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Research Article

THERMOGRAVIMETRIC ANALYSIS OF FEW MEDICINAL PLANTS OF CHHATTISGARH STATE.

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Abstract

The present study deals with the study of thermogravimetric analysis of few medicinal plants like *Ocimum santum*, *Azadirachta indica*, *Pongamia pinnata*, *Celastrus paniculatus* and *Embelia ribes*. TGA were performed with TGA 4000, Pyris 6 TGA. Z shaped TGA curve was obtained for the medicinal samples taken. This descending TGA curve obtained showed three stage weight loss which helped to determine the chemical composition of the medicinal plant sample and its thermal stability. In the years to come this method can play a vital role in authentication of medicines.

Keywords: Ocimum , Azadirachta, Pongamia ,Celastrus, Embelia and TGA.

Introduction

Ocimum sanctum belongs to family Lamiaceae. It is a shrub which is 30-60 cm tall having hairy stems with green or purple leaves. Leaves have petioles and are ovate up to 5 cm long. Flowers are purple in colour in close whorls (Warrier, P.K, 1995). It has antistress, antipyretic and vermifugal properties. Oil extracted from the leaves are used as pest repellent, antibacterial and insecticide (Afzal Shah et al 2013).

Azadirachta indica belongs to family Meliaceae. It is a tree with alternate leaves, leaflets subopposite serrate, very unequal at base. The leaves are antihelintic, alexeteric, insecticidal, good in ophthalmia and skin diseases (Kirtikar K.R 2013). It protects the liver from damage and it shows hypoglycemic effect (Aorte, S .R and P.G .Yeole, 2010).

Pongamia pinnata belongs to family Fabaceae. It is a legume tree that grows to 50-8- ft in height with large spreaded canopy. Leaves are imparipinnate, short

stalked and are soft and shiny when young and then later on becomes deep green in colour (Orwa C et al ,2009). It is used as antiinflammatory, antipyretic and shows reduction in sensitivity to painful stimuli. It is used as natural insecticide (Scott et al 2008). All parts of the plant find use in the treatment of diseases like tumour, piles, skin diseases, itches, abscess, painful rheumatic joints, wound, ulcers, diarrhea etc (Bates et al 1993).

Celastrus paniculatus belong to family Celastraceae .It is a climbing shrub. Leaves are simple broad, oval, elliptic in shape with toothed margin (Premila M.S, 2006, H .F. Macmillan, 1989). Seeds are used to sharpen memory. These activities may be due to neuro protective action (Putz et al 1991). It is also used for massage with great benefit for diseases like Sciatica, lumbago , paralysis, arthritis and to hasten the healing of wound or ulcer.

Embelia ribes belongs to family Myrsinaceae. It is a woody climbing creeper shrub (Menachery M 1962). Leaves are simple, alternate, elliptic ovate, lanceolate, smooth leaves, broad and are perfectly glabrous. Seeds are horny with mildew like appearance (Syed Asadulla et al 2011). It is highly valuable medicinal plant with antihelmintic, carminative, antibacterial, antibiotic, hypoglycemic and antifertility properties (Mitra R, 1995). It is considered vulnerable due to the excessive harvesting because of its multiple uses (Meera B et al 2003).

Thermogravimetric analysis TGA is used for material characterization in pharmaceutical applications. Loss in weight over the specific temperature provides the information of composition of the sample and thermal stability.

Materials and Methods

The medicinal plant sample taken for study were *Ocimum sanctum*, *Azadirachta indica*, *Pongamia pinnata*, *Celastrus paniculatus* and *Embelia ribes* from the Bhilai region of Durg District of Chhattisgarh. The choice of the plant parts were the leaves of *Ocimum sanctum*, *Azadirachta indica* and *Pongamia pinnata* and seeds of *Celastrus paniculatus* and *Embelia ribes* which were taxonomically authenticated. Care was taken to select the healthy plants and the plant parts for the study were collected fresh and dried for a week and powdered. The sample has to be weighed before the analysis and then placed in TGA device and start to run the experiment.

TGA were performed with TGA 4000, Pyris 6 TGA. Weight of the powdered medicinal plant samples taken

were: 6.910 mg of *Ocimum sanctum* leaves, 13.236 mg of *Azadirachta indica* leaves, 7.104 mg of *Pongamia pinnata* leaves, 9.501 mg of *Celastrus paniculatus* seeds and 8.607 mg of *Embelia ribes* seeds. These were loaded separately on quartz pan and mounted in instrument. Initial conditions of temperature were 30 °C and switch the gas to N₂ at 20 ml/min. Temperature programming were heating rate from 30 °C to 400 °C at 10 °C/min in nitrogen and hold for 1 min at 30 °C.

Results

TGA curve (Figure No. 1 to 5) were shown as Temperature Vs Weight of the sample and is displayed as Z shaped curve from left to right. In the medicinal samples taken it is observed that initial degradation at 100 °C is due to the release of adsorbed moisture as hydrogen bond water to saccharide structure. As the temperature is increased then relatively less complex molecule is released followed by highly complex molecule. Further increase in temperature releases CO₂ gas from the sample. Maximum thermal degradation in the medicinal plant samples took place between 200 – 400°C. This is due to decomposition of organic moiety. Highest initial degradation temperature is observed in *Ocimum sanctum* leaves and *Embelia ribes* seeds so these two medicinal plant samples has less activation energy and they degrade fast to yield char residue at very high temperature. Minimum Initial temperature of sample decomposition was shown by *Ocimum sanctum* leaves and *Embelia ribes* seeds. This supports its role and activity in therapeutics and preparation of medicines.

Figure 1 TGA curve of the sample KJ (Temperature Vs Weight)

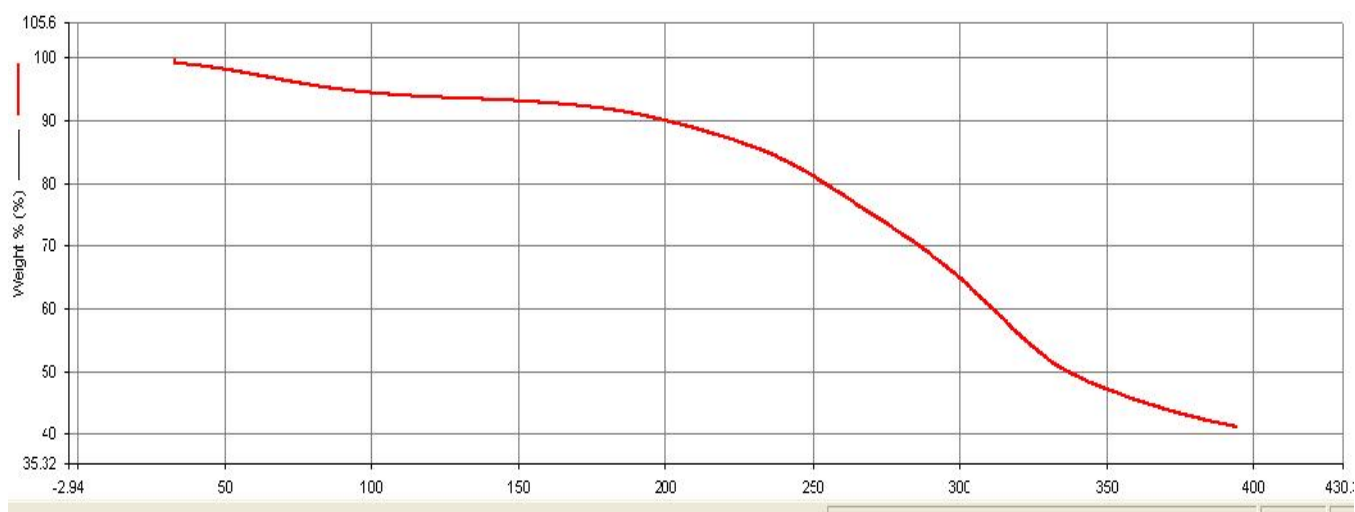


Figure 2 TGA curve of the sample ML (Temperature Vs Weight)

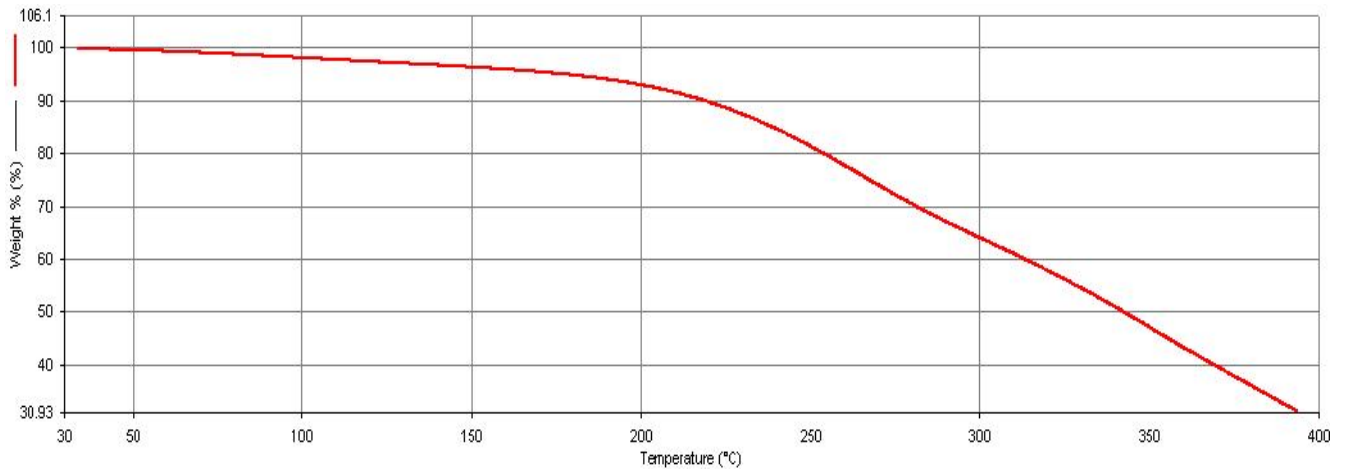


Figure 3 TGA curve of the sample NM (Temperature Vs Weight)

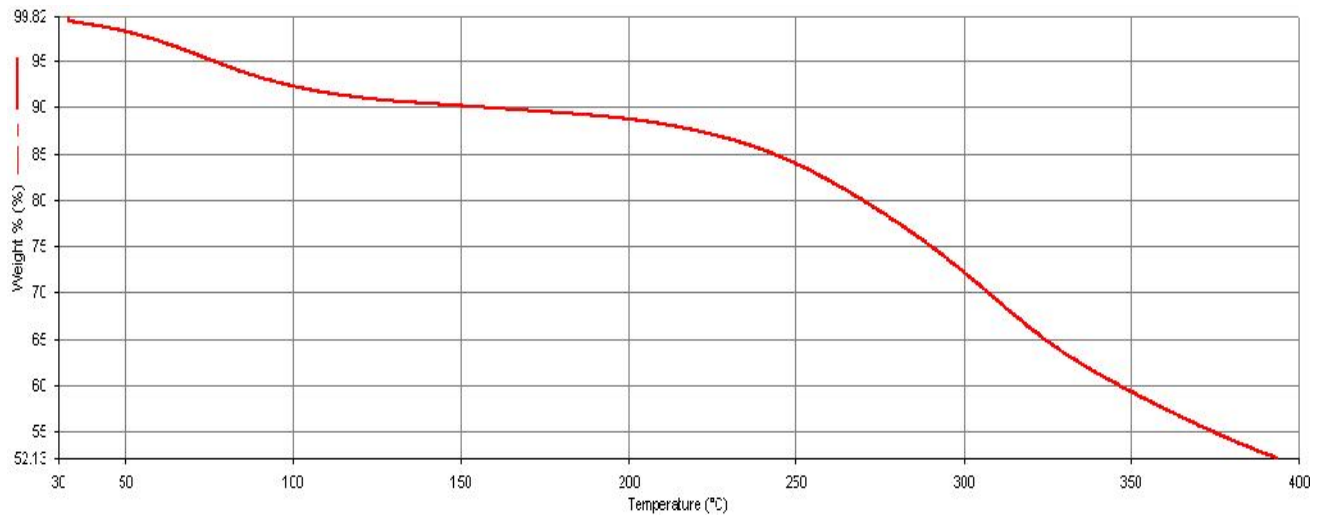


Figure 4 TGA curve of the sample TU(Temperature Vs Weight)

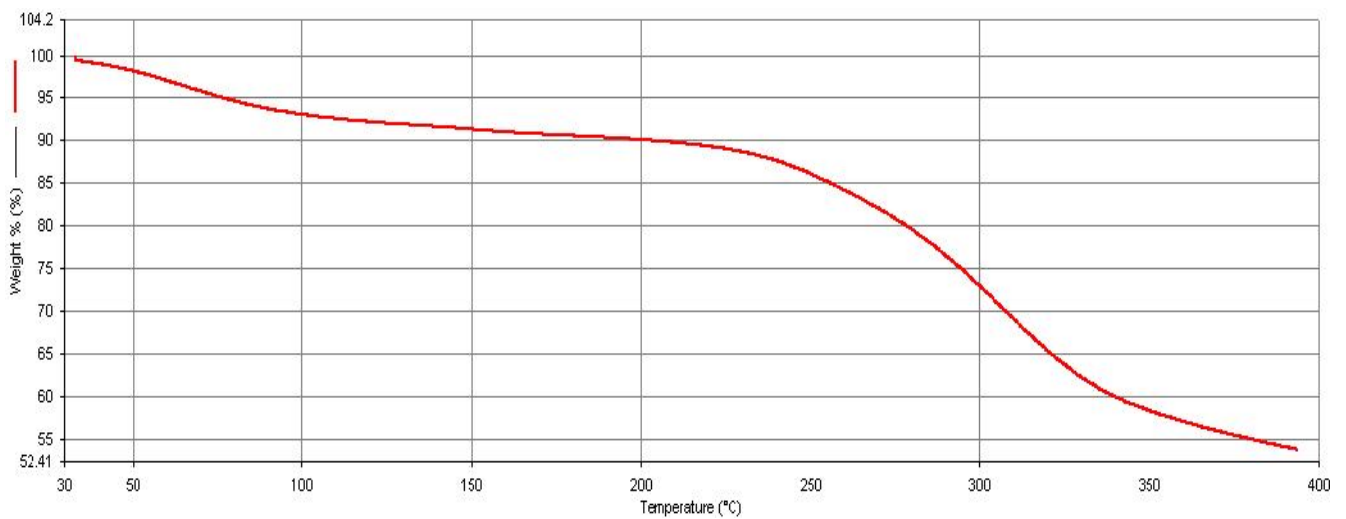
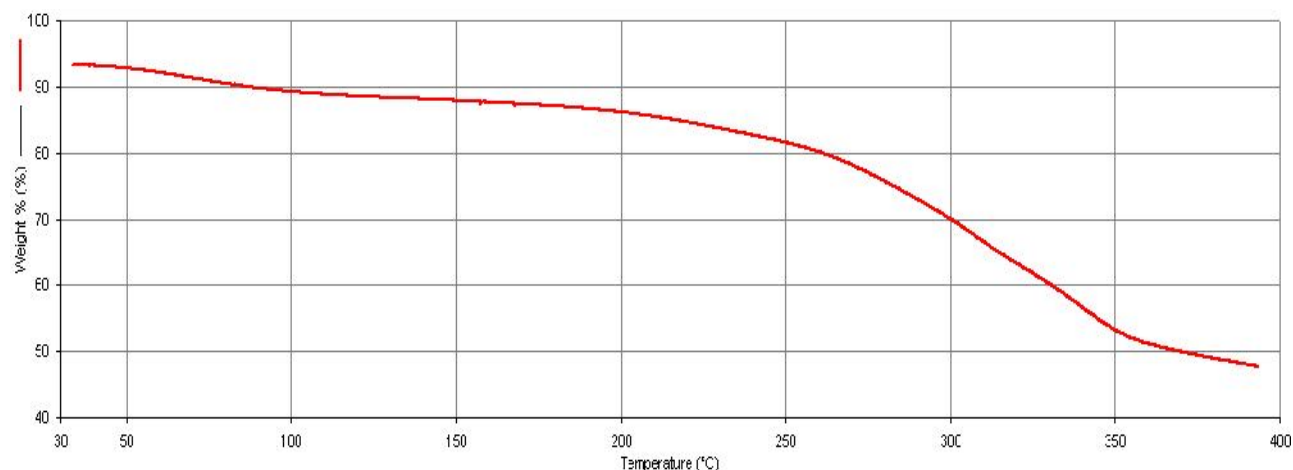


Figure 4 TGA curve of the sample VA(Temperature Vs Weight)



Discussion

The present study reveals the thermogravimetric analysis of medicinal plant samples like leaves of *Ocimum sanctum*, *Azadirachta indica* and *Pongamia pinnata* and the seeds of *Celastrus paniculata* and *Embelia ribes*. TGA is rapid, reliable, and reproducible and good at control over the temperature and heating rate. Loss in mass % of medicinal plants are observed with increase in temperature and maximum thermal degradation took place between 200 – 400 °C. TGA in general shows two types of weight loss. The water lost in the first phase in the sample is due to the loss of adsorbed and structural water of biopolymers, and then the second phase of water loss is due to the polysaccharide decomposition (Sunil B Bothara et al 2012). At temperature 200-350°C, carbon oxides are emitted and at 350-750 °C volatile organic compounds are emitted (Mejdi Jeguirim 2009). Temperature corresponding to 5% mass loss is considered to be the initial temperature of sample decomposition process (Ge X-G et al 2007). This is observed minimum in *Ocimum sanctum* leaves and *Embelia ribes* seeds so it is very effective in treatment of diseases.

Conclusion

The study support that the thermogravimetric analysis of medicinal plant samples have been used to assay the chemical composition, the structure of the sample and the thermal stability of the sample. This technique should be applied in future as a valid method for the authentication of the herbal medicines.

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