SUMMARY

Solid-state fermentation (SSF) is defined as a microbial process in which a solid materials used as the substrate or the inert support of microorganisms growing on it. In SSF, microorganisms can sometimes grow well and produce larger amounts of extracellular enzymes and other metabolities than they do in submerged (liquid) fermentation. From where, this study concerned with the production of pectinases from some of bacterial strains that isolated from potato peels which considered as agro-industrial waste and its applications in the clarification of juice also studied.

The obtained results can be summarized as follows:

1- Fifty one bacterial isolates (51) were isolated from *solanum tuberosum* (ST) peels and these isolates were purified. ST were collected from some restaurants in Benha, and then were dried. The bacterial isolates were grown on Czapek's-Dox pectin medium which contained apple-pectin as sole carbon and energy source.

2- The ability of all bacterial strains for production of pectinases under SSF by clearing zones technique qualitatively and quantitatively were studied. All bacterial strains were founded to be produce pectinases at different concentrations.

3- The ability of the best twenty (20) bacterial isolates for production of pectinases were tested in order to evaluate their ability to consume STP, SMP, EC and CPM. The tested

bacterial strains were founded to be consume the agro-industrial wastes by clearing zones technique.

4- The ability of the best bacterial isolates for the production of polygalacturonase quantitatively by Nelson's technique (1944) showed that the most three potent bacterial isolates were B-10104, B-4071 and B-107.

5- The three most potent bacterial isolates were identified on the basis of their ability to produce polygalacturonase by morphological, biochemical and physiological characteristics on the basis of the known international scientific keys for bacterial identification of Pergy's Manual of systematic bacteriology (1986, 1994) identified as *Bacillus firmus*-I-10104, *Bacillus firmus*-I-4071; and *Bacillus laterosporons*-I-107.

6- The best physical, environmental and nutritional factors affecting polygalacturonase productivities, produced by *Bacillus firmus*-I-10104 grown on STP under SSF were studied and resulted in: The best inoculum size was 1 ml which contained 30 x 10^{15} bacterial cell. The best substrate concentration was 1.25 gm and the best incubation periods was 96 hours and the best incubation temperature was 37 °C and pH was 6 and flask volume was 500 ml and the best condition for flask was shaking 200 rpm and the wanted nitrogen source was peptone 0.1 g/l. Without any vitamins, amino acids and other carbon source except STP as sole carbon and energy source.

7- The polygalacturonase was produced under the best previous nutritional, physical and environmental conditions in order to its purification.

8- The polygalacturonase was purified by preparation of cell free filtrate, using precipitation by ammonium sulfate fractionation technique. The best ammonium sulfate concentration was found to be 40 %, dialysis against tap water and sucrose respectively and followed by its purification by performance of sephadex G-200 column chromatographic technique. To be sure from the purity of the enzyme we used Gel electrophoresis and also to determine the molecular weight of the enzyme. Its founded to be 21,500. The quantitatively and the qualitatively amino acid analysis by using the amino acid analyzer was carried out. Data obtained emphasized that the degree of the enzyme activity contains the following 0.45 μg/ml glutamic acid, 8.52 μg/ml praline, 0.4 μg/ml cystine, 0.32 μg/ml tyrosine, 1.27 μg/ml phenylalanine, 0.49 μg/ml lysine and 4.87 μg/ml Arginine.

9- The factors affecting the enzyme activity were studied and resulted in the best incubation temperature was (50 °C) and the best pectin concentration was (2 %) and the best pH was (12) and the best enzyme concentration was (0.5 ml) and the purified enzyme was thermostable with maximum activity at (80 °C) and pH (12) without decomposition.

10- The application of the purified polygalacturonase on the cloudy juava juice was carried out resulted in the enzyme has

a high activity in the clarification of the juava juice when the pectin concentration 1.5 %, enzyme concentration 4.5 ml, temperature 75 °C and pH 5.

This study led to the possibility of use *Bacillus firmus*-I-10104 for the production of polygalacturonase under the ideal factors by using STP as the best agro-industrial waste under SSF conditions and its application for production of clear Juava juices.