

## **Effect of dietary supplementation of essential oil and organic acid alone or in combination in broilers**

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Both essential oil and organic acid have been demonstrated to improve growth performance and gut health of broilers. With their different mechanism of action, it is hypothesized that combining them could provide additional benefits. A floor pen study with 1,728-day-old male broilers was conducted to evaluate an essential oil blend (EOB, NEXT ENHANCE<sup>®</sup> 150, 1:1 thymol carvacrol) and an organic acid blend (OAB, AVIMATRIX<sup>®</sup>, protected benzoic acid calcium formate and fumaric acid), either used alone or in combination, on growth performance and gut health of broilers subject to mild *Eimeria* challenge. The study consisted of 9 dietary treatments in a 3 x 3 factorial arrangement with 3 levels of EOB (0, 15, and 30 g/ton) and 3 levels of OAB (0, 250, and 500 g/ton). Each diet was fed to 8 replicate pens of 24 birds. All birds were orally gavaged with a coccidiosis vaccine at 5X recommended dose on day 14. Body weight, feed intake, FCR, and mortality were determined on day 21, 28, 35, and 41. On day 22, jejunal tissues were collected for cytokine mRNA expression. On day 42, footpad dermatitis lesions were scored. Data were subject to 2-way ANOVA to evaluate main effects and their interaction; means were separated by Fisher's protected LSD test. Body weight was not affected by dietary treatments ( $P>0.05$ ). Feed conversion ratio (FCR) was more sensitive to dietary treatments and the best response was observed on day 28 and 35. There was a significant interaction between EOB and OAB ( $P<0.05$ ) where except for EOB at 15 g/ton, all treatments significantly improved FCR on day 28 and 35, and the best FCR was observed with combining 15 g/ton EOB and 250 g/ton OAB. A significant interaction was also seen for footpad dermatitis where only combining EOB (15 or 30 g/ton) with OAB (500 g/ton) reduced footpad dermatitis lesion scores and increased percentage of healthy footpad ( $P<0.05$ ). Essential oil blend at 30 g/ton also significantly reduced jejunal IL-10 mRNA expression ( $P<0.05$ ) indicating its immune modulating function. In summary, OAB improved FCR, EOB improved FCR and modulated immune response, and combining OAB and EOB resulted in better FCR and lower incidence of footpad dermatitis, indicating additional benefits can be achieved with combination.

**Key words:** Essential oil, Organic acid, *Eimeria*, Broiler