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EFFECT OF VIRGINIAMYCIN AND RELATED FACTORS ON THE GROWTH, BODY COMPOSITION AND PLASMA GROWTH HORMONE LEVELS OF RAINBOW TROUT

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SUMMARY

The addition of virginiamycin, factor M and factor S in the feed at 10 and 40 ppm levels yielded improvement in performance as expressed by weight gain, feed conversion and energy retention. The average improvement of growth rate for each group was in the order of 10 %

Difference in body composition or plasma growth hormone levels were not consistent.

RESUME. Effet de la Virginiamycine et de ses constituants sur la croissance, la composition corporelle et les taux d'hormone de croissance plasmatique chez la truite arc-en-ciel.

L'addition de virginiamycine, de facteur M et de facteur S à l'aliment à des taux de 10 et 40 ppm améliore le gain pondéral, l'indice de consommation et la rétention énergétique. L'amélioration du taux de croissance dans chaque groupe a été de l'ordre de 10%. La composition corporelle a peu varié suivant les lots et il n'a pas été observé de variations significatives du taux d'hormone de croissance plasmatique.

INTRODUCTION

Virginiamycin (VM) is a polypeptide antibiotic active against gram-positive bacteria of the gut. The drug is composed of two major factors (M and S) which show marked biological synergism when combined in an optimum ratio of 4:1 (M:S). VM supplemented diet produces growth-promoting effects in broilers, turkey, cattle, and swine. Ahmad and Matty (1989) and Viola et al. (1990) reported that VM stimulated growth and improved feed efficiency in carp.

The aim of this work was to study the growth-enhancing effect of VM and its two components, M and S, in rainbow trout. The feed efficiency, the body composition and the nutrient retention were examined. The plasma growth hormone levels were also measured.

MATERIAL and METHODS

Diets

The general composition of the diets is shown in table 1. Pellets were prepared as previously described (Cravedi et al. 1991) and stored at 4°C before use. The concentrations of VM, M and S in the feed (10 and 40 mg/kg) was verified by microbiological assay (Corpet et al. 1988).

Table I : Composition of the diets

Fish meal (%)	45
Soybean meal (%)	30
Fish oil (%)	6
Crude starch (%)	14
Binder (%)	1
Vitamin mix (%)	1
Mineral mix (%)	1
Dry matter (%)	89.9
Crude protein (% DM)	39.4
Crude fat (% DM)	10.7
Gross energy (KJ/g DM)	20.2

Growth studies

Seven groups of 100 rainbow trout each (initial body weight = 48.8 ± 1.5 g) were constituted. The growth trial was conducted in the INRA experimental fish farm (Donzacq, France) at a constant water temperature of 18 ± 1°C. Each group of fish was fed daily ad libitum with the experimental diets indicated table 2. Fish were counted and weighed at the beginning, every 4 weeks and at the end of the growth experiment that lasted 11 weeks. Initial and final samples of ten fish from each group were drawn 6 h after the last meal for blood sampling, dissection and analyses of body composition.

Table II - Incorporation of feed additives in the diets

test diets	factor	level (mg/kg diet)
Co	none	0
S10	S	10
S40	S	40
M10	M	10
M40	M	40
VM10	Virginiamycin	10
VM40	Virginiamycin	40

Analytical methods

Proximate composition of the diets and carcasses were made following the usual procedures : dry matter (110°C for 25h), protein (Kjeldahl [N x 6.25]) after acid digestion, fat (after Folch extraction), growth energy (Gallenkamp adiabatic bomb calorimeter). Growth hormone in plasma was analyzed by radioimmunoassay as described by Lebail et al. (1991).

Table III - Growth performance and nutrient retention in rainbow trout fed different diets for 11 weeks at a water temperature of 18°C.

Initial body weight : 48.8 ± 1.5 g. Each group = 100 animals

Diet	Feed intake (%IBW/day)	Mean Weight Gain (%IBW)	FGR	PER	Protein retention (%)	Energy retention (%)	Fat retention (%)
Co	2.1	117.8	1.3	2.0	38.0	32.4	78.0
M10	2.2	136.3	1.1	2.3	40.0	38.7	98.5
M40	2.4	152.5	1.1	2.4	40.4	34.7	81.5
S10	2.2	133.2	1.1	2.2	40.1	34.8	88.1
S40	2.3	139.4	1.2	2.2	43.0	37.0	95.7
VM10	2.3	146.3	1.1	2.4	41.4	33.7	77.3
VM40	2.4	144.0	1.2	2.2	37.1	33.3	86.3

IBW= Initial body weight; FGR= Feed/Gain ratio; PER= Protein effiency ratio

RESULTS AND DISCUSSION

Growth performance data and nutrient retention are shown in table 3. The addition of VM, M and S at concentrations of 10 and 40 mg/kg feed resulted in a growth rate improvement between 9 and 12% when compared with control fish. The results concerning VM are in good agreement with those obtained in carp fed a diet containing 40 ppm VM and a protein level of 47% (Ahmad & Matty, 1989). However these values are lower than those found by Viola and Arieli (1987) and Viola et al (1990) in tilapia and carp. The feed conversion, protein retention, energy retention and fat retention were also generally improved.

The body composition was not affected by the treatments (table 4). However, a slight increase in the hepatosomatic index and a small decrease of the viscera to body weight ratio was observed.

At the end of the growth trial, the plasm GH levels were not significantly different in the seven groups (Fig. 1) indicating that this hormone does not appear to be implicated in the growth promoting effect of VM, and related factors in trout. Surprisingly, both M and S, in spite of their different physical, chemical and biological properties, act as groth enhancers. As VM seems to have no effect on intestinal wall morphology and gut flora of fish (Ahmad and Matty, 1989), the mode of action of this compound remains to be investigated.

Table IV - Initial and final body composition of rainbow trout fed the different diets

	Water (% fresh weight)	Protein (% FW)	Fat (% FW)	Energy (KJ/100g FW)	HSI (%)	VSI (%)
INITIAL	77.5	15.5	3.3	215.1		
FINAL						
Co	72.5	17.4	7.2	240.7	1.4	10.5
M10	72.7	16.4	8.2	254.2	1.7	9.5
M40	73.2	16.5	7.1	241.8	1.6	9.1
S10	73.5	16.9	7.2	247.3	1.6	8.3
S40	71.4	17.9	8.0	245.0	1.6	7.9
VM10	73.9	16.7	6.7	245.1	1.9	8.6
VM40	73.1	16.4	7.7	246.6	1.7	8.7

HSI = liver to body weight ratio; VSI = viscera to body weight ratio

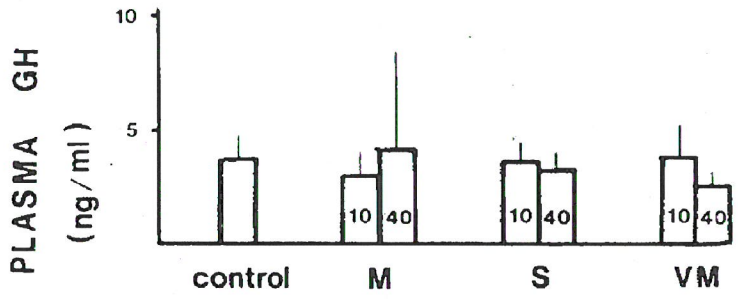


Fig. 1 : Effect of virginiamycin and related factors on plasma GH levels. The data are presented as the mean ± SD (ten trout per group).

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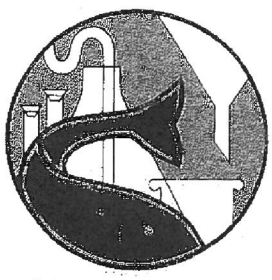
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