

when we study a chapter on latent heat. To remove such an ill-founded question, even though there is no supporting evidence, from mass circulation is not easy. It is because of the difficulties involved in getting a convincing quantitative answer when several factors are involved.

The problem we are discussing may sound innocent, specially because the *expected* answer sounds convincing, is simple to give and is uniformly accepted. A more serious problem is faced by undergraduate students while conducting experiments involving physical systems. Often there are many parameters that contaminate the experiment. The students do not have a good understanding of these extraneous factors, leave aside a good control over them in the experiment. These become a more serious handicap than the inaccuracies in the instruments. But the students are obliged to get an 'expected'

answer and often 'cook up' the results. Experiments in the chemistry curriculum, in my experience, are usually better controlled and one becomes confident after successfully getting the answers.

Coming back to the question on burns, it is not always simple to decide which of the two burns is more severe. And regarding the problem we are discussing, I checked with a couple of doctors what they have in the medical literature. They do not bother whether the burn is caused by steam or water. They go by a different classification of the burns. Probably they are forced to be more honest since there is a serious problem in hand.

It may be interesting to mention here about the damage due to cold where the heat is extracted from the body. Air at 1°C makes us uncomfortable but we can survive it. But a human being in water at 1°C cannot survive it for more than

30 minutes. This is because of higher density, thermal conductivity and specific heat of water as compared to those of air. The question of latent heat does not arise here.

Does steam cause a more severe burn than boiling water? It may; it may not also. The question is not proper. I do not give an answer, but I have an explanation.

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Remote sensing application for delineating coastal vegetation – A case study

Satellite remote sensing has progressed rapidly and has provided a wealth of information on land as well as near-shore regions due to its repetitive and synoptic coverage. Remote sensing data have been used extensively worldwide for mapping coastal vegetation¹⁻³. Similar work, however, along the Goa coast, is reported to a lesser extent^{4,5}.

This study envisages the use of digital image processing techniques for delineating geomorphic features and associated vegetation, including mangrove, along the central part of the Goa coast which includes the Mandovi-Zuari estuarine complex (Figure 1).

The typical geomorphological features, supported by favourable water currents and salinity, decide the lateral growth of coastal vegetation. Hence, identifying suitable geomorphic sites along the coast and the estuaries is a major task in depicting and delineating the vegetational features.

Multi-spectral scanner (band 4,5,6,7) data pertaining to scene (Path 49, Row 142) dated 31 March 1986 of Landsat 5 were used. Sub-image (Figure 2) with

900 lines and 900 pixels, covering Mandovi and Zuari estuarine complex, was separated and digital processing was carried out using DIPIX image processing system.

Because the influence of the coastal features on each band is highly correlated, compressing all bands into a single plane improves the identification of individual features. For this purpose,

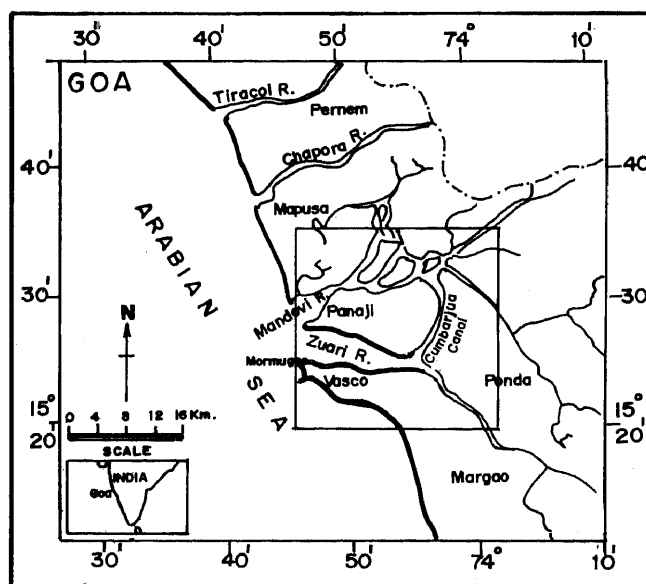


Figure 1. Location map of the study area.

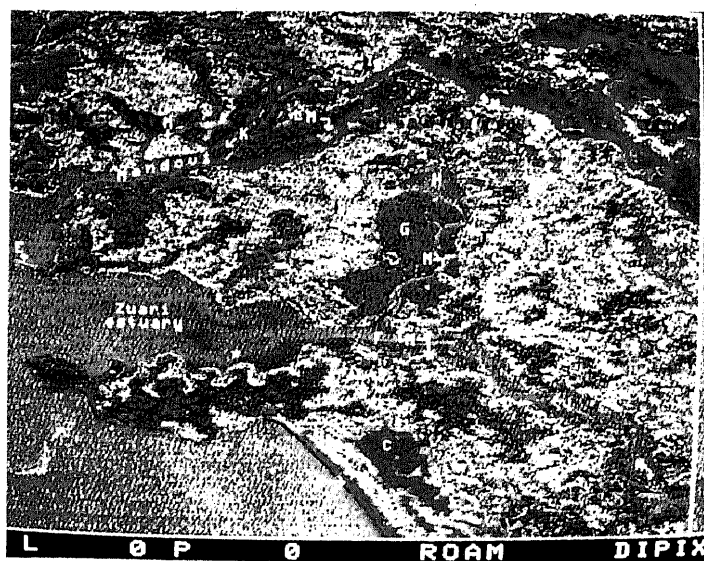


Figure 2. Colour composite image of first three principal components – PC1 (blue), PC2 (green), PC3 (red). The image shows some of typical sites of the following features. A, Green dense vegetation; B, Thin vegetation; C, Uncultivated field; D, Sandy beach; E, Rocky island; F, Sand bar; G, Mud flats; H, Water-logged body; I, Vegetated river terrace; J, River terrace devoid of vegetation; K, Point bar; L, Submerged land; M, Typical mangrove vegetation sites.

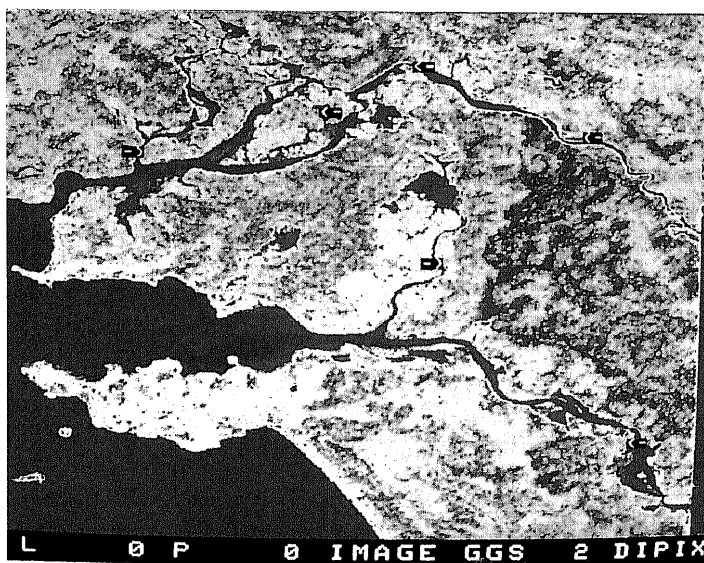


Figure 3. Intensity-modulated pseudo biomass index image showing typical mangrove sites (directed arrows).

Principal Component Transformation – digital processing of four spectral bands – was performed to produce four new Principal Component (PC) images⁶. Feature images of PC1, PC2, PC3 and PC4 were created on the monitor and photographed. False colour composite

was generated from the first three principal components on the monitor and were photographed for visual interpretation.

Intensity-modulated pseudo biomass index image was generated by subtracting radiance values of 5th band from the

radiance values of 7th band and dividing this by total radiance in both these bands. Three separate files were created by stretching and distributing gray values as described by Donker and Mulder⁷, and stored using the same look-up table. The primary colours red, green and blue were assigned to first, second and third files respectively and finally Intensity Modulated Pseudo Colour Biomass Image was created and photographed.

All image enhancement products which include false colour composite, colour composite of PCs, intensity-modulated pseudo colour biomass and first two principal components images PC1 and PC2 were visually interpreted on the basis of tone, colour, texture and their association with other features. Shore line, estuaries and inter-tidal zones were extracted from the colour composite image. River terraces, mud flats, sand bars, point bars, meander bars, beaches, etc. were mapped from the PC colour composite image (Figure 2). These units showed reddish colour if barren and violet if they were wet. Vegetation on PC composite image is noticed by yellow green (sparses) through green (dense) colour. Red colour in biomass index image marks the appearance of vegetation. The density variation was noticed on the basis of texture and colour shades, red (dense vegetation) to red spots on yellowish background (thin vegetation) (Figure 3).

Mangrove vegetation is extensive in the estuaries of the Mandovi and Zuari rivers, particularly in the silted-up fringes of the Cumbarjua Canal (Figure 3). Above the tidal limits, wherever the elevation allows beach formation, typical beach flora occur with shrubs and maritime grasses along with coconut plantations (site 'B' in Figure 2). This beach flora appears as a thin red line alongside the beaches, which appear as yellow strips on biomass image (Figure 3).

When the findings from the satellite data were compared with aerial photos (1960, 1:15,000 approx. and 1973, 1:25,000 approx.) and recent Indian Remote Sensing Satellite (IRS) images (path 96, row 62, L3 dated 5 April 1996) visually, it was noticed that small islands along the rivers are growing peripherally due to heavy siltation. Alluvial deposition along the banks of rivers have converted parts of bays into

swamps. It is possible that the sediments are mainly derived from the inland mining rejects, and from heavy erosion due to deforestation in catchment areas of the rivers. These sediments are transported downstream as suspended matter. Under favourable hydrographic conditions, the sediments flocculate near the islands of low lying areas and give rise to submerged mud banks. As the sedimentation continues, these mud banks grow above the high tide level and are subsequently stabilized when floating vegetation hold the roots. Such mud banks thus form favourable ground for the luxurious growth of vegetation.

It is concluded from this study that i) repetitive coverage and spatial resolution of space borne data permits us to locate recently deposited alluvium and change in vegetation; ii) though con-

stant biotic pressure is severely degrading the coastal vegetation, there are a few locations, where recent alluvium has deposited, forming favourable grounds for growth of vegetation.

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A rapid method of estimating essential oil content in heartwood of *Santalum album* Linn

Sandal (*Santalum album*) tree is mainly exploited for its scented heartwood which gives fragrant sandalwood oil upon steam distillation. Oil yield varies from 2.5 to 6.2% depending on age of the tree, soil, climatic and genetic factors. Fixative property and tenacious aroma of sandal oil are due to its major odoriferous sesquiterpenic constituents - alpha and beta santalols, forming about 90% of oil. However, alpha and beta santalenes and santalyl acetate which form about 6% of the oil also contribute to some extent to the overall characteristic odour of oil¹⁻⁴.

Sandalwood oil is generally obtained by hydro or steam distillation of powdered heartwood. A minimum quantity, 50 g of heartwood powder, is required for estimation of oil content. Estimation of oil in a small quantity of heartwood powder is difficult by the conventional steam distillation method. Two laboratory methods based on colour of wood and electrophoretic technique were developed earlier. In the first method, the colour of heartwood powder, whether light brown, yellow, brown or dark

brown was determined by a tintometer and correlated with oil content⁵. Peroxidase isoenzyme activity in living bark tissue was determined by polyacrylamide gel electrophoresis and used as a marker in the second method⁶. Determination by tintometer method requires clear physical distinction of colours of

heartwood powders and sometimes distinguishing colours of heartwood material in core samples taken from standing trees was found difficult.

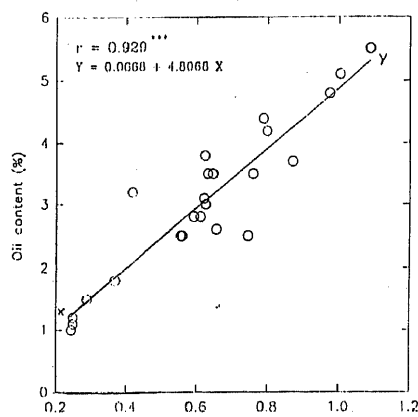


Figure 1. Relationship between oil content and optical density of hexane extract of sandalwood powder.

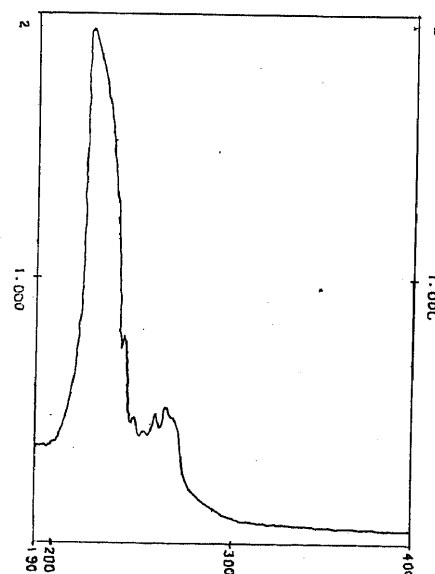


Figure 2. UV spectrum of sandalwood oil (25 mg/100 ml).