

Supplementary Information 2. Composition of nutrient contents of low-concentration antioxidant diet in the experiments

Ingredient composition (%)	Content
Corn	48.30
Wheat middlings	12.00
Wheat	17.00
Choline chloride	0.20
Bean pulp	6.80
Fish meal	4.00
Chicken powder	5.00
Animal Premix (no antioxidants)	4.00
Stone powde	1.10
Soybean oil	1.00
Secondary sodium chloride	0.45
Secondary magnesium chloride	0.15
Total	100

* **Low concentration** antioxidants represent EQ ^[1], FA ^[2], rutin ^[3] and resveratrol ^[4] add 30 mg/kg respectively.

Reference:

1. Zhou H, Huang X, Bi Z, Hu Y, Wang F, et al. 2021. Vitamin A with L-ascorbic acid sodium salt improves the growth performance, immune function and antioxidant capacity of weaned pigs. *Animal: An International Journal of Animal Bioscience*, 15: 100133.

2. Tian B, Geng Y, Wang P, Cai M, Neng J, et al. 2022. Ferulic acid improves intestinal barrier function through altering gut microbiota composition in high-fat diet-induced mice. *European Journal of Nutrition*, 61: 3767–3783.

3. Guan P, Yu H, Wang S, Sun J, Chai X, et al. 2024. Dietary rutin alleviated the damage by cold stress on inflammation reaction, tight junction protein and intestinal microbial flora in the mice intestine. *The Journal of Nutritional Biochemistry*, 130: 109658.

4. Wang P, Gao J, Ke W, Wang J, Li D, et al. 2020. Resveratrol reduces obesity in high-fat diet-fed mice via modulating the composition and metabolic function of the gut microbiota. *Free Radical Biology and Medicine*, 156: 83–98.