SUMMARY

Proximate Composition, Mineral Contents and Vitamins from Tubers of *Amorphophallus campanulatus (Roxb.)Blume ex Decne* and *Alocasia indica (Roxb.)Schott.*

- Tubers of *AC* and *AI* are rich source of carbohydrates, moderate source of crude protein and dietary fibre and low in fat content.
- The tubers of *AC* and *AI* are rich in antioxidant vitamins and their precursors like α-tocopherol, ascorbic acid, lycopene and β-carotene.
- Tubers of *AC* and *AI* possess all the essential macro and micro elements. The tubers are rich source of potassium and calcium while low in sodium. Besides, the tubers possess significant amounts of trace elements like zinc, copper, magnesium, manganese, cobalt, chromium, iron and boron.
- The tubers show no traces of heavy metals like mercury, cadmium, arsenic and lead.

In Vitro Antioxidant Potency and Gas Chromatography-Mass Spectrometric Analysis of Hydro-ethanolic Extracts of Tubers of *Amorphophallus campanulatus (Roxb.)Blume ex Decne and Alocasia indica (Roxb.)Schott.*

- Hydro-ethanolic extracts of *AC* and *AI* in a dose dependent manner are able to scavenge the commonly produced free radicals like hydroxyl (OH^-), superoxide ($O_2^{\cdot-}$), lipid peroxides (LPO) and DPPH radical as well as chelate and reduce transition metals like Fe, that participate in free radical generation reactions.
- In all these assays the hydro-ethanolic extract of *AC* at all concentration show better antioxidant potency than the extract of *AI*. Potent activity of *AC* is reflected in the lower IC_{50} values compared to the *AI* tubers.
- Gas Chromatography-Mass Spectrometry of the extracts elucidates numerous peaks in the hydro-ethanolic fractions of both the extracts. Identification of some of the major peaks from both extracts reveal the presence of bioactive components like polyphenols, flavanoid fractions, phytosterols, saturated and unsaturated fatty acids, and antioxidant vitamins.
- The peak areas of such components in both extracts reveal that yield of these components are more in *AC* tubers than *AI* tubers.

Hepatoprotective Activity of Hydro-ethanolic Extracts of Tubers of *Amorphophallus campanulatus (Roxb.) Blume ex Decne and Alocasia indica (Roxb.)Schott.* Against Ethanol Induced Oxidative Stress

- Hepatic organ damage is manifested by elevated liver marker enzymes AST, ALT and ALP, elevated total cholesterol and triglyceride, high LDL, VLDL and atherogenic index, low serum protein content and HDL cholesterol.
- Oxidative stress is measured by quantifying endogenous antioxidant stores as well as assaying the activities of different endogenous defense enzymes.
- Ethanol treatment also exhausts the enzymes like catalase, superoxide dismutase, glutathione reductase and glucose-6-phosphate dehydrogenase while augments glutathione peroxidase and glutathione-S-transferase.
- Ethanol showed dialated and congested central vein, necrotic hepatocyte and leucocyte infiltration.
- Ethanol also lowered glycogen content and DNA amount but increased collagen deposition, pro-inflammatory cytokines (TNF-α and IL-6) and fragmented DNA.
- Supplementation with hydro-ethanolic extracts of *AC* and *AI* at 250 and 500mg/kg body wt reversed the altered blood, histomorphological and histochemical observations. For *AC* there was no dose dependent variation but for *AI* a dose dependent variation was observed.

Nephroprotective Activity of Hydro-ethanolic Extracts of Tubers of *Amorphophalluscampanulatus (Roxb.) Blume ex Decne and Alocasiaindica (Roxb.)Schott.* Against Ethanol Induced Oxidative Stress

- Ethanol induced renal damage is evidenced from the elevated levels of toxic nitrogenous wastes, serum urea, creatinine and blood urea nitrogen.
- The antioxidant tissue markers also showed similar changes like that in hepatic tissue, except that of glutathione reductase and glucose-6-phosphate dehydrogenase which showed augmented activity in renal tissue.
- Ethanol altered glomerular basement membrane integrity, dialated renal tubules, showed presence of vacuolated cytoplasm.
- Like hepatic tissue there was also reduction in glycogen and DNA content with simultaneous elevation of collagen deposition and fragmented DNA.
- Supplementation with hydro-ethanolic extracts of *AC* and *AI* at 250 and 500mg/kg body weight reversed the altered blood, histomorphological and histochemicalobservations. For both *AC* and *AI* there exists a dose dependent variation, the higher dose being more prominent.

Possible pathway of mechanism of action of these extracts in preventing alcohol induced oxidative damage

- In this current study, the two tubers that are very ancient and naturally growing in the Eastern belt of India, *A. campanulatus* and *A. indica* have been selected as herbal sources to prepare crude extracts. It is observed that the extracts of these tubers potentially inhibit the molecular pathways involved in alcoholic pathogenesis. This study reveals that apoptotic pathway, inflammatory response and fibrogenesis both in hepatic and renal tissue is prevented from being elicited in the extract supplemented groups.

- As discussed in early sections of this study ethanol induced changes are believed to be outcome of robust free radical generation and development of oxidative stress environment *in vivo*. Evidences like accumulation of oxidative damage product of biomolecules like lipid peroxides and DNA strand breaks, loss of membrane integrity, altered levels of endogenous antioxidant enzymes and depleted endogenous antioxidants like GSH are in support of the fact that an oxidative stress environment develops in hepatic and renal tissues of ethanol treated rats.

- When such changes are reversed upon extract administration it can be hypothesized that the extracts exhibit certain antioxidant properties that help them to prevent such biological changes in response to ethanol.

- Taken together it is summarized that the extracts show anti-apoptotic and anti-inflammatory action in ethanol treated rats. In support of the hypothesis that the extracts offer hepatoprotection and renoprotection mainly by acting as free radical scavengers.

- To conclude it can be said that the dynamics of ethanol-induced liver injury are complex. Numerous pathways and cross-talk between them are involved in alcohol mediated pathogenesis. This study is designed on the outline of plausible known pathways of ethanol induced organ damage. Earlier to explain the background of undertaking this work, it is stated that the motive was to find a probable protective means to combat a global disease burden of alcoholism. This study is a pillar in the field of pharmacognosy, where herbal products are employed to achieve health benefit. Coming to the end, it can be said that the question attended in the beginning whether or not an ancient form of medicine i.e. alternative and/ complementary medicine can be used for treatment of a global problem like alcoholism is answered. Plants and their naturally occurring substances can offer protective and preventive measures for the problem of alcoholism.

- But it is worth mentioning that it is beyond the scope of this study whether these same herbal preparations can be used as treatment strategies and therapeutic medicines for curative purpose in response to damages that have already developed as

a result of chronic ethanol abuse. We are all familiar of the proverb "Prevention is better than cure" and our study brings into focus that these two popularly consumed tubers can be used as preventive measures against ethanol threat. Future perspective of this study involves drug formulation with active ingredients in the extracts and their ability to cure the inflammatory and fibrotic damages that progress following chronic ethanol consumption by acting as blockers of these molecular pathways either at translational or transcriptional level *in vivo*.