Nowadays the allopathic medicines play an important role in our day to day life. However in a number of diseases like hepatic disorders, viral infections, AIDS and rheumatic disorders they do not have satisfactory cure. While in other cases like hypertension, diabetes, asthma etc. these drugs give only symptomatic relief from the disease. In these cases traditional herbal medicaments can be used for the treatment of diseases. Although there are hundreds of plant products used in various polyherbal formulations, only a few could retain a place in modern medicine due to lack of accurate methods for standardisation and evaluation of their therapeutic efficacy. Therefore in the present study some herbal drugs have been selected on the basis of their utility in traditional system of medicine and literature. These are

1. *Trianthema portulacastrum* Linn.
2. *Cyperus rotundus* Linn.

This study was focussed to evaluate the above drugs for their efficacy against artificially induced liver damage. The selected plant drugs were identified in the Department of Pharmacognosy, A. R. College of Pharmacy, Vallabhbh Vidyanagar and a herbarium specimen was preserved in our college. Their identity was further confirmed by pharmacognostic studies including proximate analysis.

The plant drugs were also subjected to preliminary phytochemical screening which indicated comparatively high amount of semipolar extractive values with positive test for alkaloids, carbohydrates, phenolic compounds and flavonoids etc. The phytoprofile devised can provide a base for preparation of selective extracts of these drugs for biological studies.
These extracts as well as powdered drugs were then subjected for preliminary biological studies. Initially acute toxicity studies were performed on all the extracts and powdered drugs. In this study all the extracts and powdered drugs were found to be non-toxic. These studies provided dosage regimen for individual test samples such as 500mg/kg p.o. in case of powdered drugs, 100 mg/kg p.o. in case of extracts. In marketed formulations liquid formulations were given at the dose of 1 ml/kg p.o. and solid formulations were given at the dose of 100 mg/kg p.o. All these drug samples were administered in above dosage regimen while screening for the claimed hepatoprotective effect.

Since the selected drugs in the present study are used for liver disorders in alternative system of medicine, an approach for screening their hepatoprotective activity was designated using reported techniques for the purpose. Before directly studying the activity on intoxicated liver, an assessment of the possible hepatotoxicity if any, due to these drugs themselves was also planned. All the powdered drugs and their extracts were therefore subjected to study their effects on normal liver functions by assessing changes caused on serum and urinary biochemical parameters at the selected dosage regimens. These studies showed that all the samples tested were particularly safe as no significant changes indicating toxicity were noticed.

All the above drug samples were then subjected to assessment for hepatoprotective activity against most common chemical induced intoxication with CCl₄ as model toxicant. The powdered drugs and various extracts were administered in the selected dosage to normal rats in different groups followed by administration of CCl₄. The hepatoprotective activity was assessed in form of changes in the levels of serum biochemical
parameters and comparing them with that of toxicant and normal group. The alcoholic extract of *T. portulacastrum* and *C. rotundus* possess significant hepatoprotective activity while *C. paniculata* is devoid of any hepatoprotective activity.

These drug samples were also subjected to evaluation for their hepatoprotective activity against commonly used hepatotoxic drugs like paracetamol and rifampicin. These studies showed that out of all the test samples the alcoholic extract of *T. portulacastrum* and total alcoholic extract and alcoholic extract of *C. rotundus* possess maximum significant hepatoprotective activity. The variation in the activity exhibited by different test samples against the three toxicants may be due to the presence of active chemical moities present, causing the interference in the mechanism of induction of toxicity by individual toxicants.

The confirmation of activities of these identified drug samples were obtained from the histopathological studies of the sections of livers of treated groups and comparing them with the normal liver section.

From the above studies, the active extracts possessing biological activities were chosen. All these extracts were then subjected for isolation of probable active component using various recommended methods. The column chromatography technique was applied for the separation of chemical constituents. The separated constituents were tested for the purity by thin layer chromatographic studies. The fraction showing single spot were mixed and evaporated and purified by absolute ethanol. The alcoholic extract of *T. portulacastrum* yielded two components TP1 and TP2. Similarly the alcoholic extract of *C. rotundus* also yielded two components CR1 and CR2.
The physicochemical data as obtained from the compounds were recorded and used for their identification. The data available in literature were also taken into consideration before assigning probable chemical structure to the compounds.

The compound TP1 obtained from the alcoholic extract of the aerial parts of *T. portulacastrum* was assigned the probable chemical structure as 2-Hydroxymethyl-3-carboxyl-4-oxo piperidine (C$_7$H$_{11}$NO$_4$).

![TP1](image1)

The compound TP2 obtained from the alcoholic extract of the aerial parts of *T. portulacastrum* was assigned the probable chemical structure as 3,11,16-Trihydroxy-22-oxo-26-cholestanoic acid (C$_{27}$H$_{43}$O$_6$).

![TP2](image2)

The compounds CR1 and CR2 obtained from the alcoholic extract of tuberous roots of *C. rotundus* were assigned the probable chemical structure as 3,7,11-Trihydroxy-1,3,5(10) triene-16hydroxymethyl-17-carboxyl gonane (C$_{18}$H$_{24}$O$_6$) and 2-(2-Propenoic acid) xanthone (C$_{16}$H$_9$O$_4$) respectively. The flavonoid CR2 was found to be present for the first time in *C. rotundus* and it can be considered as a novel source of hepatoprotective drug.
All the isolated compounds were then subjected to in vivo hepatoprotective activity test against CCl₄, paracetamol and rifampicin induced intoxication. Their non-toxic effect was first observed on normal serum parameters. Out of these isolated compounds CR2 showed maximum hepatoprotective action in the dose of 10 mg/kg. While other compounds TP1, TP2 and CR1 were also found to possess significant activity but the activity was less as compared to CR2. The above results were also confirmed by carrying out histopathological studies. So CR2 can be considered biodynamic phytoconstituent of C. rotundus.

Some of the marketed preparations of these plant drugs (Although T. portulacastrum is not incorporated as such in any marketed hepatoprotective formulation but as it is considered the adulterant of B. diffusa, the preparations containing B. diffusa were taken for the present studies) were also studied for their hepatoprotective activity. All the marketed preparations were found safe while administered at the selected dosage regimen. All the selected formulations were studied for their effects against all the three toxicants i.e. CCl₄, paracetamol and rifampicin. Liv plus forte
showed the maximum activity against CCl₄ induced hepatotoxicity in rats. Livokyn showed the maximum activity against paracetamol and rifampicin induced hepatotoxicity in rats.

Since these formulations are multicomponent systems, the activity exhibited, may however, not be due to the selective drugs of present study but an overall indication of their therapeutic efficacy could be achieved. Thus the present investigation can provide a wide spectrum of information with regard to evaluation of the selected drugs which are already in practice under various alternative systems of medicine either alone or as component of polyherbal formulations.

The utility profiles as obtained from present study will also form an addition to the existing literature on phytopharmaceuticals and initiate the exploration of untapped value of various such medicaments which offer protection against hepatic disorders caused due to either hazardous environmental conditions or continuous exposure to xenobiotics. These studies, however, also provide further scope of detailed investigations on the mechanism of action of individual components obtained from these drugs.