PROCEEDINGS OF NATIONAL SEMINAR
ON
ADVANCES IN LIFE SCIENCES
IN
BOTANY

First Edition: 2016

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Co-Published by Broadway Publishing House
1st Floor, Ashirwad Bldg.,Near Caculo Island, 18th June Road,Panjim-Goa.
Tel: 2420677, 6647037, 6647038, Fax: 6647038
Website: www.bbcbooks.net Email:bbcbooks@rediffmail.com

ISBN: 978-93-84298-49-4
Printed by Rama Harmalkar 9326102225
Price:₹ 495/-

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Application of google earth for rational bioprospecting of metal tolerant microorganisms in mining belt of Goa

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Abstract: The free availability Public Domain Software like Google Earth has made it poss to conduct rational field work and sampling in areas like Geology, Biology and Microbiol Extremophilic Metal Tolerant Microorganisms (MTMs) are in high demand in area bioremediation and biotechnology . Most of the approaches used in high frequency isola of MTMs employ random sampling strategies. However, now it is possible to combine C informatics, Eco-informatics and Bio-informatics datasets for rational field surveys bioprospecting of MTMs. Except sporadic published reports on MTMs (Harithsa et al2 , Nazareth and Marbaiang, 2008., Ballav et al2012., Gazem and Nazareth,2013., Naik Futardo,2014) from Goa exhaustive attempts to tap the immense potential for bioprospec the precambian ore deposits along the entire mining belt are missing. This paper presen simple , novel approach combining Geological, Minerological and Geochemical datab with 2D and 3D terrain images obtained from Google Earth Satellite imagery databa Rational surveys can be conducted for sampling specific areas within the mining belt pinpointing the microhabitats of MTMs adapted to a precambian metallogenic environm These MTMs may include Iron and Manganese oxidizing bacteria and other microbial spe which could tolerate high concentration of heavy metals and Rare Earth Elements (RE Trial application of this approach is in progress in our laboratory aimed at ratic bioprospecting of MTMs from mining belts of Goa.

According to Ehlrich (1997) – Microbes encounter metals and metalloids of various kinc the environment and it is therefore, not surprising that they should interact with them, so times to their benefit, at other times to their detriment. The base metal including Vanadi Chromium, Manganese, Iron ,Cobalt, Nickel, Molybdenum, Silver, Cadmium and Lead; precious metal Gold and Silver; and the metalloids Arsenic, Selenium and Antimony important. In nature these metals and metalloids exist mostly as cation ,oxyanions, or bot aqueous solutions, and mostly as salts or oxides in crystalline (minerals) form or as an phous precipitates in insoluble form. A few like Iron, Copper, and Gold, may also exist in metallic state in nature, but the first two of these are very rare. All microbes, whether prok otic or eukaryotic, employ metal species for structural functions and/or catalytic functi The alkali metals Ca and Mg serve structural as well as catalytic functions. The metals V, Mn, Fe, Co, Ni, Cu, Zn, Mo and W, and the metalloid Se may participate in catalytic fu tions. Considering the present knowledge of different types of metallogenic rocks on G

paper presents a simple, new approach to pinpoint specific metal rich areas in Goa for ematic bioprospecting of MTMs (**Table 1**).

y of rocks and minerals of Goa, Geological and Geochemical database. Using published ıture it is possible to identify the metals present in the respective local rocks. Google ı software makes it possible to locate the MTMs rich areas. Areas like Rivers, Forests, ements, etc are excluded from the work as they are not accessible for sampling. Prospec- areas are highlighted for bioprospecting MTMs. The approach presented in this paper been tested in the North Goa mining belt for systematic bioprospecting of MTMs since rent rock types in Goa under Western Dharwad Craton (WDC) have been analysed hemically. It is now possible to geoindex this information for bioprospecting work. The , energy, resources, saved using this approach and would be helpful in extensive rational ıicrobiological explorations of MTMs diversity of Goa, useful in biotechnological ap- tions.

l:- Showing different types of rocks found in goa

2:- bioprospecting of Fe, Mn oxidizing MTMs is possible from circled areas.

3:-bioprospecting of Ti, Fe, Mn, Mg oxidizing MTMs is possible from circled areas.

:- bioprospecting of Mn, Mo, Ni, Co, Cr, Zn oxidizing MTMs is possible from circled areas.

:- bioprospecting of Rb, Sr oxidizing MTMs is possible from circled areas.

:- bioprospecting of Zn, Mo, Cu oxidizing MTMs is possible from circled areas.

:- bioprospecting of Fe, Mg oxidizing MTMs is possible from circled areas.

:- bioprospecting of Zn, Zr, Mo, Cu oxidizing MTMs is possible from circled areas.

:- bioprospecting of Mn, Mo, Cu, Zn oxidizing MTMs is possible from circled areas.

0:-bioprospecting of Fe, Mn, Co, Ni, Zn, Cr, V, Cu, Ti, Pb oxidizing MTMs is possible from circled areas.

ıowledgments

work is part of UGC-SAP programed at Departmment of Botany.

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Table 1 Biologically Important Metals

Atomic No	Element	Atomic No	Element
12	MAGNESIUM	28	NICKEL
23	VANADIUM	29	COPPER
24	CHROMIUM	30	ZINC
25	MANGANESE	42	MOLYBDENUM
26	IRON	74	TUNGSTEN
27	COBALT		

 ISBN:978-93-84298-49-4

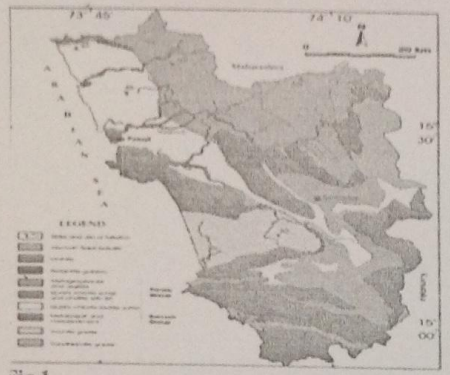


Fig 1

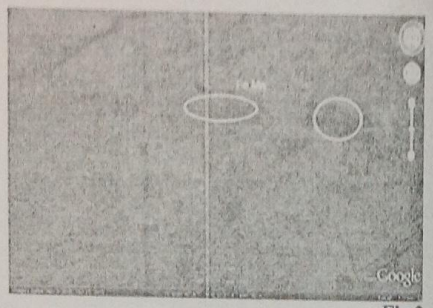
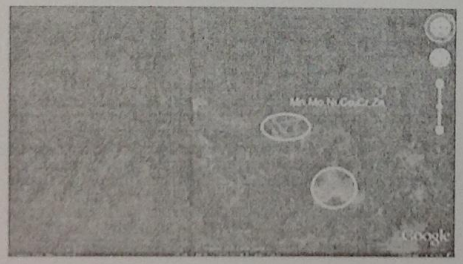


Fig 2

Fig 3



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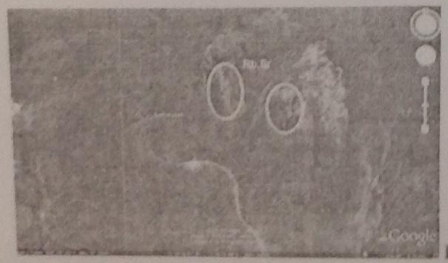

Fig 5

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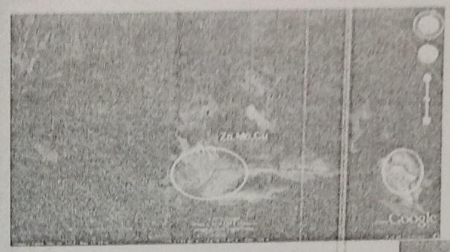
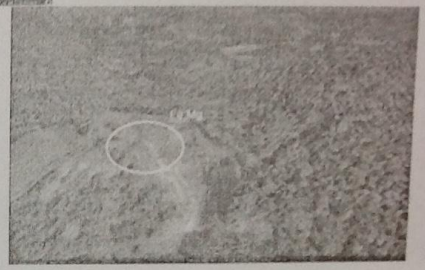


Fig 6



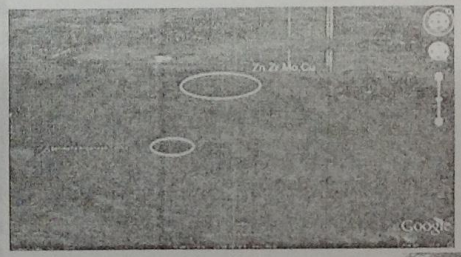
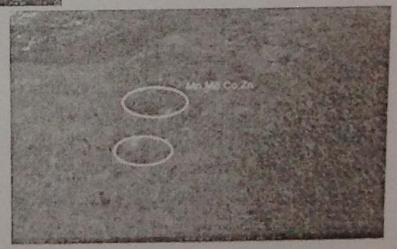


Fig 8



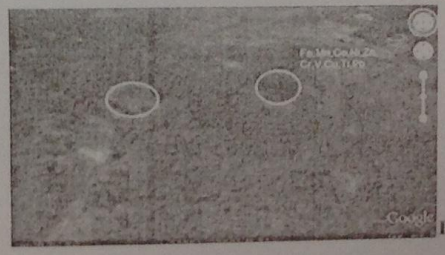


Fig 10