SUMMARY

The present thesis deals with the microbial biodegradation of chicken feather which is one of the main wastes of poultry industry. The studies were restricted to the use of thermophilic actinomycetes for this purpose. Five soil samples were collected near Benha city and were thermally enriched in thermophilic chicken feather hydrolysing actinomycetes.

Two colour types of actinomycetes isolates were obtained : (a) white type and (b) blue type. The present studies were restricted to the white type since isolates of the blue type were the subject of another extensive studies .

Isolates of the white group were found to produce white cream to pale aerial mycelium with non-pigmented substrate mycelium. These isolates produce minute colonies that consist of non-sepated substrate mycelium that carries long non-branching or rarely branching aerial hyphae which carry lateral single spores. Spores are big and have smooth surface. The studied isolates are melanine negative and true thermophiles. They were identified as a new species and named Thermoactinomyces keratinolyticus .

The time course hydrolysis of chicken feather by Thermoactinomyces keratinolyticus was studied in liquid static cultures. The product of hydrolysis were estimated in broth as soluble proteins, free amino acids, ammonia and keto acids. The content of chicken feather lysing enzyme in broth was also estimated.

In the early experiments complete solubilization of chicken feather by the studied organism was completed on the 9th day of incubation. The amount of nitrogenous products of hydrolysis of chicken feather remaining in broth on the 9th day constitutes 19.2 % of the chicken feather. Of these substances soluble proteins constituted 68.75 %, amino acids 28.64 %, ammonia 10.4 %. Chicken feather lysing enzymes were detected in broth already after 24 hours of incubation (one unit/ml of broth), increased to 8 units/ml on the 3rd day, 14 units/ml on the 5th day, 19 units/ml on the 7th day and reached a maximum of 22 units/ml on the 9th day, On further incubation it dropped to 17 units/ml on the 11th day and 7 units/ml on the 13th day of incubation.

The study of the effect of suplementing the basal medium with different nitrogen sources on the time

course hydrolysis of chicken feather and the concentration of its products in broth showed that the addition of fish extract caused both an increase and enhancement in solubl proteins production in broth. Peptone addition resulted in an increase in protein content of broth. Slight supression in the protein content in broth was achieved when $NaNO_3$ or $Ca(NO_3)_2$ were added to the basal medium , however strong supression was caused on the addition of either one of KNO_3 > $(NH_4)_2 SO_4$ > NH_4 cl > $(NH_4)_2$ HPO_4.

Amino acid production was found to be enhanced on the addition of fish extract or peptone while such production was supressed on the addition of $(NH_4)_2$ HPO_4 > $(NH_4)_2 SO_4$ > NH_4Cl > ca $(NO_3)_2$ > KNO_3 > $NaNO_3$.

Ammonia production as a product of chicken feather hydrolysis was found to be affected by the addition of nitrogenous supplements. Peptone and fish extract increased ammonia production in broth while it was supressed on the addition of $(NH_4)_2HPO_4$ > NH_4Cl > $(NH_4)_2$ SO_4 > KNO_3 > Ca $(NO_3)_2$ > $NaNO_3$.

For the production of keto acids it was enhanced on the addition of only peptone while all the remaining used nitrogen source caused the supression of keto

acids in broth when added to the basal medium .

The production of chicken feather hydrolysing enzymes was found to be affected by the addition of the used nitrogen sources. Peptone > fish extract > sodium nitrate enhanced the production of these enzymes by the studied organism, while $(NH_4)_2\ HPO_4$ > NH_4cl > $(NH_4)_2\ SO_4$ > KNO_3 > $Ca\ (NO_3)_2$ showed certain supressing effect on the products of these enzymes.

The content of broth in total nitrogenous products was enhanced on the addition of peptone or fish extract to basal medium. However this content was supressed on the addition of either one of NH_4cl > $(NH_4)_2\ SO_4$ > $(NH_4)_2\ HPO_4$ > KNO_3 > $NaNO_3$ > $Ca(NO_3)_2$.

The study of the effect of suplementing the chicken feather basal salts medium with different phosphorus sources showed that non of the tested phosphorus sources enhanced protein production by the experimental organism. Additional phosphorus supplies seem to supress protein production by the experimental chicken feather hydrolysing thermophilic actinomycete. The same phenomenon was found to apply to amino acid production as well as ammonia production as products of chicken feather hydrolysis.

Concerning keto acids production monobasic ammonium phosphate enhanced keto acid production while the dibasic or the tribasic ammonium phosphates supressed such production. Monobasic as well as dibasic potassium phosphate enhanced keto acid production while the tribasic salt supressed it. Sodium phosphate realized quite expressed enhancement of keto acid production by the experimental organism.

On the addition of any of the tested ammonium phosphates chicken feather hydrolysing enzymes production was supressed at a degree that was inversely correlated with the basicity of the used salts. For the used potassium phosphates supressions directly proportion to the basicity were recorded. Highest supression of enzyme production was recorded on adding sodium phosphate.

The content of total nitrogenous products of chicken feather hydrolysis was found to be supressed on the addition of any of the tested phosphorus sources.

Chicken feather hydrolysis by Thermoactinomyces keratinolyticus was found to be greatly affected by

the addition of microelements to the basal medium : $Mncl_2$ > $NiNO_3$ > $ZnSO_4$ > Boric acid accelerated and enhanced protein production in broth while $CuSO_4$ > $Fecl_3$ > $COcl_2$ were supressive.

Amino acids production in broth as products of hyprolysis of chicken feather was found to be stimulated by $Mncl_2$ > $NiNO_3$ > $ZnSO_4$ while it was supressed by $CuSO_4$ > $COcl_2$ > $Fecl_3$.

Using either $Fecl_3$, $COcl_2$, or $CuSO_4$ ammonia production was supressed while it was increased on using $Mncl_2$ > $ZnSO_4$ > $NiNO_3$ > or Boric acid.

The production of keto acids in broth was stimulated by $ZnSO_4$> $Mncl_2$ > $NiNo_3$ but was supressed by: Boric acid > $Fecl_3$ > $Cocl_2$ > $CuSO_4$.

The production of chicken feather hydrolysing enzymes was found to be greatly stimulated on the addition of $Mncl_2$ or $ZnSO_4$ > moderatery stimulated on the addition of $NiNO_3$ or boric acid but supressed on the addition of $Fecl_3$ > $CuSO_4$.

The content of total nitrogenous production of chicken feather hydrolysis by Thermoactinomyces

keratinolyticus were found to increase on the addition of $Mncl_2$ > $ZnSO_4$ > $NiNO_3$ > or boric acid but was supressed on the addition of $COcl_2$ > $CuSO_4$ > or $Fecl_3$.