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PREFACE

We are pleased to present our findings about in ovo feeding in poultry as a modern strategy related to early feeding issue. In our primary study, we found that in ovo feeding has some advantages in promoting the newly hatched chicks' health state. This book is the outcome of the authors' and some recent researches about in ovo feeding in poultry. Our approach was first to define all aspects of *in ovo feeding* as a modern precision feeding method in different poultry species. However, there are limited scientific technical books focusing on usage of in ovo feeding in poultry. Our second goal was introducing new early feeding strategy in poultry nutrition to compensate for the delay of accessing feed and water in poultry farms, especially when the newly hatched chicks transfer long distances to reach rearing farm. The present book has 11 chapters as follows: 1- modern early feeding strategies, 2- introduction of in ovo feeding, 3- in ovo feeding of amino acids, 4- in ovo feeding of carbohydrates, 5- in ovo feeding of fats, 6- in ovo feeding of minerals, 7- in ovo feeding of vitamins, 8- in ovo feeding of probiotics, 9- in ovo feeding of prebiotics, 10- in ovo feeding of synbiotics, 11- in ovo feeding of phytochemicals. This book may useful for poultry nutritionists and veterinarians for improving the state of poultry health as well as meat and egg quality. We gratefully thank all of the researchers who cooperated with us in gathering information. In addition, we would like to show appreciation to our family members for their unwavering companionship. We feel that we have achieved our goal of producing an outstanding book. Although the field of poultry nutrition progressing rapidly, we hope our discussion of these issues will be useful for a long time. The authors dedicate the book to those who are concerned about public health and welfare. Please feel free to contact us at h.hajati2010@gmail.com if you have any questions or recommendations

KEY OF ABBREVIATIONS

AMPs	Antimicrobial peptides
Arg	Arginine
BW	Body weight
BWG	Body weight gain
Ca	Calium
CLA	Conjugated linoleic acid
Co	Cobalt
Cr	Crumium
Cu	Copper
Cys	Cysteine
DHA	Docosa hexaenoic acid
EPA	Ecosa pentaenoic acid
EPEF	European production efficiency factor
FCR	Feed conversion ratio
Fe	Iron
GAE	Gallic acid equivalent
GALT	Gut associated lymphoid tissue
GIT	Gasterointestinal tract
Gly	Glycine
GOS	Galacto-oligosaccharide
GSH-Px	Glutathione peroxidase
HMB	Hydroxy methyl butyrate
HSP	Heat shock protein
IL	Interlukne
K	Potassium
Lys	Lysine
MCFAs	Medium chain fatty acids
MDV	Marek disease vaccine
Met	Methionine
MMTs	Million metric tons

Mn	Manganese
MOS	Mannan oligosaccharide
Na	Sodium
PDK	Pyruvate dehydrogenase kinase
PUFA	Poly unsaturated fatty acids
RFO	Raffinose family of oligosaccharides
SCFAs	Short chain fatty acids
Ser	Serine
SFRP	Secreted frizzled related protein
SOD	Super oxide dismutase
SP	*Spirulina platensis*
Thr	Threonine
TNF-α	Tomur necrosis factor- alfa
VE	Vitamin E
WHO	World health organization
Zn	Zin

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CHAPTER ONE

Introduction Of In Ovo Feeding In Poultry

1-1-INTRODUCTION

The poultry industry plays a pivotal role in the economic development of nations, primarily due to its capacity to supply substantial quantities of meat and eggs required by human populations. Both poultry meat and eggs serve as significant sources of animal protein, offering a range of essential nutrients that are beneficial to human health (Afnan & Ulupi, 2023). Currently, poultry researchers regard the in-ovo technique as a promising method for enhancing embryonic health and subsequent post-hatch growth. According to Uni and Ferket (2003), in-ovo feeding can mitigate the nutritional limitations encountered by avian embryos during the embryonic period. This intervention not only improves embryonic development but also exerts a positive carryover effect on chick growth following hatching. The embryonic phase of broiler chickens, which serve as the primary source of poultry meat in numerous countries, constitutes approximately 35% of their total productive lifespan. Consequently, this developmental period represents a critical window that directly influences hatchability rates of fertile eggs, as well as the quality and subsequent performance of newly hatched chicks. During the embryonic period, the egg yolk which contains a substantial quantity of lipids but comparatively lower levels of carbohydrates and proteins-serves as the primary energy source for the developing embryo throughout incubation (Afnan & Ulupi, 2023). Research indicates that yolk lipids are transported directly into embryonic circulation via the endocytosis pathway (Noy & Sklan, 2001). However, following hatching, the chick's intestines assume responsibility for the digestion and absorption of residual yolk contents. Early access to feed and water immediately after hatch positively influences the development of the digestive system in newly hatched chicks (Roto et al., 2016), and various early feeding methods-including provision of hydrated feed (Hajati et al., 2024), feeding immediately post-hatch in the hatchery (Bigot et al., 2003), on-farm hatching (Jessen et al., 2021), and in ovo feeding (Hajati et al., 2014; Hajati et al., 2021; Arain et al., 2022) have been shown to enhance bird performance during this critical