4.1.3.3 Identification based on Biochemical tests

Just as human beings possess a characteristics and specific set of fingerprints, microorganisms also have their own identifying biochemical characteristics. These so-called biochemical fingerprints are all properties controlled by the cell’s enzymatic activity, and they are responsible for bioenergetics, biosynthesis and biodegradation. The sum of all these chemical reactions is defined as cellular metabolism, and the biochemical transformation that occurs both outside and inside the cell are governed by biological catalysts called enzyme.

A number of biochemical tests are used for the identification of bacterial species in the laboratory. Different types of biochemical test have been previously described within material and methods.

Putative *E.coli* was subjected to Citrate, Urease, Methyl red test (MR test), Indole test, Triple sugar test in which it gave positive result for MR, Indole and TSI (without H₂S gas) A/A negative for Citrate and Urease test. This confirmed the presence of *E.coli* in the urine sample.

Putative *Klebsiella spp.* was subjected to Citrate, Urease, Methyl red test (MR test), Indole test, Triple sugar test in which it gave positive result for Citrate, Urease and TSI (without H₂S gas) A/A negative for Methyl red test (MR test), Indole test. This confirmed the presence of *Klebsiella spp.* in the urine sample.

Putative *Proteus vulgaris* was subjected to Phenylanine deaminase test (PPA), Urease, Citrate, Triple sugar test, Methyl red test (MR test), Indole test, in which it gave positive result for MR, Indole, PPA, Citrate, Urease and K/A for TSI with H₂S gas. This confirmed the presence of Proteus vulgaris in the urine sample.

Putative *Proteus mirabilis* was subjected to Phenylanine deaminase test (PPA), Urease, Citrate, Triple sugar test, Methyl red test (MR test), Indole test, in which it gave positive result for MR, PPA, Citrate, Urease and negative for Indole, TSI with H₂S gas. This confirmed the presence of Proteus mirabilis in the urine sample.

Putative *Pseudomonas sp.* was subjected to oxidase test, it was positive for it. This confirmed the presence of *Pseudomonas sp.* in the urine sample.
Putative *S. aureus* was subjected to catalase, coagulase and mannitol tests in which it gives positive results for all these three tests, this confirmed the presence of *S. aureus* in urine sample.

Putative *Enterococcus spp.* was subjected to catalase, coagulase and bile esculine test, in which it gave positive results for bile esculin test and negative for catalase, coagulase. This confirmed the presence of *Enterococcus spp.* in urine sample.

Putative *Acinetobacter spp.*, were subjected to catalase, oxidase, indole, urease, nitrate tests, in which it gave positive results for catalase and negative for oxidase, indole, urease, nitrates. This confirmed the presence of *Acinetobacter spp.*, in urine sample.

Putative *Citrobacter spp.*, were subjected to citrate, methyl red, Voges-Proskauer, Phynylalanine deaminase tests in which it gave positive results for citrate, methyl red and negative for Voges- Proskauer, Phynylalanine deaminase. This confirmed the presence of *Citrobacter spp.*, in urine sample.

Putative *Alkaligene fecalis* was subjected to oxidase, catalase and sugar fermentations tests in which it gave positive results for oxidase, catalase and negative for sugar fermentation tests. This confirmed the presence of *Alkaligene fecalis* in urine sample.

The results of these biochemical tests are summarized in Table 4.1.3.3, and Fig.4.1.3.3 shows the distinguishing characters of different Bacteria (Biochemical tests) for identification of bacterial species in Laboratory.