NUTRIMARK

A Unique Product From EXOTIC BIOSOLUTIONS

Trial Result in Broilers

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Introduction

Exotic Biosolutions Pvt. Ltd.

- Started business in 1989 as Exotic Mushrooms
- Started manufacturing unit for Feed Supplements in 1998
- Has FAMI QS Version 6 Certification
- Contract Manufacturer/supplier to many AH Companies
- More than 10 formulations for own marketing
- Introduced several new concept products for poultry and dairy farmers:
  - Fly control products
  - Marine algae based products
  - Yeast based products, including MOS
  - Toxin binders and Acidifiers
  - Glycine Chelated Mineral combinations

Nutrimark

Specially processed, marine algae based product that has

- Naturally chelated macro and micro minerals
- Vitamins A, E and C
- Bioactive compounds (*Sulfonated Polysaccharides. Phenols, Flavanoids, Aryl polyketides etc.*) that have
  - Antibacterial
  - Anti-inflammatory
  - Hepato-protective and
  - Anti-oxidative properties

These natural bioactive compounds in Nutrimark lead to

- Modulated intestinal microbiota improving their beneficial effect
- Improved nutrient absorption
- Better energy metabolism
- Reduced stress and better immune response

Context and Plan of Study

- While scientific papers show bioactive compounds present in brown marine algae may improve poultry production efficiency; limited data is available on poultry performance evaluation using them in feed.
- Exotic Biosolutions planned to study the results of Nutrimark usage in different species in collaboration with different organizations-
  - For Dairy, we collaborate with different farmers' organizations and educational institutions
  - For Poultry, we collaborate with organized farms and educational institutions
  - Present study was in collaboration wit MVAFSU- conducted by Dr. RC Kulkarni at Udgir Veterinary College.

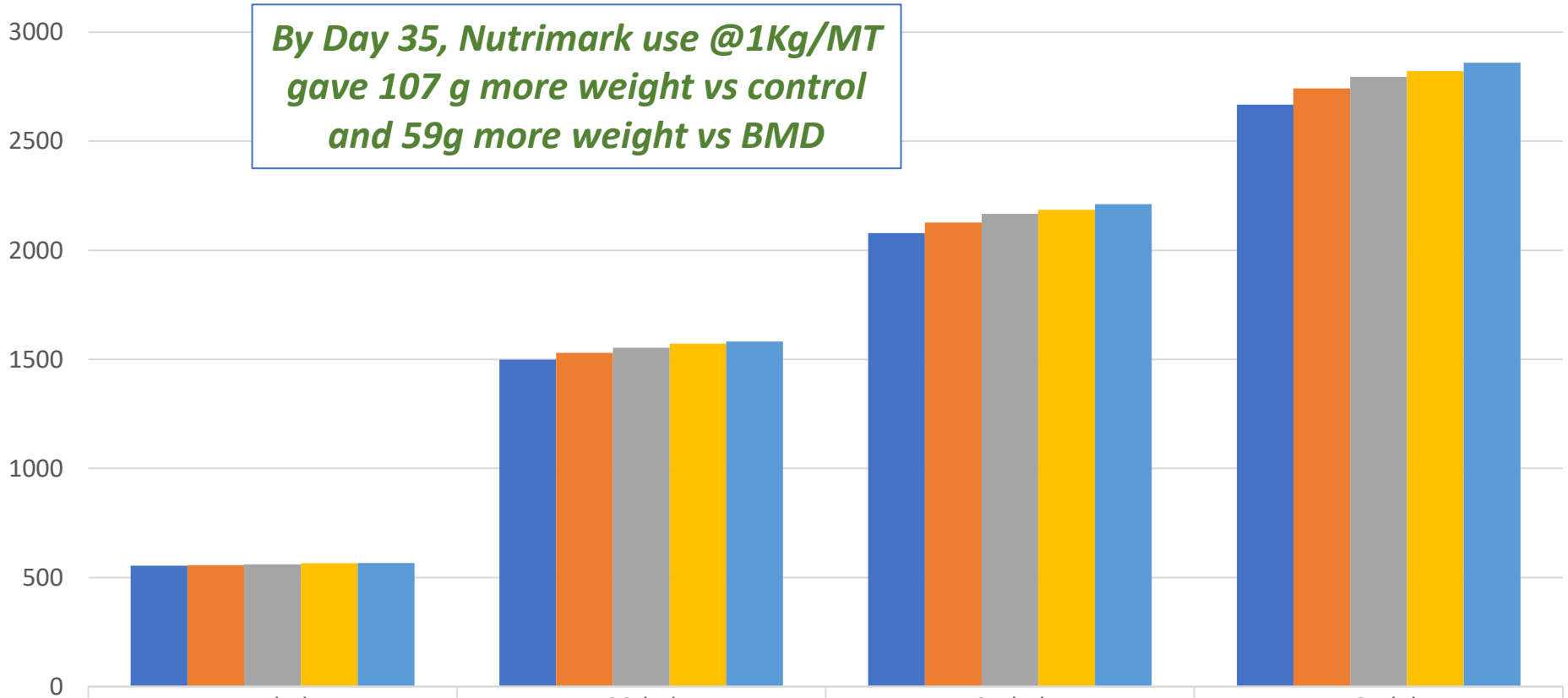
Study Design

- Randomized, controlled trial (RCT) to evaluate Nutrimark usage and compare it with a null control and a positive control in broiler birds.
- 600 chicks were enrolled and divided into 5 treatment groups of 120 birds each; each treatment group was further divided into 8 replicates of 15 birds each.
- Treatment Groups-
  - C2: Null
  - C1: Positive Control with BMD 50 PPM in feed
  - T1: Nutrimark 700g/MT Feed
  - T2: Nutrimark 1kg/MT Feed
  - T3: Nutrimark 1.3Kg/MT Feed
- Observations recorded to evaluate effect of Nutrimark on
  - Performance – Bodyweight, Feed Consumption and FCR
  - Gut Integrity – MUC2 Gene Expression, Histological evaluation, Bacterial count
  - Immune competence – ND vaccine Titer, CMI PHAP foot web index (cellular immune response); lymphoid organ weights, H:L ratio
  - Carcass Traits – Ready to cook, Eviscerated and Cut up parts yields, fat pad thickness
  - Mortality

Results

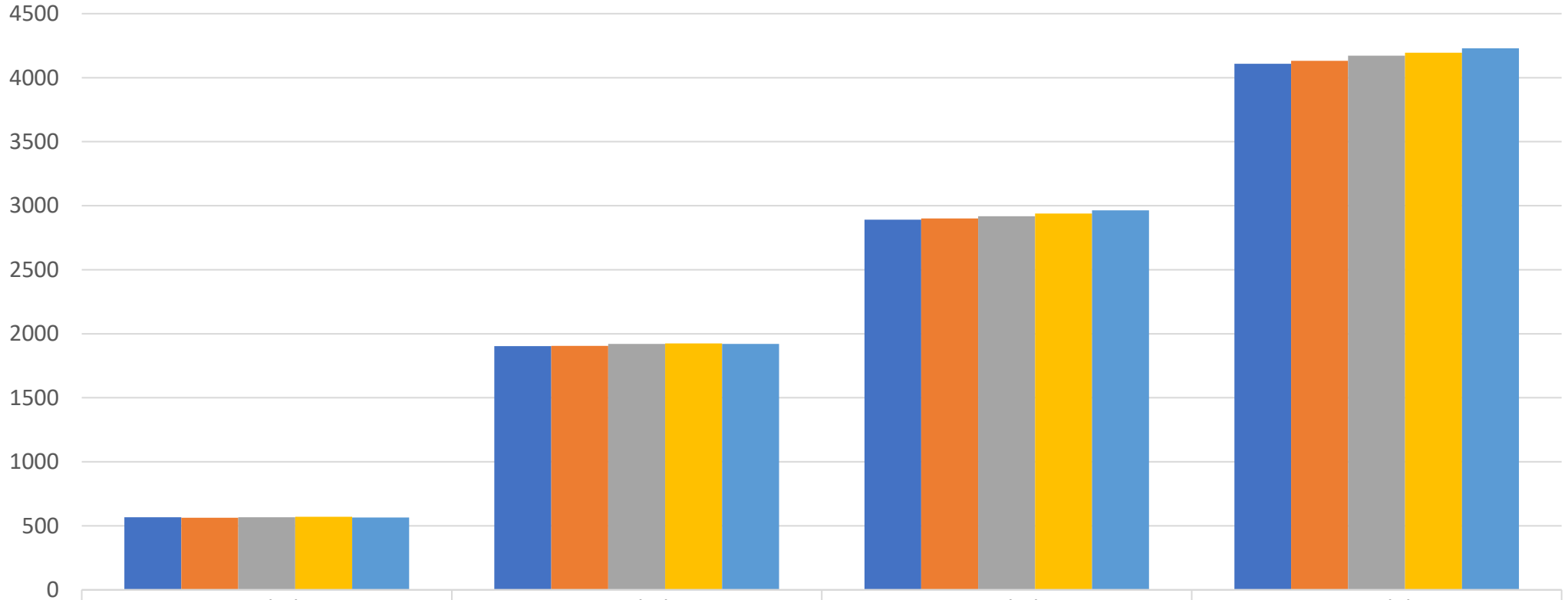
- Bodyweight, Feed Consumption & FCR
- Mortality
- Intestinal Health
  - Villi height & Crypt depth:
  - Total viable bacterial count:
- Immune Competence
  - CMI PHAP foot web index
  - ND Titer
  - Lymphoid organ weights
  - H:L ratio
- Carcass Traits:
  - Ready to cook yield
  - Eviscerated yield
  - Cut-up parts yield
  - Fat pad thickness

Bodyweight (g)



	14th d	28th d	35th d	42nd d
C2	554	1499	2079	2669
C1	557	1530	2127	2742
T1	560	1553	2167	2795
T2	566	1572	2186	2822
T3	567	1583	2212	2860

Feed Consumption (g)



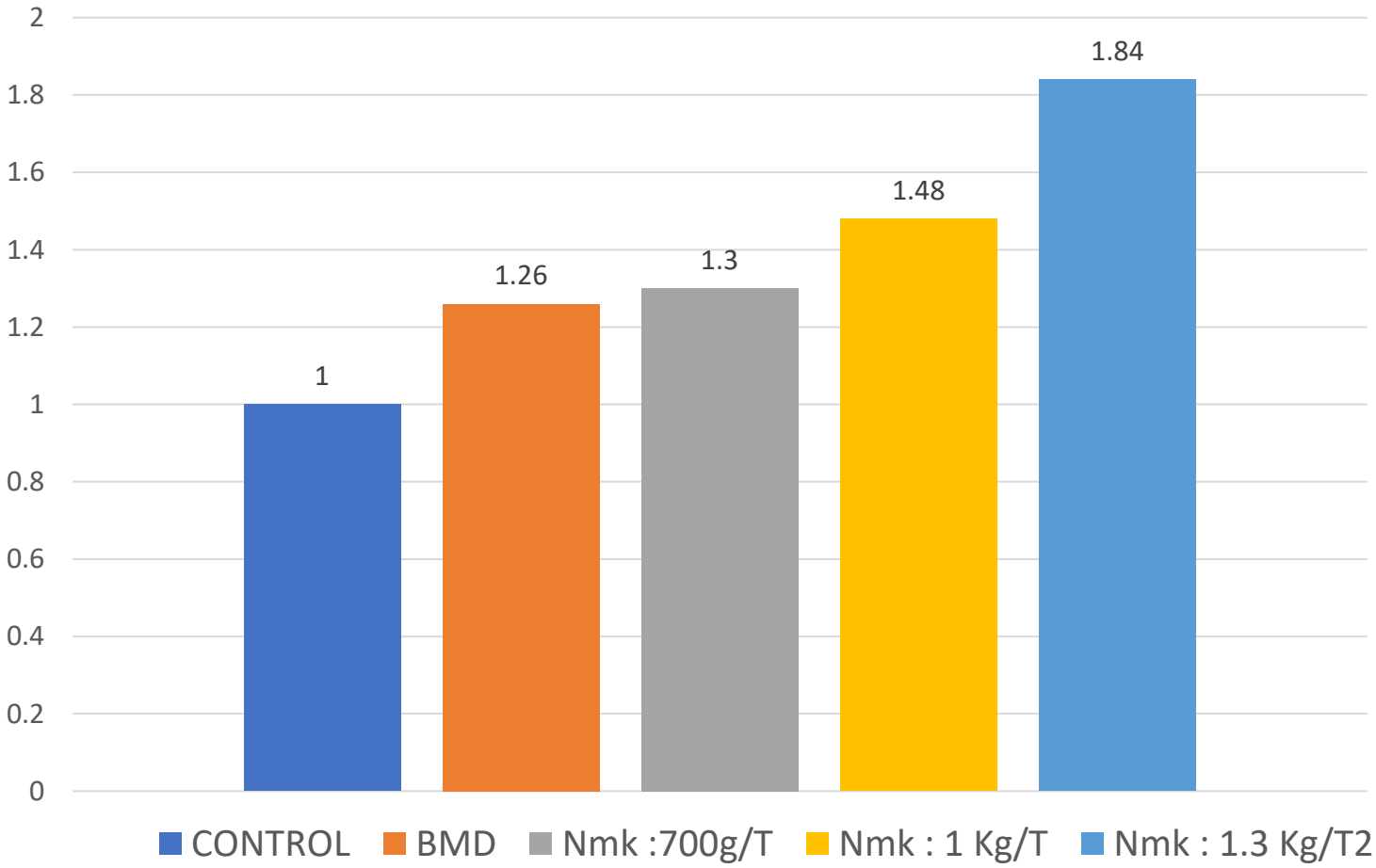
	14th d	28th d	35th d	42nd d
C2	566	1904	2892	4109
C1	563	1906	2901	4131
T1	566	1920	2918	4172
T2	570	1925	2939	4195
T3	566	1920	2964	4230

FCR

Nutrimark showed a linear reduction in FCR with increased usage

Timeline	C2	C1	T1	T2	T3
7th d	1.047	1.044	1.029	1.025	1.018
14th d	1.114	1.103	1.100	1.095	1.085
21st d	1.191	1.172	1.160	1.156	1.139
28th d	1.309	1.284	1.274	1.261	1.249
35th d	1.422	1.394	1.376	1.373	1.368
42nd d	1.566	1.532	1.517	1.511	1.503

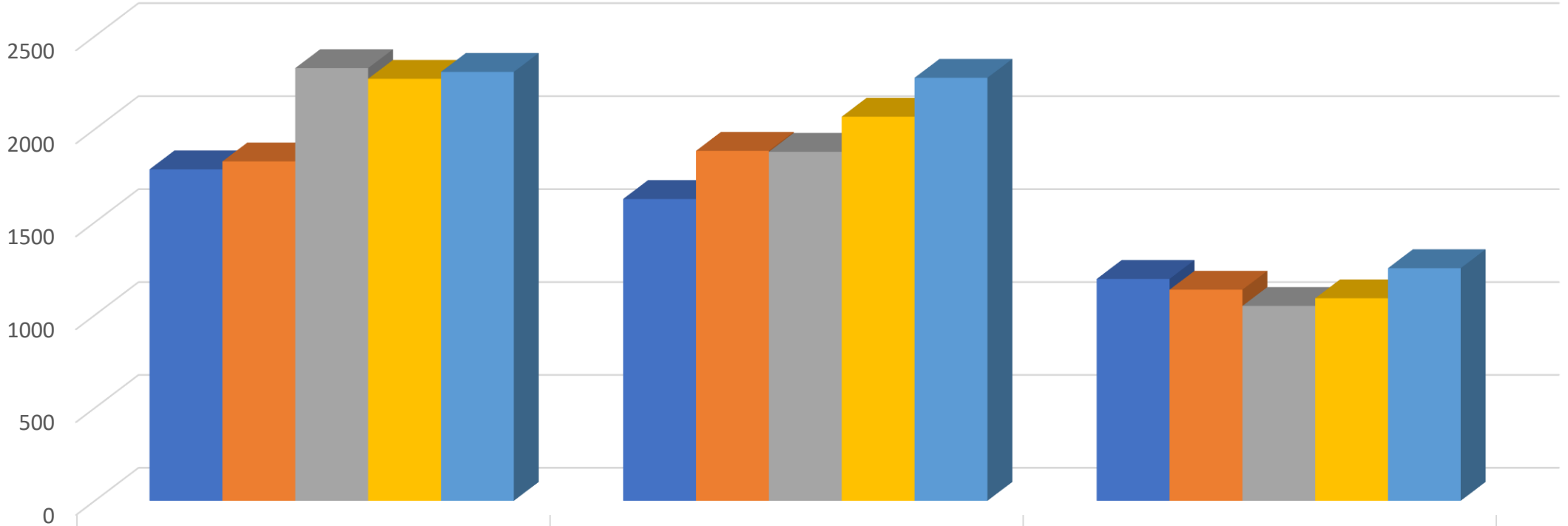
Intestinal Integrity: MUC2 Gene Expression



- MUC2 Gene expression leads to mucus secretion in intestinal lumen
- The mucus layer is essential for absorption of nutrients and protection of GIT from infectious bacteria.
- Nutrimark use @1Kg/MT dose resulted in 1.48 fold upregulation of MUC2 gene expression. (*1.84 fold @1.3Kg*)

Intestinal Integrity: Villi Height (µm)

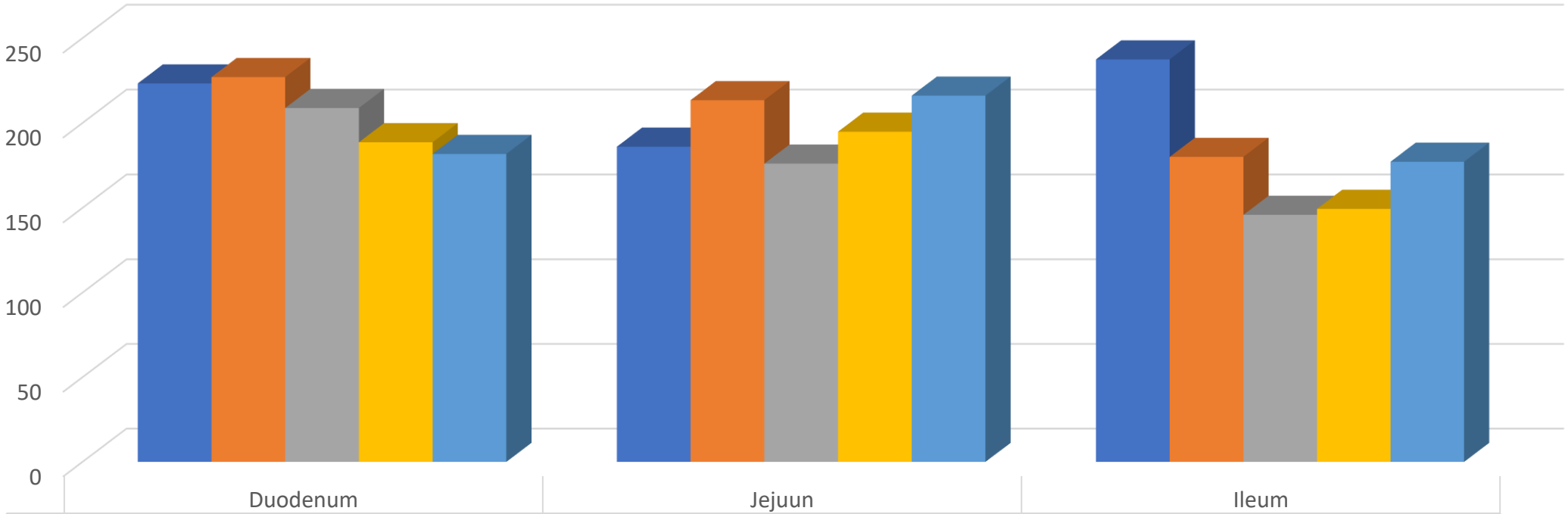
Nutrimark use resulted in increased villi heights



	Duodenum	Jejuun	Ileum
C2	1784	1625	1195
C1	1827	1884	1137
T1	2328	1878	1049
T2	2271	2067	1091
T3	2308	2276	1253

Intestinal Integrity: Crypt Depth (µm)

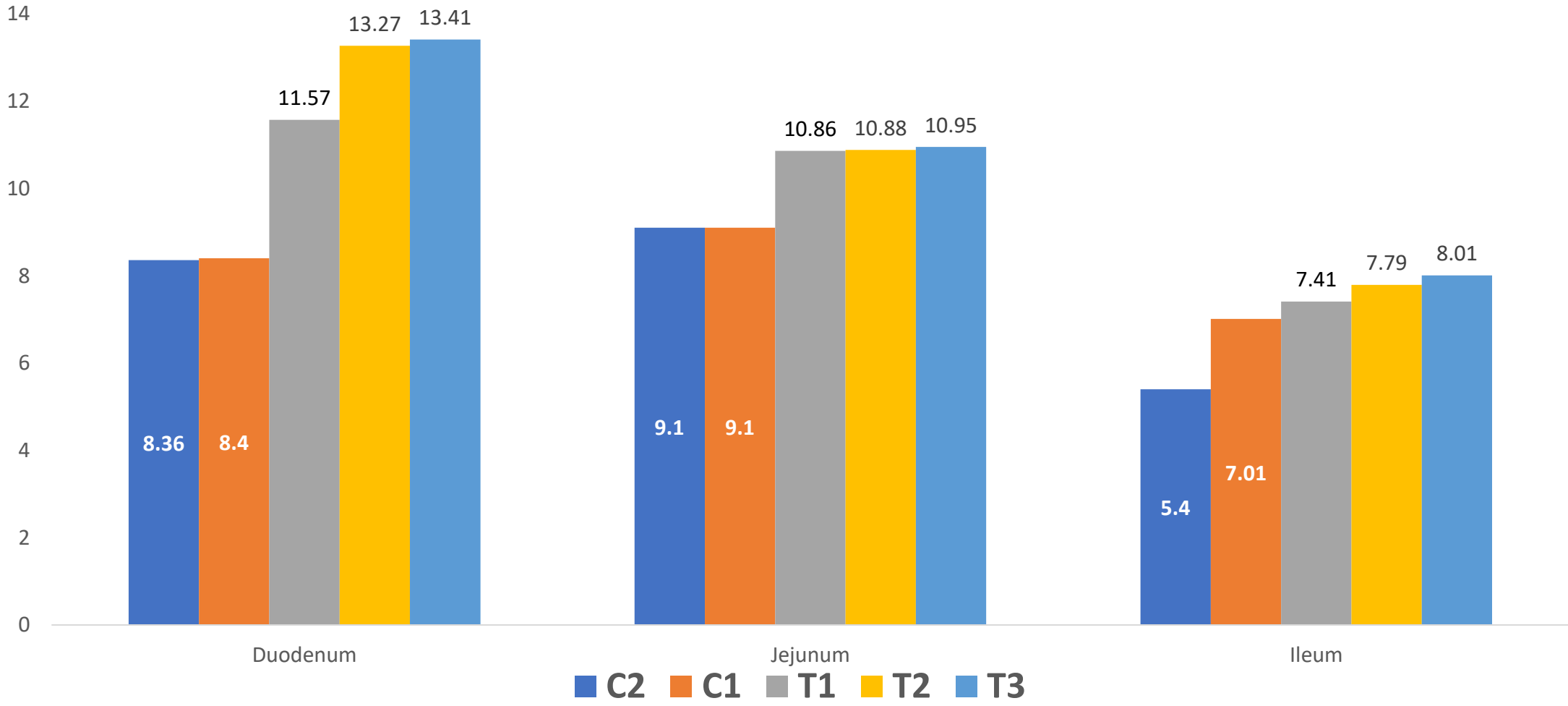
There was no significant difference in crypt depth between the groups



	Duodenum	Jejuun	Ileum
C2	223	186	237
C1	227	213	180
T1	209	176	146
T2	189	195	149
T3	182	216	177

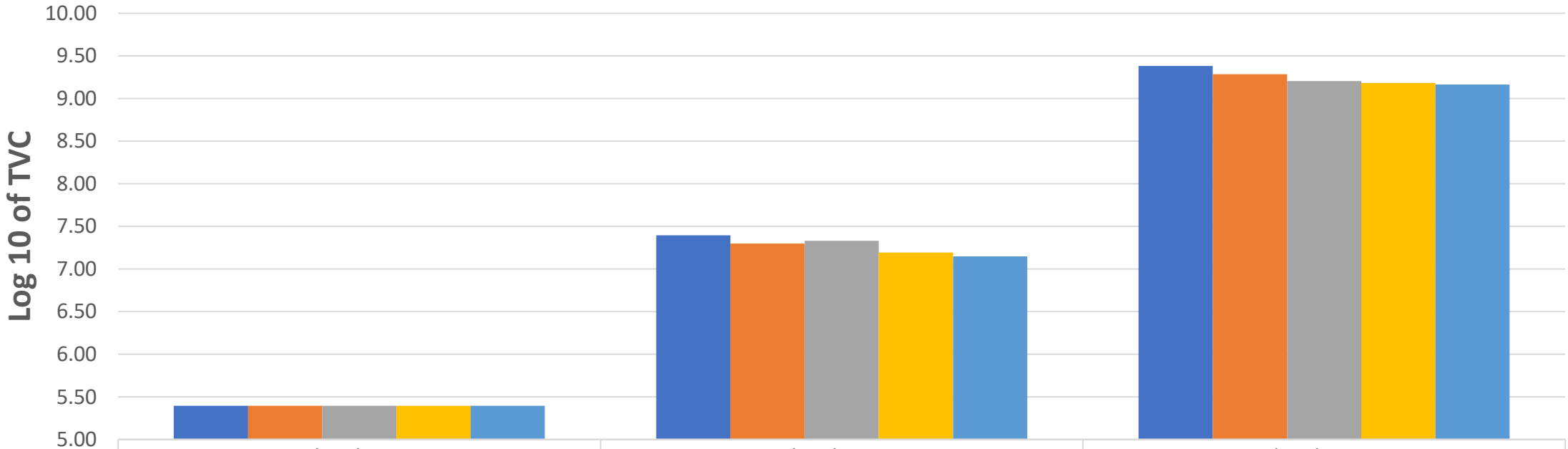
Intestinal Integrity - VH:CD Ratio

Use of Nutrimark resulted in higher VH:CD ratio



Intestinal Health: Total Viable Count

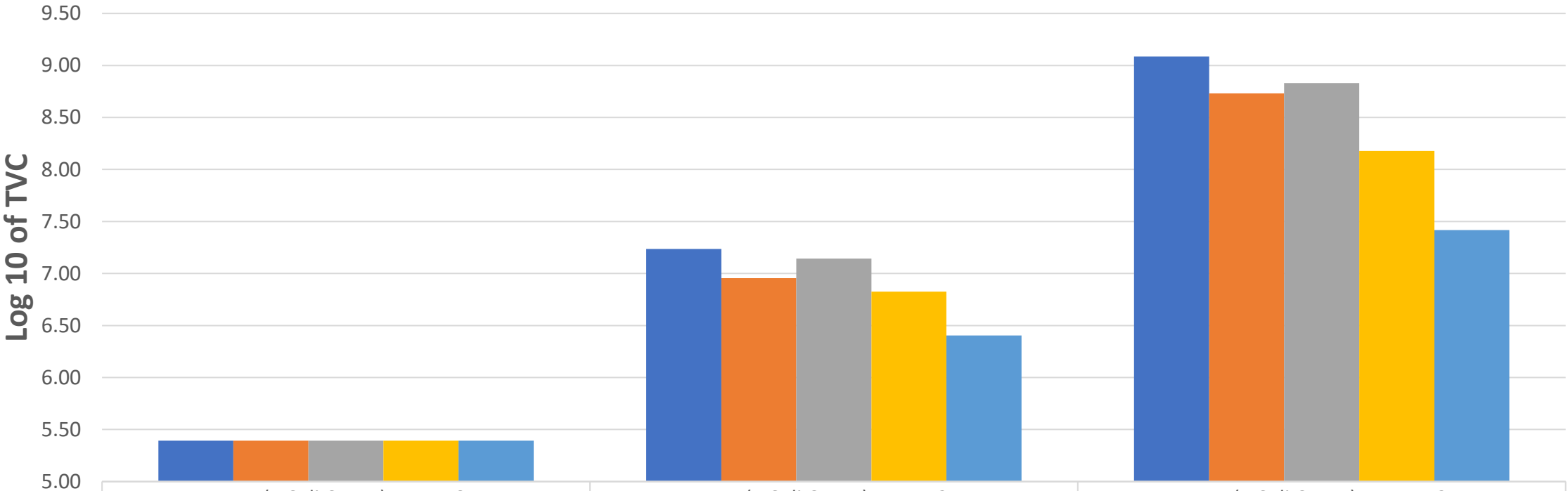
Using Nutrimark reduced Total Viable Count in bird's intestine



	Log (TVC) at Day 0	Log (TVC) at Day 21	Log (TVC) at Day 42
C2	5.39	7.39	9.38
C1	5.39	7.30	9.29
T1	5.39	7.33	9.21
T2	5.39	7.19	9.18
T3	5.39	7.15	9.17

Intestinal Health: E Coli count

Using Nutrimark significantly reduced E coli count in bird's intestine



	Log (E Coli Count) at Day 0	Log (E Coli Count) at Day 21	Log (E Coli Count) at Day 42
C2	5.39	7.24	9.09
C1	5.39	6.95	8.73
T1	5.39	7.14	8.83
T2	5.39	6.83	8.18
T3	5.39	6.40	7.42

Immune Competence Parameters

Immune-Competence	C2	C1	T1	T2	T3
Cell Mediated Immunity PHAP Foot Web Index (mm)	0.22	0.26	0.28	0.30	0.31
Humoral Immunity [Titer against ND (log2)]	4.75	4.75	5.13	5.38	5.50
Lymphoid Organ Weight (as % of Live weight)					
Bursa	0.145	0.15	0.151	0.161	0.171
Spleen	0.218	0.224	0.226	0.235	0.23
Thymus	0.399	0.406	0.425	0.431	0.439
Heterophil to Lymphocyte Ratio	0.537	0.543	0.501	0.469	0.437

Carcass Traits

	C2	C1	T1	T2	T3
% Eviscerated Yield	69.25	69.39	69.56	70.06	70.61
% Ready to cook Yield	74.35	74.54	74.81	75.37	75.99
Abdominal Fat Pad Thickness	0.68	0.64	0.62	0.63	0.57

Mortality

No significant difference was observed in bird mortality between the groups

Treatment Groups	No. of birds / Treatment	Mortality
C2	120	4
C1	120	3
T1	120	3
T2	120	3
T3	120	3
Overall mortality (from 600 birds)		16

NUTRIMARK Usage Result : Summary

- Bodyweight : Nutrimark fed birds had significantly higher bodyweight
- Feed Consumption : Nutrimark fed birds had higher feed intake (*statistically insignificant*)
- FCR : Nutrimark resulted in lower FCR (*linear performance with usage rate*)
- Mortality : No significant difference, though numerical improvement was seen
- Intestinal Health
  - MUC2 Gene expression increased 1.48 fold with recommended dose of Nutrimark
  - Villi height & Crypt depth: Nutrimark showed significant improvements in VH:CD ratio
  - Total viable bacterial count: Significantly lower TVC and E coli with Nutrimark @ 0.1% & 0.13%
- Immune Competence
  - PHAP foot web index : Nutrimark resulted in significantly higher response
  - ND Titer : Nutrimark showed numerically higher titer, but statistically not significant
  - Lymphoid organ weights: Nutrimark resulted in higher weight (as % live weight)
  - H:L ratio: Significantly lower HL ratio with Nutrimark
- Carcass Traits – Better yield, smaller abdominal fat pad with Nutrimark
- ***Linear improvement in performance with increased usage of Nutrimark***