Abstract: In order to study the chemical composition, mineral contents and protein quality of poultry by-product meal (PBPM), 10 composed samples of PBPM produced in Iran were provided during two months sampling period from rendering units of three industrial poultry slaughter-houses. The proximate analysis showed that the average dry matter (DM), ether extract (EE), crude protein (CP), crude fiber (CF) and ash of the PBPM samples were 94.8, 23.4, 60.5, 0.90, and 9.3 percent, respectively. The average gross energy (GE) value for the PBPM samples was 5645 kcal kg⁻¹. The average values of major elements including Ca, P, Na, K, Cl, Mg, and S were 3.51, 1.88, 0.52, 0.31, 0.74, 0.06, and 0.99 percent, respectively. The average values of trace elements including Fe, Cu, Mn, Zn, and Se were 623.2, 9.3, 16.5, 47.8, and 0.73 mg kg⁻¹, respectively. Biological evaluation of protein quality was done by chicks fed a nitrogen-free basal diet (as negative control) or chicks fed semipurified diets containing 10 percent crude protein from the PBPM or Kilka fish meal (as positive control) as the sole source of dietary protein. The values of protein efficiency ratio (PER) and net protein ratio (NPR) showed significant differences (p<0.05) among the PBPM samples and varied between 1.45 to 2.05 and 2.31 to 2.87, respectively. The PER and NPR values for the PBPM samples were significantly lower (p<0.05) than that of Kilka fish meal.

Key words: Poultry by-product meal, chemical composition, protein quality

Introduction
Recycling of wastes from poultry slaughter-houses is of economical, biological and environmental importance (Cai et al., 1994; Steffens, 1994). Poultry by-product meal (PBPM) is one of the by-products resulting from poultry slaughter-houses and produced by processing of the inedible parts of poultry carcasses including heads, feet, and viscera, with the exception of feathers (Bohnert et al., 1999; Daghir, 1975; Dale et al., 1993; Escalona et al., 1987; Senkoylu et al., 2005). PBPM has a proper profile of available essential amino acids and is rich in calcium, phosphorus and vitamin B₂ (NRC, 1994; Waldroup and Adams, 1994). This by-product is used as a protein source in diets of monogastric animals like pig (Zier et al., 2004), Poultry (Aimiuwu and Lilburn, 2006; Escalona et al., 1987) and aquatic animals (Steffens, 1994) and also extensively used as a ruminally undegradable protein source in ruminant diets (Bohnert et al., 1999). The chemical composition, mineral contents and protein quality of PBPM can vary greatly depending on the raw material source (Johnson and Parsons, 1997; Johnson et al., 1998), storage time of raw materials prior to rendering (Tamim and Doer, 2003), processing method (Robbins and Firman, 2006), processing pressure and temperature (McNaughton et al., 1977), and ash content (Johnson and Parsons, 1997) and needs to be evaluated continuously. Determination of the chemical composition of PBPM is important in estimating its metabolizable energy content (Dale et al., 1993; NRC, 1994; Pesti et al., 1986) and measurement of its mineral content especially calcium and phosphorus is of significance to include PBPM in the balanced diets (Leeson and Summers, 2001). Currently, biological assays including protein efficiency ratio (PER) and net protein ratio (NPR) are extensively used to evaluate the protein quality of various animal protein sources for poultry (Douglas et al., 1997; Escalona et al., 1986; Johnson and Parsons, 1997) and rainbow trout (Anderson et al., 1993). The classical PER and NPR assays are conducted for 28 days with rats (Jansen, 1978) and usually last 17 days with poultry (Douglas et al., 1997; Johnson and Parsons, 1997), but a study has been conducted to determine whether the PER and NPR assays can be reduced in length, and thus, make them more timely to detect differences in protein quality among animal protein meals (Johnson and Parsons, 1997).

At present, there are 37 industrial poultry slaughter-houses in Iran that produce PBPM by processing waste materials from slaughtering of broilers, and spent layers and breeders which are mostly used in poultry and cold water fish diets. Although many studies have been conducted on protein quality changes and other nutritional characteristics of PBPM in several countries (Aimiuwu and Lilburn, 2006; Bhargava and O’Neil, 1975; Dale et al., 1993; Dozier et al., 2003; Escalona et al.,