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PHYSICOCHEMICAL AND MICROBIAL PROFILING OF POULTRY LITTER OVER TIME POST-HARVEST

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Whilst experimental exposure to used litter often aims to induce reduced performance arising from anticipated litter-derived challenges (1,2), performance may be improved instead (3,4). Such variation may be associated with differences in litter quality between studies, e.g. arising from variation in pathogen load and duration between litter collection and usage. Here we investigated changes over time in microbial profiling and quality of litter, derived from a 35d broiler trial. Litter was kept at room temperature at trial end (d0), 200 g samples were collected weekly in sterile plastic bags at d0, d7, d14, d21 and d28, and stored at -80 °C pending analysis of pH, moisture and microbial profiling. The latter included quantification of 16S ribosomal DNA for total bacterial counts, 18S ribosomal DNA for total fungal counts and PCR screens for selected pathogens. DNA extracted from litter-derived bacterial pellets (5) using the DNeasy® PowerSoil® kit, was used to quantify total bacteria and fungi, Salmonella spp., avian pathogenic E. coli O1:K1:H7 (APEC) and Clostridium perfringens through qPCR, with outcomes converted into log gene copy number per g litter (cpg). Analysis of variance showed that pH gradually reduced from 8.42 at d0 to 8.09 at d28 (s.e.d. 0.066; P=0.002). Moisture levels were stable between d0 and d14 at ~33.7%, and then gradually reduced to 12.5% at d28 (s.e.d. 2.28%; P<0.001). Total bacteria increased from 8.06 log cpg at d0 to 8.25 log cpg at d7, then gradually reduced to 7.71 log cpg by d21 and then increased to 8.23 log cpg at d28 (s.e.d. 7.44 log cpg; P<0.001). Total fungi gradually reduced from 6.85 log cpg at d0 to 6.30 log cpg at d28 (s.e.d. 6.49 log cpg; P=0.013). PCR results revealed that this litter was negative for Salmonella spp and Clostridium perfringens. However, APEC gradually reduced from 7.00 log cpg at d0 to 6.30 log cpg at d28 (s.e.d. 5.67 log cpg; P<0.001). Thus, microbial profiles and quality of litter may vary over time post-harvest. Future work employing reused litter methods may benefit from detailed litter characterisation to optimise study design, to define what constitutes a sufficient pathogenic load, and to assist explaining subsequent outcomes on broiler performance and gut health.

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