**Supplementary tables:**

**Table S1.** Composition and nutrient level of basal diet (as-fed basis)

| Item, % | Amount | |
|---|---|---|
| Corn | 64.80 | |
| Soybean oil | 0.20 | |
| Soybean meal | 24.00 | |
| Calcium carbonate | 8.66 | |
| Calcium hydrophosphate | 1.16 | |
| NaCl | 0.35 | |
| Choline Chloride | 0.16 | |
| Vitamin premix[1] | 0.03 | |
| Mineral premix[2] | 0.50 | |
| Analyzed nutrient level, % | | |
| AME[3], kcal/kg | 2680 | |
| Crude protein | 15.73 | |
| Calcium | 3.61 | |
| Available Phosphorus | 0.28 | |
| Lysine | 0.69 | |
| Methionine | 0.34 | |
| Analyzed trace element level | Feed, μg/g | Water, μg/mL |
| Cd | ND[4] | ND[4] |
| Pb | ND[4] | ND[4] |
| Mo | 1.5 | 0.01 |
| Fe | 145 | 0.19 |
| Cu | 56 | 0.03 |
| Zn | 138 | 0.13 |
| Se | 0.9 | 0.01 |

[1]proviede per kilogram of diet: vitamin A, 8,000 IU; vitamin $D_3$, 1,600 IU; vitamin E, 5 mg; vitamin $K_3$, 2 mg; vitamin $B_1$, 0.8 mg; vitamin $B_2$, 2.5 mg; vitamin $B_6$, 1.5 mg; vitamin $B_{12}$,0.04 mg; folic acid, 0.25 mg; niacin, 20 mg; Ca-pantothenate acid,2.2 mg, and biotin, 0.1 mg.

[2]Provided per kilogram of diet: 60 mg Mn (as MnSO4•H2O); 80 mg Zn (as $ZnSO_4$); 8 mg Cu (as $CuSO_4$•$5H_2O$); 60 mg Fe (as $FeSO_4$•$7H_2O$); 0.3 mg Co ($CoSO_4$•$5H_2O$); 0.35 mg I (as KI), and 0.3 mg Se (as $Na_2SeO_3$•$5H_2O$)

[3]Calculated by NRC (1994).

[4]ND represented not detected.

**Table S2**. Effect of molybdenum and tea polyphenols on production performance of laying hens[1]

| Item | | Egg production, % | Egg weight, g | ADFI, g | FCR |
|---|---|---|---|---|---|
| MO, mg/kg | TP, mg/kg | | | | |
| 0 | 0 | 89.38±1.21[a] | 64.7±0.6 | 119±2 | 1.92±0.11 |
| 0 | 600 | 88.69±1.09[a] | 64.4±0.5 | 118±1 | 1.96±0.07 |
| 100 | 0 | 84.35±2.01[b] | 64.8±0.7 | 116±2 | 2.05±0.23 |
| 100 | 600 | 87.75±1.66[a] | 64.0±0.9 | 116±1 | 1.96±0.19 |
| P-Value | | 0.02 | 0.30 | 0.44 | 0.43 |
| P-Value | | | | | |
| MO | | 0.03 | 0.91 | 0.31 | 0.57 |
| TP | | 0.38 | 0.29 | 0.47 | 0.22 |
| MO*TP[2] | | <0.01 | 0.09 | 0.42 | 0.66 |

[1]Each mean represents 5 replicates, with 10 layer/replicate. Abbreviations represented: TP = total polyphenols; MO = molybdenum; ADFI = average daily feed intake; FCR = feed conversion ratio.

[2]MO*TP means the interaction between MO and TP.

[a,b] Means in the same column with different letters differ significantly ($p < 0.05$).

**Table S3.** Effect of molybdenum and tea polyphenols on egg quality of laying hens[1]

| Item[1] | | Eggshell thickness, $mm^{-2}$ | Eggshell strength, $kg/cm^3$ | Albumen height, mm | Yolk color | Haugh unit | Yolk weight, % | Eggshell weight, % | Albumen weight,% |
|---|---|---|---|---|---|---|---|---|---|
| MO, mg/kg | TP, mg/kg | | | | | | | | |
| 0 | 0 | 0.36±0.01 | 3.79±0.67 | 7.09±0.37 | 9.44±0.14 | 83.20±1.34 | 28.21±0.45 | 11.30±0.66 | 60.71±1.66 |
| 0 | 600 | 0.35±0.02 | 3.80±0.54 | 7.05±0.18 | 9.43±0.07 | 82.40±1.78 | 28.88±0.77 | 11.23±0.77 | 60.08±0.78 |
| 100 | 0 | 0.33±0.02 | 3.73±0.41 | 7.29±0.25 | 9.11±0.09 | 83.76±1.56 | 27.83±0.54 | 11.02±0.44 | 61.07±0.60 |
| 100 | 600 | 0.34±0.02 | 3.66±0.35 | 7.39±0.33 | 9.14±0.11 | 84.59±1.32 | 28.46±0.66 | 11.00±0.56 | 60.58±0.98 |
| P-Value | | 0.93 | 0.43 | 0.56 | <0.01 | 0.68 | 0.62 | 0.43 | 0.14 |
| P-Value | | | | | | | | | |
| MO | | 0.55 | 0.92 | 0.57 | <0.01 | 0.42 | 0.20 | 0.27 | 0.32 |
| TP | | 0.82 | 0.38 | 0.32 | 0.31 | 0.59 | 0.76 | 0.69 | 0.81 |
| MO*TP[2] | | 0.97 | 0.13 | 0.42 | 0.36 | 0.63 | 0.51 | 0.41 | 0.16 |

[1]Each mean represents 5 replicates, with 10 layer/replicate. Abbreviations represented: TP = tea polyphenols; MO = molybdenum.

[2]MO*TP means the interaction between MO and TP.

[a,b] Means in the same column with different letters differ significantly ($p < 0.05$).

**Table S4.** Effect of molybdenum and tea polyphenols on serum characteristics of laying hens

| Items[1] | | AST, U/gprot | ALT, U/gprot | AKP, U/gprot | LDH, U/gprot | XOD, U/gprot |
|---|---|---|---|---|---|---|
| MO, mg/kg | TP, mg/kg | | | | | |
| 0 | 0 | 226.40±20.34[b] | 20.10±2.10[b] | 380.50±45.62 | 450.21±35.88 | 7.89±0.89 |
| 0 | 600 | 218.22±18.21[b] | 21.32±1.41[b] | 400.21±55.32 | 461.20±29.54 | 8.01±0.54 |
| 100 | 0 | 330.60±28.21[a] | 30.55±2.78[a] | 440.32±61.21 | 520.77±41.44 | 4.21±1.32 |
| 100 | 600 | 234.50±22.34[b] | 22.75±1.43[b] | 410.22±34.98 | 465.58±57.88 | 5.14±0.99 |
| P-Value | | <0.01 | 0.04 | 0.57 | 0.65 | 0.05 |
| P-Value | | | | | | |
| MO | | 0.02 | 0.04 | 0.71 | 0.24 | 0.02 |
| TP | | 0.33 | 0.45 | 0.67 | 0.78 | 0.74 |
| MO*TP[2] | | 0.02 | 0.02 | 0.38 | 0.69 | 0.51 |

[1]Each mean represents 5 cages, with 2 layer/cage. Abbreviations represented: TP = tea polyphenols; MO = molybdenum; TC = total cholesterol; TG = total triglyceride; AST = aspartate aminotransferase; ALT = alanine transaminase; AKP = alkaline phosphatase; LDH = lactic dehydrogenase; XOD = xanthine oxidase.

[2]MO*TP means the interaction between MO and TP.

[a,b] Means in the same column with different letters differ significantly ($p < 0.05$).

**Table S5.** Effect of molybdenum and tea polyphenols on genus abundance of cecum microbiota of laying hens

| Items[1] | | Lactobacillus | Romboutsia | Bacteroides | Aeriscardovia | Chryseolinea |
|---|---|---|---|---|---|---|
| MO, mg/kg | TP, mg/kg | | | | | |
| 0 | 0 | 45.95±8.78[a] | 10.07±3.12[b] | 5.04±2.65 | 2.53±0.45 | 0.25±0.12[b] |
| 0 | 600 | 30.29±10.12[a] | 42.23±8.55[a] | 3.12±1.89 | 2.78±0.21 | 0.07±0.03[b] |
| 100 | 0 | 12.99±6.57[b] | 11.33±3.22[b] | 0.94±0.54 | 1.13±0.67 | 5.07±1.05[a] |
| 100 | 600 | 47.64±12.34[a] | 12.07±1.98[b] | 0.72±0.33 | 2.61±1.43 | 0.86±0.51[b] |
| P-Value | | 0.05 | <0.01 | 0.22 | 0.71 | <0.01 |
| P-Value | | | | | | |
| MO | | 0.40 | 0.02 | 0.06 | 0.47 | <0.01 |
| TP | | 0.31 | 0.01 | 0.51 | 0.42 | <0.01 |
| MO*TP[2] | | 0.01 | 0.01 | 0.61 | 0.57 | <0.01 |

[1]Each mean represents 5 cages, with 2 layer/cage. Abbreviations represented: TP = tea polyphenols; MO = molybdenum.

[2]MO*TP means the interaction between MO and TP.

[a,b] Means in the same column with different letters differ significantly ($p < 0.05$).