

GENERAL CONCLUSION

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From the present thermophysical study, it has been concluded that the medicinal plant leaves-A Nephafu (*Clerodendron colebrookinum*), B-Mahaneem (*Azadirachta indica*), C-Tulsi (*Ocimum sanctum*), D- (*Vinca rosea*) and also fruits E- Bandordima (*Chisocheton peniculatus*) & F- Saru-moin (*Cudrania javanensis*) possess similar structure with semicrystalline behaviour. The crystalline part of them is embedded with amorphous region. Both of them have significant roles on thermo-physical characteristics of the leave and fruit samples. Among them the leave sample B and C possess highest crystallinity and less in sample A. Again the crystallinity is more in fruit samples than in leave samples.

The investigation with different physical method, it has been confirmed that all the medicinal plant leaves and fruits are in hydrophilic in nature.

Again the diffractogram of fruit samples E and F showed that the crystallinity is more in the sample E than the sample F.

From the XRF analysis it has been found that the major elements present in each case of the leave samples A,B,C & D are Fe, Ca, and K and also in case of medicinal plant fruits E it has been found that the major elements present are Zn, Ca, Fe and K. But for the sample F it has been found that in addition to those five major elements Rb also present. The intensity counts of XRF analysis of thermally treated samples are increased.

Both medicinal plant leaves and fruits under study show two step variation in two distinct temperature ranges. The first step at lower temperature range represents their dehydration character and second step at reasonably higher-temperature range shows their decomposition reaction. During decomposition stage the structural set up of the medicinal plant leaves and fruits is broken and molecules are transformed in to gases, carbon monoxide and carbon dioxide etc

Different kinds of thermodynamical parameters are found to vary significantly during dehydration and decomposition reactions attributed in thermal conditions. Different media have also important roles for variation of thermodynamical properties of the leave and fruit samples.

In Chromatographic separation method we have consider two plant fruits one is *Chisocheton paniculatus* Hiren of Meliaceae family and other is *Cudrania javanensis* of Moraceae family

It has obtained three compounds of the two plant fruits one compound was “6 α acetoxy azadirone” (MK-001) from *Chisocheton paniculatus* was isolated from the Petroleum ether fraction and purified by TLC. On repeated crystallization (Toluene: MeOH:: 8:2) a pure crystalline white solid was obtained. “6 α acetoxy azadirone” (MK-001) one of the most important limonoid it has potent antifungal and antifeedant properties. The biological activity of the molecule is found to be due to two main functionalities, one is a furan ring in position 17 and the other is α , β -unsaturated carbonyl group in position 1, 2 and 3. Due to the absence of these two functionalities the molecule is found to loss its activity to a greater extent.

Other two compounds are isoflavones from plant *Cudrania javanensis* which shows tremendous potential to fight disease on several fronts, these are 1. {5-hydroxy-3-(3-hydroxyphenyl)-8, 8-dimethyl-6-(3-methylbut-2-enyl)-4H.8H-pyrano[2,3-h]chromen-4-one,} (MN-01) and 2. {5,7,4'-trihydroxy -6, 3'-diprenylisoflavone} (MN-02).

Both the compound MN-01 and MN-02 are prenylated flavonoid has more antioxidative effect than non-prenylated flavonoid. The compound (MN-01) has cardio protective effects against ischemia-reperfusion induced injury. Again the compound

(MN-02) has neuroprotective activity. This is the first report of the isolation of these two isoflavonoids from this species.

In HPLC technique three isolated compound namely MK-001, MN-01 & MN-02. On studying HPLC analysis the fruits extract of plant *Cudrania javanensis* it is found that in water and methanol fraction both the isolated compound (MN-01) & (MN-02) are present.

Similarly On studying HPLC analysis the fruits extract of *Chisocheton peniculatus* it is seen that the isolated compound (MK-001) present in petroleum and methanol fraction.

From the study of Molecular and Crystal Structure of Compound “6 α acetoxy azadirone” (MK-001) has a Orthorhombic cell with lattice parameters $a = 10.699(3) \text{ \AA}$

$b = 15.510(4) \text{ \AA}$, $c = 16.626(4) \text{ \AA}$; $\alpha = 90^\circ$, $\beta = 90^\circ$, $\gamma = 90^\circ$ with space group $P2_12_12_1$.

The results of investigation reveal that the crystal structure comprises two molecules per asymmetric unit. The bond length and bond angles obtained from “6 α acetoxy azadirone” are fitted satisfactory. The values of $R(\text{int}) = 0.0585$ and $R(\text{sigma}) = 0.0640$ show that the quality of the data was satisfactory. The final $R = 0.079$ for 6681 reflection and goodness of fit = 0.998 From the study of Molecular and Crystal Structure of Compound (MN-02) has a monoclinic cell with lattice parameters $a = 25.2732(12) \text{ \AA}$, $b = 7.4414(3) \text{ \AA}$, $c = 22.3113(9) \text{ \AA}$, $\alpha = 90^\circ$, $\beta = 93.063(3)^\circ$, $\gamma = 90^\circ$ with space group C_2/c , Completeness to theta = 26.66° (88.1) % and Goodness of fit on F2 = 0.928.

The results of investigation reveal that the crystal structure comprises 8 molecules per asymmetric unit. The values of $R(\text{int}) = 0.0509$ and $R(\text{sigma}) = 0.1009$ show that the quality of the data was satisfactory.

So it is establish that the thermo-physical, chromatography & crystallography analysis of the medicinal plants give vital information for manufacturing many allopathic drugs (Phytopharmaceuticals) for treatments on many diseases.

SCOPE OF THE FUTURE WORKS

The thermo physical and crystallographic natures of medicinal plants also play a vital role in developing the desired product for our use in industries as well as medicinal fields also. Both medicinal plant leaves and fruits under study show dehydration and decomposition character. Again the investigation with different physical method, it has been confirmed that all the medicinal plant leaves and fruits are semicrystalline and hydrophilic in nature. In my future work it will be extended to study roots, rhizomes, barks etc of medicinal plant for thermo-physical study in which might gives us vital information about medicinal properties of the medicinal plant.

The medicinal plant based drugs have the added advantage of being simple, safe, affective and offering a broad spectrum of activity with an emphasis on the preventive action of drugs. The secondary metabolites, such as terpenoids, flavonoid, alkaloids, amino acids, etc, which are produced via biogenesis in plants are used in many diseases as medicines. These are produced in leaves, barks, fruits, roots and rhizomes of the plants. Such phyto-constituents can be separated using various methodologies; one of such suitable method is chromatography. The compounds show separated are further purified by crystallization using various solvents

To know about details of the pure isolated compounds, single crystal development and study is the one of the suitable methods.

The absolute structure of the phyto-constituents obtained from the X-ray study gives us many vital information like the substitutions, orientation, 3D-configuration etc. By manipulating the structure and orientation of the phyto-constituents having medicinal properties, many important remedies for human diseases may be obtained.

The nature of phyto-constituents present in different parts of the plant may be different,so people use different plant-parts for treating various diseases.We have undertaken the crystallographic study of fruits of some selected plants in my present work as evedent from the literature that fuits are used in curing many diseases.

The present investigations deal with the isolation,purification,structure elucidation and study of crystal structure of isolated phyto-constituents from fruits.So in my future work it will be extended to study medicinal plants leaves,roots,rhizomes,barks etc.for chromatographic isolation, purification and structure elucidation of various constituents, which might give us vital information and lead for many important drug/precursor of herbal/allopathic drugs(phytopharmaceuticals) for treatments on many human diseases.
