7. Summary

*Mangifera indica* is large spreading evergreen trees grow up to 45m in height with a heavy doom shaped crown. It belongs to the family Anacardiaceae. All parts of this plant have been used in TSM as a major curative agent. Seed kernel of this plant is considered as a medicine for diarrhoea, dysentery etc.. It is also used to heal all types of wounds.

The seed kernel consists of a thin seed coat and two thick cotyledons. The seed coat in slightly thick end along with raphe. The raphe was thick and it consists of loosely arranged thin walled parenchyma cells. Along the inner part of the raphe occur numerous irregular masses of vascular strands. The vascular strands are located in tangential band. The strands have thick walled lignified squarish cells. The cotyledons are thick, fleshly and it has homogenous, thin walled compact parenchyma cells which are angular or circular in shape. The epidermal layers of the cotyledons are district. Wide, large, circular laticiferous canals are frequently seen in the cotyledons. Surrounding the canals occur wide zone of the xylem and phloem elements. The canals are long narrow and unbranched. They include dark amorphous tannin content and starch grains. The ground parenchyma cells have dense deposition of tannin bodies and starch grains.

*M.indica* seed kernel appears the whitish brown in colour and mild aromatic odour with bitter taste. No foreign matter is in the drug powder. The drug powder have 7.2% total ash, 2.9% Acid insoluble ash, 3.6% water insoluble ash, 25.9% water extractives value and 24% alcoholic extractives value. Various natures of chromatophores were produced when treated with different solvents. Natural microbial load of MISK powder was within the limits of international pharmacopeal standards.
Antimicrobial activities of MISK extracts were done by making use of five clinical isolates like *Escherichia coli*, *Salmonella* sp. *Staphylococcus aureus* *Streptococcus pyogenes* and *Pseudomonas aeruginosa*. These organisms were identified by growth characteristics on selective cum differential agar, microscopic and biochemical features. All the isolates were resistant to multiple numbers of commercial antibiotics tested.

The aqueous (MISKAЕ) and phenolic (MISKPE) extracts of *Mangifera indica* possess prominent antibacterial activity against all the MDR isolates. Both extracts inhibited the growth of the clinical isolates effectively and the inhibition zones ranged from 10±0.11 mm to 19±0.15 mm at different concentration of extracts (50µg/ disc to 400 µg/ disc).

Phenolic extract produced best MIC against *E.coli* at 125 µg/ ml concentration where as aqueous extract produced MIC values at 175 µg/ml concentrations for *E.coli*.

Antioxidant activity of *M.indica* seed kernel aqueous and phenolic extracts and Ascorbic acid were assessed using DPPH assay, Ferric reducing power assay, Nitric oxide radical scavenging assay, Superoxide radical scavenging assay, ABTS radical scavenging assay and H$_2$O$_2$ scavenging assay. *M.indica* aqueous extract showed the following % scavenging power with specific IC$_{50}$.

- **DPPH anion scavenging power**: 33.87±0.02% (97.01±0.02µg/ml)
- **Ferric reducing power**: 53.8±0.01% (86.4±0.02µg/ml)
- **Superoxide radical scavenging**: 51.75±0.01% (63.4±0.05µg/ml)
- **Nitric oxide scavenging**: 46.34±0.54 % (69.97±0.61 µg/ml)
- **ABTS radical scavenging**: 47.6±0.12% (67.7±0.19µg/ml)
- **Scavenging hydrogen peroxide**: 46.34±0.06 % (60.97±0.09 µg/ml)

*MISKPE* exhibited the following *In Vitro* antioxidant effect with specific IC$_{50}$.

- **DPPH anion scavenging power**: 50.10±0.03 % (90.55±0.03 µg/ml)
Ferric reducing power 93.3±0.03 % (15.1±0.03 µg/ml)
Nitric oxide scavenging 80.27±0.12% (66.47±0.15µg/ml)
Superoxide radical scavenging 52.81±0.01 % (60.01±0.03 µg/ml)
ABTS radical scavenging 74.7±0.27% (66.4±0.28µg/ml)
Scavenging hydrogen peroxide 72.57±0.06% (66.47±0.09µg/ml)

The results of the present study showed that the aqueous and phenolic extract of Mangifera indica seed kernel possesses good antioxidant activity. Among the two extracts, the phenolic extract of Mangifera indica seed kernel exhibit significant antioxidant activity than aqueous extract. The potential antioxidant activity of Mangifera indica seed kernel due to the presence of flavonoids, tannin and poly phenols. Thus, it would considered as a good source of antioxidant molecule.

Three different methods are adopted to screen antidiarrhoeal activity. MISKPE produced 43.65% inhibition of defecation in diarrhoeal rats where as standard drug (Gp III) inhibited defecation only up to 26.33 %. Similarly MISKPE produced 50.95% of reduction of gastrointestinal transit at 200mg/kg bw and 73% protection with reference to gastric enteropooling.

. MISKPE showed effective protection in ulcer in ethanol induced gastric ulcer in rats. Gastro protection is possibly mediated to a major extent by a gastric mucosal secretion mechanism as the M.indica seed kernel were capable to restore the gastric pH and acidity almost towards normal levels as saw in control. The percentage of ulcer healing was 70 % which was similar when compared to the standard drug ranitidine. The gastro protective effect observed in the present study might be due to phytochemical such as polyphenols and flavonoids etc.

Anticancer activity also noticed when MISKPE was studied with EAC induced cancer in mice. Significant anticancer activity was noted with M.indica phenolic extracts. MISKPE increases the life span of cancer bearing animals. It also lours the body
weight and ascites fluid accumulation. MISKPE treatment restored the levels of antioxidant mechanisms, haematological features. Phytochemicals like elagitannins may responsible for the anticancer activity.

*M. indica* seed kernel are considered to be a potential source of bioactive compounds. The results of the qualitative analysis showed that tannin, sapanoin, flavonoids, terpenoids, alkaloids, carbohydrate, polyphenols and glycoside present in MiskAE and MiskPE.

UV-FTIR, NMR and GC–MS analysis of the Phenolic extract of the *M. indica* seed kernel showed the phenolic profile compounds including Benzene-1, 3, 5-triol, Mangiferin (1, 6, 7-trihydroxy-2-(3, 4, 5-trihydroxy-6-hydroxymethyl-tetrahydro-pyran-2-yl)-xanthone-9-one) and Cholest-4–6–dien–3–ol. These phenolic compounds have the ability to restore biological system in experimental animals.

This study confirms the antibacterial, antioxidant, anti-diarrhoeal, anti-ulcer and anticancer activities of MISK extracts. Presence of polyphenol also evidenced through this study.