The current study was designed to evaluate the effect of supplementing different levels of nano-emulsion essential oils (NEEO's) blend (garlic and onion; 1: 1) on broilers performance, carcass traits, digestibility of nutrients, serum biochemical parameters and antioxidant responses. A total number of 200 unsexed d-old Arbor Acres broiler chicks were randomly distributed into 5 equal treatments containing 40 chicks each (10 birds /replicate). The first group fed standard diet and served as a control (T1). The second group was fed diet supplied with antibiotics (Oxytetracyclinne; 50 mg Kg-1 diet) (T2). Other three groups T3-T5 fed basal diet supplemented with 2.5 NEEO's, 5 NEEO's and 10 NEEO's ml kg-1 diet nano-emulsion essential oils blend (garlic and onion), respectively for 35-day. At the end of the feeding trial, the results showed that compared to the control chicks of T4 significantly recorded the best EE% digestibility coefficient, while crude fiber (CF%) digestibility coefficient was significantly decreased by adding different supplementation. The highest body weight gain (BWG) during overall growth period was achieved by chicks fed 2.5 ml NEEO's kg-1 diet, while, the best feed conversion ratio (FCR) was found in chick fed 5 ml NEEO's kg-1 . No significant differences were found in carcass characteristics of broiler among treatment groups. According to meat chemical analysis, chicks of fed 10 ml NEEO's kg-1 diet recorded the highest protein% in breast and thigh muscles; nevertheless, the same group recorded the lowest fat% in thigh compared to control. Chicks fed 10 ml NEEO's kg-1 diet recorded the lowest intestinal bacterial count, lipid profile values and total saturated fatty acids in both breast and thigh muscles. The highest antioxidant values, immune status also breast and thigh mono and poly-unsaturated fatty acids were achieved in 10 ml NEEO's kg-1 diet group. In conclusion, the best level of added nano-emulsion essential oils Blend (garlic and onion) is 10 NEEO's ml kg- 1 diet which translated as improvement in growth performance, chemical meat quality, mono and poly- unsaturated fatty acids, and finally reflected on economic efficiency.