5. SUMMARY AND CONCLUSIONS

Poultry slaughterhouse by-product meals are nowadays widely used as ingredients in rations for all classes of animals. In recent years, poultry by-product meals have been examined in poultry rations as substitutes or supplements for expensive traditional feed proteins. The variable quality, due in part to the raw materials, processing conditions (cooking and drying) and storage condition, is a major obstacle in practical rations. Therefore, this study was performed to evaluate the protein quality of HFM and POM locally manufactured, and the possibility of using these by-products to substitute a part or all of either soybean meal protein or fish meal protein in practical rations of broiler chicks. Three experiments were carried out during this study at Gizerat El-Sheir Poultry Farm, Animal Production Research Institute, Agricultural Research Center using day-old Hubber broiler chicks.

Experiment 1 was carried out to determine the NPU values of HFM and POM. All semi-purified rations used in this experiment had the same non-protein constituents but varied in the protein sources (14%) and amino acid supplementation. Each poultry by-product meal (HFM or POM) was used as the sole source of protein in experimental

rations either without amino acid supplementation or supplemented with methionine, lysine or both of them together.

Experiments 2 and 3 were planned to study the effect of using different levels of HFM and POM on the performance of broiler chicks. Each experiment included two growth periods, a starter period from 1 to 4 weeks of age and a finisher one from 4 to 7 weeks of age. HFM was used in tested rations of experiment 2 to substitute either 25, 50, 75 or 100% of soybean meal protein or to replace 50 or 100% of fish meal protein in the control rations. While, POM was used to substitute 50 or 100% of fish meal protein in the control rations. The starter and finisher control rations used in this experiment have protein contents mainly from soybean meal and fish meal. All starter and finisher rations used in experiment 2, except the controls, were unsupplemented with amino acids.

The design, levels of HFM and POM substitution, starter and finisher rations used in experiment 2 were, similarly, used in experiment 3, except that experimental rations were supplemented, if needed, with DL-methionine and L-lysine to cover the chicks requirements from these two amino acids according to NRC (1984).

Starter and finisher rations, used either in experiment 2 or experiment 3, were formulated to be nearly

isonitrogenous and isocaloric. The CP contents were between 21.90 and 22.20% for starter rations and 17.95-18.20% for finisher ones, while ME values were between 3000-3040 Kcal/Kg starter rations and 3025-3085 Kcal/Kg finisher ones.

Results of this study could be summarized as follows:

Proximate analysis, amino acid composition and pepsin digestibility of HFM and POM.

1. The average proximate analysis of HFM was 90.52, 3.73, 1.66, 0.81 and 3.28% for CP, EE, NFE and ash, on DM basis, respectively. The corresponding values of POM were 58.70, 23.28, 4.37, 2.11 and 11.54%. These results indicated that HFM is a good source of protein, while POM is considered as a source of energy, protein and minerals.

2. The results of amino acid composition and chemical score values showed that methionine was the first limiting amino acid in both HFM and POM, while lysine and histidine were the second and third limiting ones for HFM. Whereas, cystine and histidine were the second and the third limiting amino acids for POM. The high content of cystine in HFM is considered as a useful source of sulfur amino acids, which could partially remedy the deficiency of methionine in broiler rations.

3. The average pepsin digestibility values for HFM and POM were 79.90 and 80.92%, respectively.

Net protein utilization values of HFM and POM (Experiment 1)

1. Values obtained showed that HFM without amino acid supplementation recorded the lowest NPU values (36.02%), whereas HFM fortified with both methionine and lysine achieved the highest value (49.64%). Similarly, POM without amino acid supplementation showed the lowest NPU value (51.85%), while POM fortified with both methionine and lysine recorded the highest value (59.78%).

2. Methionine and/or lysine supplementation significantly ($P<0.05$) improved the NPU values of either HFM or POM. In addition, HFM supplemented with methionine had better NPU value than that fortified with lysine, while the reverse was true with POM. Whereas, supplementing either HFM or POM with both methionine and lysine resulted in higher ($P<0.05$) NPU values than using each one singly.

Effect of using HFM and POM without amino acids supplementation on broiler performance (Experiment 2).

Results of this experiment showed that:

1. Average BWG values for broilers fed different levels of HFM or POM were lower than that of chicks fed the control, during the starter, finisher and entire periods. The differences in BWG between chicks of the control and those of all other treatments were significant during the finisher and entire periods, while the reverse was true through the

starter period. Average BWG mostly decreased with increasing the level of tested by-product in the ration but the differences were almost insignificant.

2. Feed consumption decreased with increasing the level of HFM or POM in the ration and the differences were significant in most cases during the finisher and whole periods, whereas a reverse trend was observed during the starter period.

3. Chicks fed the control ration recorded the best feed conversion values, and the differences between the control and other treatments in feed conversion values were significant during the finisher and entire periods and almost insignificant through the starter one. Also, the differences in feed conversion values due to increasing the level of tested by-products in the ration were almost insignificant.

4. Chicks fed rations with 50 or 100% of fish meal protein of the control ration replaced by either HFM or POM, showed somewhat better performance than those fed rations in which 50 or 100% of soybean meal protein was substituted with HFM.

5. It seems that the adverse effect of poultry by-product meals (HFM or POM) on the performance of broilers is mainly due to the deficiency of these by-products in some critical amino acids, namely, methionine and probably histidine.

Effect of supplementing HFM and POM with lysine and methionine on broiler performance (Experiment 3).

Data of this experiment revealed that:

1. Chicks fed on different levels of HFM or POM supplemented with lysine and methionine recorded higher BWG values than those fed the control ration at the end of the starter period (1-4 weeks of age). Whereas, chicks fed the control ration recorded the highest BWG values at the termination of the finisher period (4-7 weeks of age), and BWG tended to decrease with increasing the level of either HFM or POM in the ration, but the differences were almost not significant. Similarly, the differences in BWG values due to the inclusion of either HFM or POM in broiler rations during the whole period (1-7 weeks of age) were mostly non-significant.
2. Feed consumption tended almost to increase with increasing the level of poultry by-product meals in the ration at the starter and whole periods. The differences in feed consumption between chicks fed the control ration and those on most other treatments were not significant during the whole period, but the reverse was true during the starter period. Whereas, the inclusion of poultry by-product meals in broiler rations had no-significant effect on feed consumption during the finisher period.
3. The best feed conversion values were achieved by chicks of T4 (75% of soybean meal protein replaced by HFM) during

the three experimental periods, followed by those of the control in most cases, and the poorest ones were shown by chicks on T6 (HFM replaced 50% of fish meal protein) and T7 (HFM substituted 100% of fish meal protein) during the finisher and entire periods. However, the differences in feed conversion values among all experimental treatments were not significant during the starter period, and the effect of increasing the level of HFM or POM in the ration on feed conversion values during the finisher and whole periods were almost insignificant.

4. Data of replacing 50 or 100% of fish meal protein in the control rations by either HFM or POM (BWG, feed consumption and feed conversion values through the experimental periods) followed nearly the same trend observed when substituting the same levels of soybean meal protein with HFM in broiler rations. Moreover, the differences in BWG, feed consumption and feed conversion values during the different experimental periods due to replacing 50 or 100% of soybean meal protein or fish meal protein in the control rations by either HFM or POM were not significant in most cases.

5. From the foregoing results, it could be concluded that HFM can replace up to 75% of soybean protein in broiler rations containing adequate levels from methionine and lysine. Whereas, HFM or POM could be incorporated in broiler rations fortified with methionine and lysine to

substitute 50% of fish meal protein.

Economic efficiency of using HFM and POM in broiler rations.

From the economical point of view, HFM could be incorporated in broiler rations to replace up to 75% of soybean meal protein, whereas fish meal protein could be completely substituted by either HFM or POM. Therefore, it could be concluded that the local processed HFM and POM could be economically used in broiler rations in Egypt rather than importing tremendous quantities of the highly expensive soybean and fish meals which would help, in turn, in decreasing the feed cost of the experimental rations.