Study of phytochemical and pharmacological analyses of four angiosperm plant species, namely *Acorus calamus* (sweet flag), *Aloe vera* (aloe), *Eupatorium ayapan* (ayapan), and *Withania somnifera* (Indian ginseng), was undertaken in this Ph.D. dissertation.

For isolation and purification of secondary metabolites-water, chloroform, petroleum ether, and methanol solvents were used. Following constituents were studied: β asarone from *A. calamus*, aloin from aloe plant, thymoquinone, herniarin, and 1, 3-dioxlo-benzopyran-6-one from *E ayapan* (ayapan), and withaferin A from *W. somnifera*. Quantification was done by HPLC. Structure determination was done by IR, NMR, and Mass spectroscopic methods. A comparative account of their activities on microbes (bacteria and fungi), Swiss albino mice, and on cultured human/mammalian cell lines were noted.

It is hypothesized that metabolic pathway for aloin biosynthesis remained unchanged during aloe tissue culture. A chromosome analysis supports this. During tissue culture maneuvering, development of foliar embryos on aloe leaves was observed. Scanning electron microscopy confirmed this. This was not reported earlier for aloe plant. This would be a viable approach for mass propagation of aloe without a loss of its phytochemical properties.

For *A calamus*, chloroform extract at low concentration showed no action on microbes but at higher concentrations it had positive effects. From literature it is apparent that long term use of β asarone is carcinogenic. On the other hand methanol and petroleum ether extracts of ayapan showed positive actions. The semipure fraction of *W. somnifera* was effective against Gram positive bacteria and fungi. Best activity of aloe gel was noticed on cancer cells. Similarly semipure ayapan leaf extract by petroleum ether also showed anticancer activity. Its constituent (thymoquinone) tested positive for cytotoxicity against acute myeloblastic leukemia (HL 60 cells), chronic myelogenic leukemia (K562 cells) and cervical epithelial carcinoma (He La cells). At high doses they affected the hematological and renal parameters too. Some of the extracts such as methanol extract of ayapan and water extract of aloe gels (from wild variety and tissue cultured raised variety) have hepatoprotective activity. This was revealed by SGOT, SGPT and SALP tests.