 ^a
IM60	241.0±4.8	1.63±0.01 ^{bc}	2.05±0.04	0.76±0.01 ^b	1.30±0.18 ^{ab}
PBM30	240.0±2.4	1.64±0.01 ^{bc}	2.06±0.03	0.76±0.01 ^b	1.48±0.21 ^b
PBM60	244.0±2.0	1.66±0.01 ^c	2.07±0.03	0.75±0.01 ^b	1.44±0.21 ^{ab}
CF	231.2±4.5	1.61±0.01 ^{ab}	2.00±0.03	0.78±0.01 ^{ab}	1.90±0.29 ^c

FBW final body weight (g); SGR Specific growth rate (%/d); FI Feed intake (g/fish*d); FCR Feed conversion ratio; HSI hepatosomatic index. Different letters indicate significant differences among diets (P < 0.05)

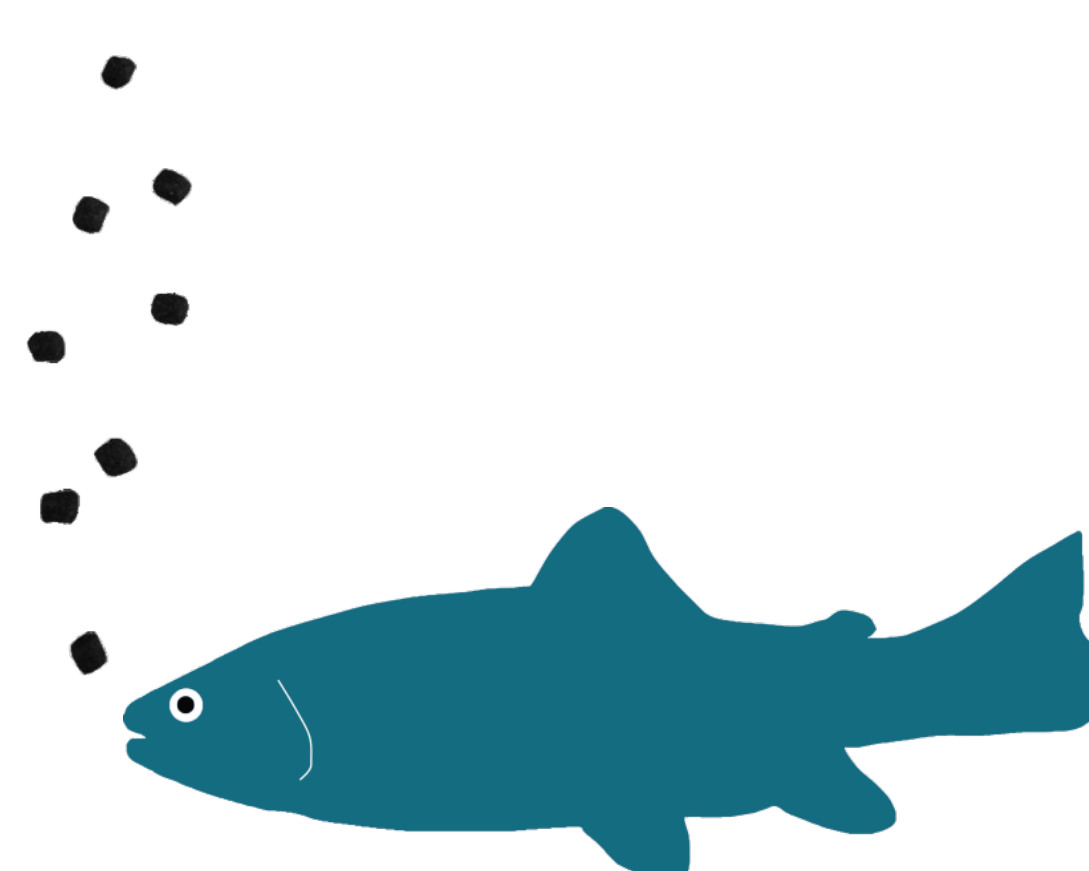
DISCRIMINANT ANALYSIS

- CF group is significantly discriminated from others
- CV, IM60, PBM60, IM30, PBM30 are placed along a physiological gradient according to CHO, TP, TAG
- PBM30 group shows a slight lower metabolic profile than all other group



References

- Di Marco et al., 2017. Aquaculture 471:92-105
- Manera and Britti. 2006. J. Fish Biol. 69: 1427-1434
- Pinedo-Gil, et al., 2019. Aquaculture 501:32-38.



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