The Effects of Essential Oils and Prebiotics On Egg Quality and Production Parameters In Late Laying Hens

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Introduction

- Reduction in egg quality and laying performance in late laying hens due to various health challenges causes feeding and housing to become economically inviable.
- The use of antibiotic growth promoters (AGPs) were previously used in the poultry industry as a feed supplement to maintain gut health, balance intestinal microbiota, and promote growth [1].
- AGPs have raised apprehensions among consumers due to possible contribution of antibiotic resistance and possible antibiotic residue found on poultry products [1].
- Various in vitro studies have demonstrated the antimicrobial properties of essential oils (EO) on diverse pathogens, evidence also supports that positive impact on poultry growth performance [2].
- Previous research has shown that essential oil has improved eggshell quality in late laying hens [3].
- Dosage of EO has not yet been determined to distinguish a positive effect on egg laying performance [4].
- Prebiotic *Clostridium butyricum* (zlc-17) has been shown to enhance egg production and quality [5].

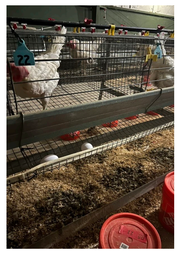
Objective

To investigate the effects of essential oils (EO) on production parameters (feed efficiency and egg production) and egg quality (egg weight, eggshell thickness, eggshell strength, yolk color, yolk weight, and albumen height) when used as an antibiotic substitution on late laying hens.

Treatments Applied

A total of 60 late laying hens of 50 weeks or older were randomly assigned to one of six treatments:

1. Control diet
2. 0.5% Essential Oil diet
3. 1.0% Essential Oil diet
4. Prebiotic diet



Methodology

- Treatment diets were pre-mixed with basal diet.
- Hens were assigned to one of four dietary treatments (control, 0.5% EO, 1.0% EO, and prebiotic) and birds were fed ad libitum for four weeks.
- Eggs were collected, counted, and recorded in the afternoon each day, and mass was calculated weekly.
- Eggs were analyzed for weeks 0, 2, and 4.
- Bird weight was recorded during week 0 and week 4.

Results

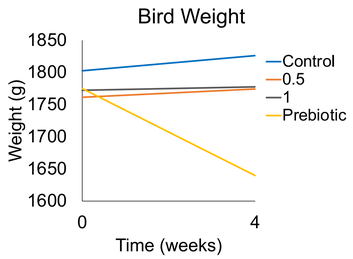


Figure 1. Average bird weight in weeks 0 and 4.

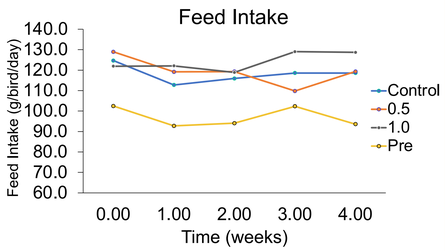


Figure 2. Average feed intake (g/bird/day) in weeks 0, 1, 2, 3, 4.

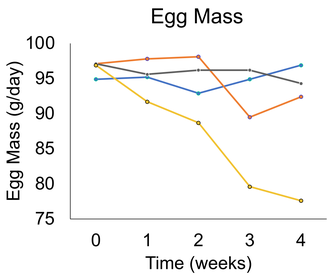


Figure 3. Average egg mass (g/day) in weeks 0,1, 2, 3, 4.

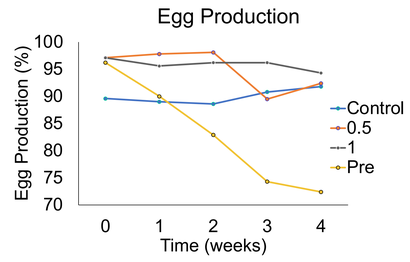


Figure 4. Average egg production (%) in weeks 0,1, 2, 3, 4.

Treatments				
Week	**Control**	**EO-0.5**	**EO-1.0**	**Prebiotic**
0	66.2±1.5	65.2±1.0	67.6±1.5	65.7±1.1
2	66.9±1.03	65.4±0.9	68.4±1.5	65.6±1.2
4	65.6±1.3	66.7±1.0	66.4±1.1	64.8±1.2

Table 1. The relationship between different treatments and the egg weight (g/egg) on week 0, 2 and 4. (P>0.05).

ANOVA – Albumen Height		
Treatment	$F_{3, 54}$ = 0.62941	P = 0.59919
WK	$F_{2, 108}$ = 1.49639	P = 0.22854
WK + Treatment	$F_{6, 108}$ = 0.34479	P = 0.91082

Table 2. An ANOVA table displaying the significance values between different treatments and weeks (WK) and their effect on albumen height.

ANOVA – Yolk Weight		
Treatment	$F_{3, 54}$ = 0.84858	P = 0.4734
WK	$F_{2, 108}$ = 0.16469	P = 0.16469
WK + Treatment	$F_{6, 108}$ = 0.28195	P = 0.28195

Table 3. An ANOVA table displaying the significance values between different treatments and weeks (WK) and their effect on yolk weight in grams.

ANOVA – Yolk Color		
Treatment	$F_{3, 54}$ = 0.95572	P = 0.42035
WK	$F_{2, 108}$ = 8.43003	P = 0.00640
WK + Treatment	$F_{6, 108}$ = 1.88375	P = 0.42679

Table 4. An ANOVA table displaying the significance values between different treatments and weeks (WK) and their effect on yolk color.

Results

- There was a significant decrease found in the mass of birds fed prebiotic treatment diet in week 4 (P = 0.007).
- Bird weight was consistent in hens fed EO diets throughout the four-week trial.
- A significant decrease in egg mass and egg production was found in birds fed prebiotic treatment diet during weeks 2, 3, and 4 (P < 0.05).
- There is no significant difference in egg quality (albumen height, egg yolk color, and eggshell strength) when comparing treatment diets without prebiotic (P > 0.05).
- A significant difference was not detected for feed conversion ratio (daily feed intake/daily mass of eggs laid) among treatments.

Conclusions

- The data suggests that, for the first four weeks, the supplementation of 1.0 % EO as a feed additive in a late laying diet increase the egg production numerically.
- Essential oils may be a viable poultry feed additive to improve bird health and production.
- Further research could investigate the effect EOs has on gut microbiota

Acknowledgements

We would like to thank the Agricultural Research Institute for funding this study, and to Steve Soderstrom and the staff of the Cal Poly Poultry Unit and Animal Nutrition Center for making this project possible.

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