ABSTRACT

The work in this thesis consists of isolation, characterization and pharmaceutical evaluation of polysaccharides isolated from seeds of *Salvia plebia (SP)*, *Mimosa pudica (MP)*, *Lallemantia royleana (LR)*, *Plantago ovata* seeds (POseeds), *Ocimum basilicum (OB)*, gums *Acacia modesta (AM)*, *Acacia nilotica (AN)*, *Astragalus tragacantha (AT)* and *Plantago ovata* husk (*PO* husk) The polysaccharides were characterized by elemental analysis, FT-IR spectroscopy, thermal analysis, scanning electron microscopy (SEM), atomic force microscopy (AFM), monosaccharide analysis, protein analysis, nuclear magnetic resonance(NMR), ultracentrifugation, light scattering and gel permeation chromatography (GPC). The polymers were also subjected to rheology studies, determination of mechanical strength, swelling index and water retention.

Monosaccharide analysis, protein analysis, elemental analysis and FT-IR proved that these materials were polysaccharides and protein content in them was approximately negligible (< 0.5%). Based on these studies the polymers were characterized as: rhamnoxylan (*SP*), galactoarabinan (*AN*), glucoxylan (*MP*), arabinoxylan (*PO*), rhamnogalactoarabinan (*AM*), xylogalactorhamnoarabinoglucan (*LR*), and galactorhamnoarabinoxyloglucan (*OB*) with moisture content of 0.40 – 14.81%.

The NMR analysis revealed that these polymers consist of β-(1,3)Ara*f* and α-(1,5)Gal*p* linkages. Microscopic studies depicted that the polymers had voids, rough surface and drugs molecules can be encapsulated. The polymers exhibited tensile strengths in the range 0.47 - 19.68 Nmm^{-2}, which reflect diversity in their structures.

Thermogravimetry (TGA) revealed that polymers are stable upto 300^0C. Before this temperature only loss of absorbed water occurs. Isoconversional analysis of the decomposition step revealed that the process was multistep (*MP*, *PO*, *AN* and *AM*) or single step (*LR*, *OB* and *AT*) with activation energies in the range 132-187 kJ mol^{-1} as determined by Flynn–Wall–Ozawa method. The mean comprehensive index of thermal stability (ITS) fell in the range 0.33–0.43.

These polysaccharides were evaluated for their potential as drug delivery agents, suspending agents, thickeners, film-coating agents, and binders in pharmaceutical formulations. Drug loading and distribution in the polymers was studied by time-of-flight secondary ion-mass spectrometry (ToF-SIMS), which depicted that the uptake and distribution depends upon the nature of drug molecules. Among these polymers OB stood out as a good encapsulating polymer overall.

Drug release was studied from the drug loaded films and matrix tablets prepared from caffeine and diclofenac sodium as model drugs. It was found that the films produced better sustained release than that by tablets. This suggests that the polymers can advantageously used for formulation of ophthalmic solutions. As compared to others *MP* appeared to provide the highest sustained release of two different drugs for both film and tablet. Release mechanisms of all these polymers could be classified as Fickian, non-Fickian or super case-II transport depending on the release of incorporated drug through diffusion, swelling, erosion or a combination. Majority of the materials under study showed non-Fickian release involving a diffusion and swelling mechanism.