

# MARIGOLDS EFFECT IN BROILERS DIET

I. Ungureanu<sup>1\*</sup>, M.-G. Usturoi<sup>1</sup>

<sup>1</sup>“Ion Ionescu de la Brad” University of Life Sciences,  
8 Mihail Sadoveanu Alley, 700490, Iasi, Romania

## Abstract

*The color of the meat and skin of chickens is one of the most important factors in determining consumer preferences in many countries. The quality of the meat is most often evaluated based on color. To meet market demand, pigments are usually added to poultry feed to enhance the yellow color of poultry products in commercial production. Marigold extract is a mixture of xanthophyll pigments extracted from the marigold flower, having lutein and zeaxanthin as its active ingredient, carotenoids that are considered safe because they are naturally present in edible plants. Of all natural pigments, marigold flour and extracts are the most accepted products in poultry feed. The purpose of this paper is to analyze the impact of supplementing the diet with marigold extract on pigmentation, growth, antioxidant activity and meat quality in broilers.*

**Key words:** marigolds, broiler, additives, carotenoids

## INTRODUCTION

Antibiotic-based growth promoters have been used in animal nutrition for more than 50 years to promote growth and protect health. Even though the application of antibiotics has a positive effect on poultry production, overconsumption has led to problems such as the development of multiple antibiotic resistance in pathogenic bacteria, drug residues in the final product, and dysbacteriosis.

Due to the need for suitable alternatives to antibiotics, prebiotics, probiotics, herbs, and herbal products have received increased attention. Plant materials such as herbs, spices, plant extracts, essential oils and flours fit perfectly into the category of possible natural alternatives to growth promoters' antibiotics to improve the performance of the poultry sector.

It is highlighted in many studies that the color of the skin and meat affect the final decision of consumers on the quality and value of products.

Pigmentation plays a key role in attracting and convincing consumers and is also an important factor in the perception of chicken quality in several countries. Most consumers want a yellow bird, because the yellow color is perceived as an indicator of quality.

Marigolds have many vitamins, minerals and contain carotenoid pigments. In addition to the coloring effect, the compounds in marigolds may have positive effects on the overall health of birds by reducing oxidative stress and supporting the immune system. These characteristics make marigold flowers attract major interest.

## MATERIAL AND METHOD

To carry out this review, scientific articles, specialized books and official reports published between 2000 and 2025 were consulted, available in databases such as Google Scholar, Scopus and on the websites of recognized institutions (EFSA, USDA, ISO). The keywords used in the

\* Corresponding author: [irina.ungureanu@iuls.ro](mailto:irina.ungureanu@iuls.ro)

The manuscript was received: 04.05.2025

Accepted for publication: 10.06.2025



search included: "marigolds", "broiler", "additives", "carotenoids".

The selection of papers was based on their relevance to the proposed theme, considering both experimental studies and synthesis articles. Only materials that directly analyzed the importance of marigold flowers and their effect on chickens (health effects, effects on meat and egg quality, on general welfare) as well as food safety aspects were included. The extracted information was then grouped and synthesized according to the categories of factors presented in the text, to provide a clearer and more accessible picture of the main conclusions in the literature.

RESULTS AND DISCUSSIONS

Marigolds (*Calendula officinalis* L.) belong to the category of medicinal plants of the genus *Calendula* of the Asteraceae family and are widely distributed in Australia, Switzerland, Hungary, Germany, the Czech Republic, Austria and Syria. Marigolds contain active substances, including saponins, flavonoids [26] and carotenoids, which have an antioxidant effect and are essential for the immune system [14]. Meanwhile, it has been reported that supplementing the diet with marigold extract improves meat quality in chickens [28], increases carcass characteristics, antibody titers against Newcastle disease virus and avian influenza virus, but also broiler breeding performance [18]. Studies conducted by Vahed *et al.* [26] observed the ability of marigold oil extract to lessen the negative effects of liver damage and reported that it can be used as a suitable natural antioxidant in poultry feed.

Marigolds (*Calendula officinalis*) are an economically important flower crop, being cultivated worldwide for essential oils and carotenoid pigments, used for nutritional or pharmaceutical purposes [11].

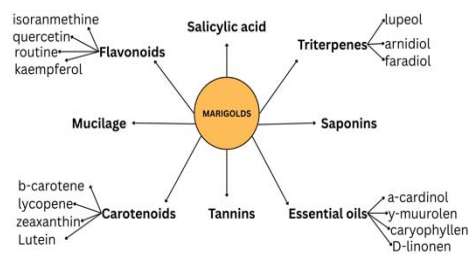


Fig. 1. Chemical composition of marigold flowers (Figure 1 highlights the main bioactive substances identified in the literature. Among these compounds, carotenoids with antioxidant properties, flavonoids with anti-inflammatory effect, but also essential oils and triterpenes that are involved in tissue regeneration processes stand out. Source: own processing after (Rita & Chozin 2025) [21], using CANVA application.

Table 1. Main bioactive compounds of marigold flowers

Active substance	Chemical class	Biological effect
Lutein	Carotenoids	Antioxidant, coloring
Flavonoids	Polyphenols	Anti-inflammatory
Triterpenes	Saponins	Antimicrobial
Essential oils	Volatile	Antibacterial

Source: own processing after (Rita & Chozin 2025).

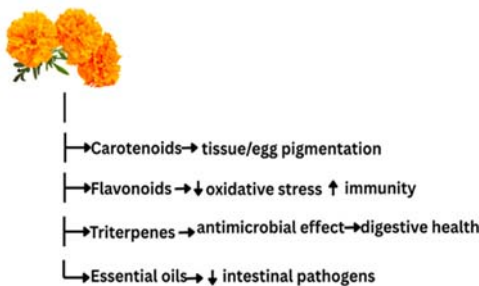


Fig. 2. The mechanisms by which marigold flowers influence the health of chickens Source: own processing after (Rita & Chozin 2025) [21], using CANVA application.

Studies conducted by Rajput *et al.* [18] tells us that supplementing the broilers' diet with marigold extract during the start and finish period showed no significant effect on overall weight. Similarly, Foroutankhah *et al.* [10] reports that the final weight of chickens fed marigold extract did not increase compared to chickens fed the control diet. Following studies carried out conducted by Sapkota [22] marigold flowers can be used effectively in the diet of chicken broilers in a proportion of 0.60% to improve overall performance, meat quality and improve yellow color.

Considering that marigold flowers contain polyphenols (Table 1), the evaluation of their antioxidant properties is of great interest for understanding the positive effect of these compounds (Figure 2). In a study carried out by Rajput *et al.* [18] it is clearly specified that supplementation with marigold extract significantly increases the total antioxidant capacity and superoxide dismutase activities in the liver and thigh muscle. The active compounds found in marigold extract may increase the antioxidant status and reduce the oxidative stress of broilers, resulting in a subsequent improvement in their performance [25].

As we know, the yellow color of the meat and skin of the broiler is an important factor in assessing the quality, so Wang *et al.* [27] conducts a study in which they demonstrate that the addition of marigold extract to the diet of the broiler increases the intensity of the yellow color of the calves, beak and skin of the muscles.

The literature reports that in the first week of administration in the chicks' nutrition marigold flowers had no effect, instead from the second week the yellow

color of the beak and calves was significantly improved [28].

Study conducted by Matache *et al.* [15] that adds red pepper powder and marigold powder to the broiler's diet reports that these two natural sources of carotenoids have the same effect on pigmentation, feed conversion yield, and overall performance.

Abd El-Wahab *et al.* [2] report that supplementing broilers' basic diet with 1.2% marigold extract improved product production performance, blood parameters, antioxidant capacity, immunological parameters, and digestibility.

Udachon *et al.* [25] report that supplementation with calendula products led to a decrease in serum malondialdehyde, reduced aspartic transaminases, impaired xanthophyll storage but improved the meat and skin color of broilers.

Specialized studies show that the addition of marigold flowers in powder form in a proportion of 1.2% in the hens' nutrition leads to an increase in the percentage of egg production, their weight and mass. Marigold extract improved nutrient digestion, immunological parameters, and antioxidant capacity [2]. Different types of xanthophylls extracted from yolks such as lutein, monohydroxy pigment, b-cryptoxanthin, and a-cryptoxanthin have been shown to have the same effect on chicken pigmentation [29]. Supplementing the diet with marigold flower extract improves body weight, daily feed intake, water and feed conversion ratio. Supplementing the diet with 4% yolk extract led to a much more intense yolk color from the 3rd week of consumption [12].

Table 2. Comparing the effects of marigold flowers with other natural additives in broiler nutrition

Natural additives	Dose (mg/day)	Effect	References
Calendula Officinalis	50-60	-antioxidant - enhances growth performance - enhances the color of the meat	[27]
Peppermint essential oil	1000	-increases egg production	[3]
Oregano	100	- enhances growth performance	[8]
Black Cumin	20-100	-reducing cholesterol in the egg	[5]
Chilli	100-150	-enhances the hue of the yolk	[17]
Black pepper	1000	-antioxidant -antimicrobial	[16]
Eucalyptus	100-200	- enhances growth performance	[9]
Ginger	100-150	- increases egg production	[13]
Dill	100-200	-enhances the form index and yolk index	[23]
Game	20-40	- antioxidant - enhances growth performance	[7]
Common chicory	300-500	-strengthening the integrity of the microbiota	[6]
Turmeric	1000	- antioxidant	[4]
Grape seed extract	100-200	-increases body weight	[29]
Chili pepper	100-200	-antioxidant - enhances the color of the meat	[19]
Moringa	150-200	- antioxidant -antibacterial	[20]
Tomato pomace	250-300	- improve significantly egg traits, in particular egg-yolk colour	[24]

## CONCLUSIONS

The results obtained in this research highlight the potential of using yolk flowers as a natural additive in the diet of broilers, having advantageous effects in ensuring better health, serving a natural source of antioxidants, reducing the use of medicines, heat stress relievers, increasing the quality of meat and eggs and intensifying the color of the yolk and skin, increasing the features of

the carcass, antibody titers against Newcastle disease virus and avian influenza virus.

Thus, the introduction of this plant in feed rations can represent a sustainable alternative to synthetic pigments, responding to the growing demands for natural and high-quality food products.

However, further studies are needed to optimize the doses used and assess the long-term effects on the quality parameters of eggs and meat.

## REFERENCES

1. Abdel Kader, I. A. T; Ramadan, A; Saad, M & S Abdelrasoul, R. A. Effect of using effective microorganisms (EM) as a growth promoter on broilers performance, thyroid hormones, lipid profile, hepatosomatic index, immune response, enteric pathogens, and antioxidant parameters. *Egyptian Poultry Science Journal*, **2023**, 43(2), 259-275.
2. Abdelwahab, A. A; Aly, M. M. M; Saad, M & Abdelrasoul, R. A. S. Effect of dietary supplementation of pot marigold flower powder and extract (*calendula officinalis*) on nutrient digestibility, performance, serum biochemistry, antioxidant parameters, immune response and some gut bacterial count of laying japanese quail. *Egyptian Poultry Science Journal*, **2023**, 43(2), 277-295.
3. Akbari, M; Torki, M & Kaviani, K. Single and combined effects of peppermint and thyme essential oils on productive performance, egg quality traits, and blood parameters of laying hens reared under cold stress condition. *International Journal of Biometeorology*, **2016**, 60, 447–454.
4. Ao, X & Kim, I. H. Effects of grape seed extract on performance, immunity, antioxidant capacity, and meat quality in Pekin ducks. *Poultry Science*, **2020**, 99(4), 2078–2086.
5. Azeem, T; Zaib-Ur-Rehman, U. S; Asif, M; Arif, M & Rahman, A. Effect of *Nigella Sativa* on poultry health and production: a review. *Sci. Lett*, **2014**, 2(2), 76–82.
6. Azorín-Ortuño, M; Urbán, C; Cerón, J. J; Tecles, F; Allende, A; Tomás-Barberán, F. A & Espín, J. C. Effect of low inulin doses with different polymerisation degree on lipid metabolism, mineral absorption, and intestinal microbiota in rats with fat-supplemented diet. *Food Chemistry*, **2009**, 113(4), 1058–1065.
7. Brisibe, E. A; Umoren, U. E; Brisibe, F; Magalhães, P. M; Ferreira, J. F. S; Luthria, D; Wu, X & Prior, R. L. Nutritional characterisation and antioxidant capacity of different tissues of *Artemisia annua* L. *Food Chemistry*, **2009**, 115(4), 1240–1246.
8. Ding, X; Wu, X; Zhang, K; Bai, S; Wang, J; Peng, H; Xuan, Y; Su, Z & Zeng, Q. Dietary supplement of essential oil from oregano affects growth performance, nutrient utilization, intestinal morphology and antioxidant ability in Pekin ducks. *Journal of Animal Physiology and Animal Nutrition*, **2020**, 104(4), 1067–1074.
9. Fathi, M. M; Al-Homidan, I; Ebeid, T. A; Abou-Emera, O. K & Mostafa, M. M. Dietary supplementation of *Eucalyptus* leaves enhances eggshell quality and immune response in two varieties of Japanese quails under tropical condition. *Poultry Science*, **2020**, 99(2), 879–885.
10. Foroutankhah, M; Toghyani, M & Landy, N. Evaluation of *Calendula officinalis* L.(marigold) flower as a natural growth promoter in comparison with an antibiotic growth promoter on growth performance, carcass traits and humoral immune responses of broilers. *Animal Nutrition*, **2019**, 5(3), 314–318.
11. Gupta, Y. C; Panwar, S; Banyal, N; Thakur, N & Dhiman, M. R. Marigold. In *Floriculture and Ornamental Plants*, Singapore: Springer Nature Singapore, **2022**, (pp. 1-23).
12. Hasin, B. M; Ferdous, A. J. M; Islam, M. A; Uddin, M. J & Islam, M. S. Marigold and orange skin as egg yolk color promoting agents. *International Journal of Poultry Science*, **2006**, 5(10), 979-987.
13. Incharoen, T; Yamauchi, K & Thongwittaya, N. Intestinal villus histological alterations in broilers fed dietary dried fermented ginger: Intestinal histology and dried fermented ginger in diets. *Journal of Animal Physiology and Animal Nutrition*, 2010, 94(5), e130-7.
14. Kim, J. H; Lim, Y. J; Kim, J. H & Eom, S. H. Impact of dry processing on secondary metabolites in the petals of marigold (*Tagetes* spp.) cultivar. *Horticulturae*, **2024**, 10(4), 382.
15. Matache, C. C; Cornescu, G. M; Drăgoțoiu, D; Cișmileanu, A. E; Untea, A. E; Sărăcilă, M & Panaite, T. D. Effects of marigold and paprika extracts as natural pigments on laying hen productive performances, egg quality and oxidative stability. *Agriculture*, **2023**, 14(9), 1464.
16. Oso, A. O; Suganthi, R. U; Reddy, G. B. M; Malik, P. K; Thirumalaisamy, G; Awachat, V. B; Selvaraju, S. Arangasamy, A & Bhatta, R. Effect of dietary supplementation with phyto-genic blend on growth performance, apparent ileal digestibility of nutrients, intestinal morphology, and cecal microflora of broiler chickens. *Poultry Science*, **2019**, 98(10), 4755–4766.

17. Özer, A.; Zik, B; Erdost, H & Özfiliz, N. Histological investigations on the effects of feeding with a diet containing red hot pepper on the reproductive system organs of the cock. *Turkish Journal of Veterinary & Animal Sciences*, **2006**, 30(1), 7–15.
18. Rajput, N; Naeem, M; Ali, S; Rui, Y & Tian, W. Effect of dietary supplementation of marigold pigment on immunity, skin and meat color, and growth performance of broiler chickens. *Brazilian Journal of Poultry Science*, **2012**, 14, 291-295.
19. Rehman, S; Durrani, F. R; Ch, N; Khan, R. U & Rehman, U. R. F. Comparative efficacy of different schedules of administration of medicinal plants infusion on hematology and serum biochemistry of broiler chicks. *Research Opinions in Animal Veterinary Science*, **2011**, 1, 8
20. Rehman, Z; Chand, N; Khan, R. U; Naz, S & Alhidary, I. A. Serum biochemical profile of two broiler strains supplemented with vitamin E, raw ginger (*Zingiber officinale*) and L-carnitine under high ambient temperatures. *South African Journal of Animal Science*, **2018**, 48, 935–942.
21. Rita, W & Chozin, M. Phytochemical Content Analysis of 4 Marigold (*Tagetes Erecta*) Accessions in Bengkulu Province Which has the Potential as a Poultry Feed Supplement. *International Journal of Integrative Sciences*, **2025**, 4(5), 965-980.
22. Sapkota, R. *Effect of dietary supplementation of marigold flower powder on the productive performance of broiler chickens* (Doctoral dissertation, College of Veterinary Science, Assam Agricultural University, Khanapara Campus) **2022**.
23. Torki, M; Sedgh-Gooya, S & Mohammadi, H. Effects of adding essential oils of rosemary, dill and chicory extract to diets on performance, egg quality and some blood parameters of laying hens subjected to heat stress. *Journal of Applied Animal Research*, **2018**, 46(1), 1118–1126.
24. Tufarelli, V; Baghban-Kanani, P; Azimi-Youvalari, S; Hosseintabar-Ghasemabad, B; Slozhenkina, M; Gorlov, I & Laudadio, V. Effect of dietary flaxseed meal supplemented with dried tomato and grape pomace on performance traits and antioxidant status of laying hens. *Animal biotechnology*, **2022**, 33(7), 1525-1532.
25. Udchachon, S; Pongmanee, K; Boonruangrod, R; Attamangkune, S & Ruangpanit, Y. Effect of marigold-derived products as pigment source on growth performance, antioxidant activity and liver enzymes of broiler chickens. *Agriculture and Natural Resources*, **2021**, 55(6), 925-934.
26. Vahed, R; Kermanshahi, H; Nasiri Moghadam, H; Hassanabadi, A & Beheshti Moghadam, S. Effect of different levels of marigold (*Calendula officinalis*) oil extract on performance, blood parameters and immune response of broiler chickens challenged with CC14. *Iranian Journal of Animal Science Research*, **2015**, 7(4), 447-455.
27. Wang, S; Zhang, L; Li, J; Cong, J; Gao, F & Zhou, G. Effects of dietary marigold extract supplementation on growth performance, pigmentation, antioxidant capacity and meat quality in broiler chickens. *Asian-Australasian journal of animal sciences*, **2016**, 30(1), 71.
28. Wei, Y; Qin, K; Qin, X.; Song, F & Xu, X. Effects of different types of xanthophyll extracted from marigold on pigmentation of yellow-feathered chickens. *Animal Bioscience*, **2023**, 36(12), 1853.
29. Zhang, J. F; Bai, K. W; Su, W. P; Wang, A. A; Zhang, L. L; Huang, K. H & Wang, T. Curcumin attenuates heat-stress-induced oxidant damage by simultaneous activation of GSH-related antioxidant enzymes and Nrf2-mediated phase II detoxifying enzyme systems in broiler chickens. *Poultry Science*, **2018**, 97(4), 1209–1219.