Summary

The present thesis aimed at the isolation, characterization, and taxonomic identification of ***Streptomycetes*** of some soils of Qalubia governorate, and establishing a culture collection of these ***Streptomycetes***.

Using starch nitrate agar and applying dilution technique, 154 ***Streptomyces*** isolates were obtained from five soil samples covering the soil types of Qalubia governorate. All isolates proved to be ***Streptomycetes***.

Using the color wheels of **Treesner and Backus (1963),** the obtained isolates were differentiated into 4 color sections:

1. **Yellow section** that contains 29 isolates.
2. **Red section** that contains 26 isolates.
3. **Gray section** that contains 93 isolates and which were further differentiated into two color subsections:

Sub - section (A) of red gray ***Streptomycetes*** that contains 66 isolates.

Sub - section (B) of light gray ***Streptomycetes*** that contains 27 isolates.

4. **Blue section** that contains 6 isolates.

The isolates are further differentiated into groups according to the color of aerial and substrate mycelium, pigmentaion, morphology of spore chains, and ornamentation of spores. As a result of this study the experimented isolates were differentiated into 24 groups. Representative isolates are subjected to detailed taxonomic studies as recommended by the newest determinative manuals of ***Streptomycetes*** i.e. **Bergey's Manual of Systematic Bacteriology Volume 4, (1989).**

Yellow section: The 29 isolates of this section were differentiated into 4 groups as following:

Group (1): This group includes five isolates of which isolate **Y-11** was chosen as the representative one. This isolate produces short straight chains of spores, short cylindrical spores with abrupt ends, spores are of smooth surface. It produces pale yellow aerial mycelium but light yellow green substrate mycelium. The green pigmented were found to be pH sensitive (pink → green). No melanin pigments are produced. Growth was sensitive to some inhibitors, and some antibiotics. Utilized a wide set of carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances against gram (+ve) bacteria, yeasts, and fungi. Exhibits well expressed lipolytic activities. Degrades a wide set of organic complex compounds. This group is identified as ***Streptomyces streptomycini*** **(Krassilnikov, 1970).**

Group (2): This group includes five isolates of which **Y-18** was chosen as the representative one. It produces very long straight chains of spores, arranged in tufts. Spores are cylindrical with abrupt ends and smooth surface. Aerial mycelium is pale yellow but substrate mycelium is light brown. Produces pH sensitive green pigments. Melanin negative. Growth was sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances that inhibit the growth of gram (+ve) bacteria, yeasts and fungi. Exhibits well express lipolytic, keratinolytic, cellolytic, and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces globisporus*** **(Krassilnikov, 1941).**

Group (3): This group includes nine isolates of which **Y-9** was chosen as the representative one. Produces long straight chains of spores which may be slightly wavy. Spores are short cylinders with smooth surface. Aerial and substrate mycelia are pale yellow. No diffusible

pigments. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes a set of carbon and nitrogen sources. Mesophile and neutrophile. Produces some antimicrobial substances against gram (+ve) bacteria, yeasts, and fungi. Exhibits well lipolytic, keratinolytic, pectinolytic, and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces vulgaris*** **(Nikitina et al, 1961).**

Group (4): This group includes ten isolates of which **Y-20** was chosen as the representative one. It produces long straight chains of spores that arranged in tufts, and long cylindrical spores with abrupt ends and interposal pads, and smooth surface. Aerial and substrate mycelia are pale yellow. No diffusible pigments. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes a set of carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances against gram (-ve) bacteria, gram (+ve) bacteria, yeasts, and fungi. Exhibits well lipolytic, keratinolytic, cellulolytic, pectinolytic, and chitinolytic activities. Degrades some organic complex compounds. This group was found to be dissimilar to any described species of the yellow *Streptomyces* and so it is declared as a new species to which the name ***Streptomyces albolongus*** **(Hussein and Mohammed, 2005)** was coined.

Red section: The 26 isolates of this section are differentiated into 4 groups as following:

Group 5: This group includes eight isolates of which isolate **R-2** was chosen as the representative one. This isolate produces, moderate in length straight chains of spores, long cylindrical spores with abrupt ends and smooth surface. It produces pale orange yellow aerial mycelium but light brown substrate mycelium. No diffusible pigments. Melanin negative. Growth is inhibited by some inhibitors and antibiotics. Utilizes

a set of carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances, against gram (+ve) bacteria, yeasts and fungi. Exhibits well lipolytic, keratinolytic, cellulolytic activities. Degrades some organic complex compounds. This isolate is identified as ***Streptomyces gilvus*** **(Krassilnikov, 1970).**

Group 6: This group includes five isolate of which **R-3** was chosen as the representative one. It produces very long straight chains of spores which are with well extraordinarily long cylindrical spores with smooth surface. Aerial mycelium is grayish yellowish pink but substrate mycelium is light brown. No diffusible pigments. Melanin negative. Growth was affected by some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances against gram (+ve) bacteria, yeasts and fungi. Exhibits lipolytic, keratinolytic, pectinolytic, and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces stramineus*** **(Hussein and Konsoh, 1981) .**

Group 7: This includes four isolates of which **R-41** was chosen as the representative one. It produce primitive loose spiral chains of spores, Spores are long with tapering ends and smooth surface. Aerial mycelium is grayish yellowish pink but substrate mycelium is moderate yellowish pink. No diffusible pigments. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances against gram (+ve) bacteria, yeasts and fungi. Exhibits well lipolytic, keratinolytic, cellulolytic, and chitinolytic activities. Degrades some organic complex compounds. It is identified as the new species ***Streptomyces roseobrunneus n.sp.*** **(Hussein and Mohammed, 2005).**

Group 8: This group includes nine isolates of which **R-5** was chosen as the representative one. It produces long straight chains of spores that ends with quite open loops or hooks in the form of tufts. Spores are long cylinders with abrupt ends and smooth surface. Aerial mycelium is moderate yellowish pink but substrate mycelium is pale yellow. No diffusible pigments. Melanin positive. Growth is sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances against gram (-ve), gram (+ve) bacteria, yeasts and fungi. Exhibits well lipolytic and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces lavendulae*** **(William and Henrici, 1948).**

Gray section: The 93 isolates of this section are differentiated into 2 colored subsections as follows:

Sub-section (A): Red gray isolates that contains 66 isolates, and that are differentiated into 9 groups according to the ornamentation of spores, pigmentation and morphology of spore chains.

Group 9: This group includes three isolates of which isolate **G-100** was chosen as the representative one. It produces long loose spiral spore chains that consist of 3-6 turns. Spores are cylindrical with rounded ends and smooth surface. Aerial mycelium is light grayish reddish brown but substrate mycelium is grayish yellow. It does not produce pH sensitive pigments. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances that inhibit gram (+ve) bacteria and yeasts. Exhibits well lipolytic, keratinolytic, cellolytic and pectinolytic activities. Degrades some organic complex

compounds. It is identified as ***Streptomyces humidus*** **(Nakazawa and Shibata, 1958).**

Group 10: This group includes seven isolates of which **G-121** was chosen as the representative one. It produces short stalked spore chains with 1-2 turns. Spores are short cylindrical with smooth surface. Aerial mycelium is grayish yellowish pink but substrate mycelium is light orange yellow, the brown diffusible pigments are found to be pH sensitive (brown → yellow). No melanin pigments are produced. Growth is sensitive to some inhibitors and antibiotics. Utilizes a wide set of carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances against gram (-ve), gram (+ve) bacteria, yeasts and fungi. Exhibits well expressed lipolytic, keratinolytic, cellulolytic, pectinolytic, keratinolytic, cellulolytic, pectinolytic, and chitinolytic activities. Degrades a wide set of organic complex compounds. This group is identified as ***Streptomyces gilvocinereus*** **(Krassilnikov, 1970).**

Group 11: This group includes twenty one isolate of which **G-23** was chosen as the representative one. It produces straight spore chains with straight ends, spores are long cylindrical with smooth surface. Aerial mycelium is light grayish reddish brown but substrate mycelium is light brown. It does not produce pH sensitive pigments. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substance against gram (+ve) bacteria and yeasts. Exhibits well lipolytic, keratinolytic, pectinolytic, and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces misakiensis*** **(Nakamura, 1961).**

Group 12: This group includes five isolates of which **G-107** was chosen as the representative one. It produces loose spiral spore chains, consist of 2-4 turns. Spore are long cylindrical with rounded

ends and smooth surface. Aerial and substrate mycelia are brownish gray. No diffusible pigments. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances against only yeasts. Exhibits lipolytic, Keratinolytic, cellulolytic, pectinolytic, and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces capuensis*** **(Krassilnikov, 1970).**

Group 13: This group includes twelve isolates of which **G-49** was chosen as the representative one. It produces well developed loose spiral spore chains. Spores are short cylindrical with rounded ends, spore surface is smooth. Aerial mycelium is light gray but substrate mycelium is pale blue. No diffusible pigments. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. It does not produce any antimicrobial substances against gram (-ve), gram (+ve) bacteria, yeasts, or fungi. Exhibits lipolytic, keratinolytic, cellulolytic, pectinolytic, and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces rubrocyaneus*** **(Hussein, 1964).**

Group 14: This group includes one isolate **GNG5**. It produces short spore chain in the form of somewhat close spiral. Spores are short cylindrical, with rounded ends, spore surface is with fine short acute spines. Aerial mycelium is moderate gray but substrate mycelium is light olive brown. No diffusible pigments. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances against only yeasts. Exhibits well lipolytic, keratinolytic cellulolytic, pectinolytic and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces toyocaensis*** **(Nishinwra et al, 1950).**

Group 15: This group includes nine isolates of which **G-69** was chosen as the representative one. It produces short chains of spore in the form of hooks or loops spores are elongated cylinders with abrupt ends, spore surface is covered with fine acute spines. Aerial mycelium is light gray but substrate mycelium is pale yellow green. No diffusible pigments. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces some antimicrobial substances against only yeasts. Exhibits well lipolytic, keratinolytic, pectinolytic and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces greseorubens*** **(Preobrajenskaya et al., 1968).**

Group 16: This group includes one isolate **G-64.** It produce short loose spiral spore chains in the form of tufts. Spores are short cylinders with sounded ends. Spore surface is densely covered with long broad hairs. Aerial mycelium is pale blue but substrate mycelium is dark greenish gray. No diffusible pigments. Melanin negative. Growth is sensitive by some inhibitors and antibiotics. Utilizes set of carbon and nitrogen sources. Mesophile and neutrophile. Produces some antibiotics against (+ve) bacteria and fungi. Exhibits well lipolytic, keratinolytic, cellulolytic, pectinolytic and chitinolytic activities. Degrades some organic complex compounds. It is identified as the new species ***Streptomyces cyanotrichosporus n.sp.*** **(Hussein and Mohamed, 2005).**

Group 17: This group includes seven chosen of which **G-7** was chosen as the representative one. It produces loose spiral spore chains consists of 1-2 turns, spirals are stalked. Spores are very long cylindrical with abrupt ends, spore surface is hairy. Aerial mycelium is dark gray but substrate mycelium is pale yellow. No diffusible pigments. Melanin negative. Growth is affected by some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces

some antimicrobial substances against gram (+ve) bacteria and yeasts. Exhibits well lipolytic, keratinolytic, cellulolytic, pectinolytic and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces sporopillosus*** **(Krassilnikov, 1970).**

Subsection (B)

This subsection includes 27 isolates and differentiated into 6 groups depending on the morphology of spore chains and color of aerial mycelium.

Group (18): This group includes six isolates of which **G-115** was chosen as the representative one. It produces open spiral spore chains in the forms of hooks. Spores are of big size in the form of short cylinders and smooth surface. Aerial mycelium is light gray but substrate mycelium is light yellow. No diffusible pigments. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances against only yeasts. Exhibits well lipolytic, keratinolytic cellulolytic, pectinolytic and chitinolytic activities. Degrades some organic complex compound. It is identified as ***Streptomyces canofumeus*** **(Krassilnikov 1970).**

Group (19): This group includes four isolates of which **G -101** was chosen as the representative one. This isolate short primitive chains of spores in the form of hooks or loops. Spores are in the form of short cylinders with abrupt ends, spore surface is smooth. Aerial mycelium is light gray but substrate mycelium is light yellow. Produces light yellow diffusible pigments. Melanin production is positive. Growth is sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produce antimicrobial substances against only yeasts. Exhibits well lipolytic, keratinolytic, cellulolytic,

pectinolytic and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces cinereous*** **(Krassilnikov, 1970).**

Group (20): This group includes three isolates of which **G-72** was chosen as the representative one. It produces stalked spiral chains of spores, consisting of 2-3 turns. Spores are cylindrical with abrupt ends and smooth surface. Aerial mycelium is medium gray but substrate is light olive brown. No diffusible pigments. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances against gram (+ve) bacteria and yeasts. Exhibit well lipolytic, keratinolytic, pectinolytic and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces anlanosinicus.*** **(Thieman and Beretta, 1966).**

Group (21): This group includes eight isolates of which **GNG8** was chosen as the representative one. It produces well developed spiral spore chains that have 3-4 turns, spores are oblong, with attenuated ends, spore surface is smooth. Aerial mycelium is light gray but substrate is light olive brown. Produces brown diffusible pH sensitive pigments (brown → gray). Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances against gram (+ve) bacteria and yeasts. Exhibits well lipolytic, keratinolytic, cellulolytic, pectinolytic and chitinolytic activities. Degrades some organic complex compounds. It is identified as the new species ***Streptomyces cinereobrunneus n.sp*** **(Hussein and Mohammed 2005).**

Group (22): This group includes five isolates of which **G-113** was chosen as the representative one. It produces spore chains of spores

consist of 2-5 turns, spores are of big size with abrupt ends and with smooth surface. Aerial mycelium is light gray but substrate mycelium is brownish gray. Brownish gray diffusible pigments are not pH sensitive. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Utilizes come carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances against gram (-ve), gram (+ve) bacteria, and yeasts. Exhibits well lipolytic, pectinolytic and chitinolytic activities. Degrades some organic complex compounds. It is identifies as ***Streptomyces phaeochromogenes*** **(Krassilnikov, 1970).**

Group (23): This group contains only one isolate GnG6. It produces spiral chains of spores that have 4-6 turns. Spores are short cylinders, with abrupt ends, spore surface is provided with short spines. Aerial mycelium is light gray while substrate mycelium is brownish gray. The brownish gray diffusible pigments are not pH sensitive. Melanin negative. Growth is sensitive to some inhibitors and antibiotics. Isolate GNG6 utilizes some carbon and nitrogen sources. Mesophile and neutrophile. Produces antimicrobial substances active against gram (+ve) bacteria and yeasts. Exhibits well lipolytic, keratinolytic, pectinolytic and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces variabilis*** **(Gauze et al., 1957).**

Blue section:

Group (24): This group contains 6 isolates of which G-14 was considered as the representative one. It produces well developed spiral chains of spores spiral may be of 4-8 turns (multiwhorled), spores are short moderate cylinders, spore surface ornamented with fine acute spines. Aerial mycelium is light greenish blue but substrate mycelium is grayish green. No diffusible pigments. Melanin positive. Growth is

sensitive to some inhibitors and antibiotics. It utilizes some carbon and nitrogen sources. Mesophile and neutrophile. It does not exhibit any antimicrobial activities. Exhibits well lipolytic, keratinolytic, cellulolytic, pectinolytic and chitinolytic activities. Degrades some organic complex compounds. It is identified as ***Streptomyces viridochromogenes*** **(Krainsky, 1914).**