# Determination of apparent metabolizable energy of full-fat sunflower seed in broiler chickens

S Salari, H Nassiri Moghadam, J Arshami, A Golyan, M Sari
Ferdowsi University of Mashhad, Mashhad, Islamic Republic of Iran
*Email: somayehsallary@yahoo.com*

**Introduction** Sunflower (*Helianthus annuus* L.) is one of the most widely cultivated oilseeds in the world and ranks third in importance as a source of vegetable oil. In our experiment, full-fat sunflower seed (FFSS) had 180 g/kg CP, 380 g/kg EE, and 143 g/kg CF. Among the various oilseeds available on the market, FFSS contains more ether extract (EE) and is available at a relatively low price. This high EE content contributes to a high ME per unit or high energy density of feed. The increased production and availability of hybrid FFSS coupled with its oil content make FFSS a potentially desirable ingredient in poultry feeds. In the last few years, unextracted whole seed has been used as a feed ingredient in poultry diets. This experiment was conducted to determine the apparent metabolizable energy ($AME_n$) of FFSS in broiler chickens.

**Materials and methods** One-day old male chicks of Ross strain were housed in floor pens, exposed to light for 24 h/d, and fed a standard broiler diet for 2 wk. Feed and water were provided *ad libitum*. FFSS was incorporated into the basal diets at 3 concentrations (70, 140, and 210 g/kg). The 4 experimental diets, which contained 3 g/kg chromium oxide as an indigestible marker, were evaluated in a balance trial to determine the ME content. On d 10, 80 birds were placed at random in 16 cages giving 4 replicates per dietary treatment. On d 15, the birds were starved for 4 hours and then received the experimental diets from 15 to 21 d of age. During the last 3 d, excreta samples from each cage were collected and stored at -20°C. After being thawed, excreta were homogenized, dried, and ground through a 1-mm screen. Diets and excreta were analysed for dry matter, CP, chromium oxide, and gross energy. Apparent metabolizable energy was calculated as follows:
ME (MJ/kg) = dietary gross energy× [1-(diet Cr2O3 / excreta Cr2O3) × (excreta gross energy/diet gross energy)].
The correction of AME to zero nitrogen retention ($AME_n$) was based on a factor of 34.4 kJ/g of retained N (Hill and Anderson, 1958). The $AME_n$ value of FFSS was calculated using the following equation: $AME_n = (AME_n\ T - \alpha \times AME_n\ B)/b$, where T is the test diet, α is the proportion of the basal diet in the test diets, B is the basal diet, and b is the proportion of FFSS in the test diets. Statistical analyses were performed by using the GLM procedures of SAS software (SAS Institute, 2004). Data were subjected to ANOVA to identify variation produced by inclusion level of FFSS; regression analysis was also used to establish dietary changes as a function of inclusion level of FFSS.

**Results** Table shows $AME_n$ data (MJ/kg) for the experimental diets and for FFSS using the difference technique described above. Increasing inclusion rate of FFSS increased the $AME_n$ of the diets numerically but this effect was not significant. The $AME_n$ (MJ/kg) of FFSS, calculated by difference (Table) ranged from 13.7 to 14.3 MJ/kg. The $AME_n$ values obtained for the diets were regressed against the level of FFSS in the basal diet to estimate the $AME_n$ content in FFSS. The equation derived by fitting a linear model was the following: $y = 12.394 + 0.0018X$ ( $R^2 = 0.80$). An estimate of the $AME_n$ of FFSS, obtained by extrapolation of this equation gave a value of 14.22 MJ/kg.

**Table 1** Apparent metabolizable energy ($AME_n$)[1] of diets with increasing levels of full-fat sunflower seed (FFSS), and of FFSS determined by difference and regression analysis

| Level of FFSS (g/kg) | $AME_n$ of diets (MJ/kg) | $AME_n$ of FFSS MJ/kg) |
|---|---|---|
| 0 | 12.42 | - |
| 70 | 12.51 | 13.74 |
| 140 | 12.60 | 13.68 |
| 210 | 12.82 | 14.31 |
| SEM | 0.164 | |

[1]$AME_n$ determinations were made based on 16 cages of 1 bird each.
Linear regression equation: $y = 12.394 + 0.0018X$; $R^2 = 0.8$ where y = $AME_n$ (MJ/kg) and x = dietary inclusion level of FFSS (g/kg)

In this experiment, the energy value obtained for FFSS was lower than the 18.70 MJ/kg and 17.67 MJ/kg reported by Rodriguez *et al* (1998) and Rodriguez *et al* (2005), respectively. This difference may be related to crude fat content because the sunflower seed they used had a higher amount of crude fat (473 and 444 g/kg respectively).

**References**

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