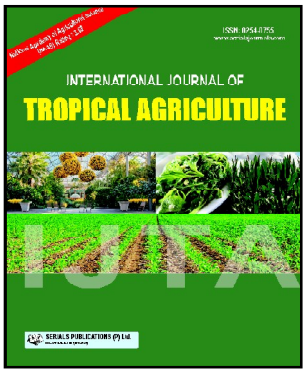

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Evaluation of Different Soils and their Physico-Chemical Properties for Geomedicinal Values

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Abstract: As per title of paper "Evaluation of different soils and their physico-chemical properties for geomedicinal values" was calculated during the year 2007-08 at Department of Soil Science and Agricultural Chemistry, College of Agriculture, Marathwada Agricultural University, Parbhani. In all twelve different soils from different locations were collected for evaluation of soil properties for medicinal values. The soil samples collected were: Soil from Sulphur Deposits - from village Unkeshwar, Dist. Nanded, Soil from Lonar Crater - from village Lonar, Dist. Buldhana, Soil of Gadhi - from village Daithana, Dist. Parbhani, Multani soil - from Local market of Parbhani, Dist. Parbhani, Soil form Ant's Living Home- from village Malsona, Dist Parbhani, Calcium Carbonate Rich soil - from M.A.U. Region, Dist. Parbhani, Red Soil- from village Daithana, Dist Parbhani, Soil from Janwal - Butte - from village Janwal-Wadwal Dist. Latur, High Clay Soil - from village Anglegaon, Dist. Parbhani, Forest Soil - from village Kinwat, Dist. Nanded, Soil Under Banyan Tree - from village Daithana, Dist. Parbhani, Normal Soil-from village Daithana, Dist. Parbhani.

These soils were processed for the estimation of pH, Ec, organic carbon, $CaCO_3$, N, P, K, Fe, Zn, Cu, Mn.Soils having higher pH *viz.*, soil from ant's living home used for washing of hairs due to presence of swell-shrink clay and sodium (high pH). Soils containing high organic matter are a resource for antibiotics. Multani soil contains lowest organic matter and high salt concentration, hence suitable for cosmetic industry. Due to presence of high calcium carbonate highly calcareous soil used for cloth washing. Depletion of nutrients especially N, P and K in cultivated soil may possess a problem of malnutrition. Calcium carbonate content rich soil contained low zinc and iron which is one of the reasons of prevalence of anemia in the region. Soil from sulphur deposits are used as a disinfectant due to its high content of sulphur.

Key words: Sulphur Deposits, Geomedicinal Values, Red soil, High clay soil etc.

INTRODUCTION

In the coming years, agricultural practice will be quite different in ecological, technical and socio-economic conditions than in decades before. There is not only increasing competition for the space, for the food production through an exponential growth of urban and un-urban areas, but also severe competition between gross-full production on one side and quality of soil at another side. Soil is a basic natural resource which supports life in all forms. Basically earth's crust composed of mineral matter which is made of various elements combined together to form compounds. Almost all elements present in the earth's crust like oxygen, silicon, iron, calcium are useful to human body. Each element in a combination with one or more other elements to form definite chemical compound. These compounds referred as minerals that combine to form rocks. Further these rocks crumbled into pieces and produce regolith/parent material. The various soil forming processes work under the umbrella of soil forming factors and parent material to get transformed into a 'true soil'.

The soil is indeed almost a perfect laboratory for creation of natural medicines. Soil contains an array of mineral matter, tiny microhabitats that create an enormous variation in the appearance and survival strategies of soil microbes. As time passes, soil get matured due to various physical and chemical processes. Biological oxidation of inorganic and organic compounds carried out by diverse group of microbes produce varied type of soils. The geological material observed in the form of rocks, minerals and soil particles, which forms a backbone of earth's life. The relationship between geologic materials and human health has been known for centuries. Ancient Chinese, Egyptian, Indian, Islamic and Greek texts describe the many therapeutic applications of various rocks and minerals and many health problems that they may cause. More than 2000 years ago Chinese texts describe 46 different minerals that were used for medicinal purposes. Arsenic minerals for example, Orpiment (As_2S_2) and Realgar (As_2S_3), were extensively featured in the material medica of ancient cultures. Health effects associated with the use of these minerals were described by Hippocrates (460-377 B.C.) reported in 2006. There have been many pioneering collaborations on environmental health issues between geoscientists and medical scientists (Bencko and Vostal, 1999; Cronin and Sharp, 2002; Centeno *et al.*, 2002a), but the interests and enthusiasm of individual scientists have largely driven these studies. Pedologist or soil scientist nobody have exception to these developments.

In Marathwada region there are many such places where the local residents use natural resources for disease and health management. Use of hot springs for curing skin diseases, use of soil for varying mud therapies, use of location specific plants for curing varying diseases are some of them. Considering this knowledge of local people, it was thought to conduct scientific study on these soils so as to build data on basic soil properties that are enforcing the medicinal value.

MATERIAL AND METHODS

The soil, a natural resource even today is less understood and less recognized in comparison to plants and animals. Soil is made from various geological materials and inherits the properties of parent material. Some of these properties and material in composition are used for various medicinal treatments. However, no one looked into this scientifically. Therefore, in the present project efforts were made to collect soils and study their properties and its relevance for medicinal purpose.

Location, Geography and Climate of Selected Soil Sites

The twelve soil samples were collected from various locations of Maharashtra state. Soil samples *viz*, Ghadi's soil, calcium carbonate rich soil, red soil, Ant's living home soil, high clay soil, soil under

banyan tree and normal soil belongs to Parbhani district, while soil under sulphur deposits and forest soil were collected from Nanded district. Soil of naturally grown medicinal plants (Janwal butte) belongs to Latur district and soil of Lonar crater belongs to Buldhana district. Multani soil was purchased from Parbhani local market.

General climate and geography of the districts from which soil samples are collected are given below.

Table 1
Locations of soil samples

Sr. No.	*Soil type*	*Village name*	*Tahsil*	*District*
1	Soil from Sulphur Deposits	Unkeshwar	Nanded	Nanded
2	Soil from Lonar Crater	Lonar	Buldhana	Buldhana
3	Soil of Gadhi	Daithana	Parbhani	Parbhani
4	Multani soil	Local market of Parbhani	Parbhani	Parbhani
5	Soil from Ant's Living Home	Malsona	Parbhani	Parbhani
6	Calcium Carbonate Rich Soil	M.A.U. Region	Parbhani	Parbhani
7	Red Soil	Daithana	Parbhani	Parbhani
8	Soil from Janwal-Butte	Janwal-Wadwal	Latur	Latur
9	High Clay Soil	Anglegaon	Parbhani	Parbhani
10	Forest Soil	Kinwat	Nanded	Nanded
11	Soil Under Banyan Tree	Daithana	Parbhani	Parbhani
12	Normal Soil	Daithana	Parbhani	Parbhani

Geography and Climate of Parbhani District

Geographically Parbhani is situated at 409 m above the mean sea level and spread over 19°16′ North latitude and 76°47′ East longitude in Marathwada region of Maharahstra state and has sub tropical climate. The regular monsoon started from 2nd week of June 2008. The rainfall was 925.30 mm distributted from June to October mean maximum temperature varied from 28.30°C to 43.1°C, whereas mean minimum temperature was between 7.4°C to 25.8°C. Relative humidity was observed 30 to 93 per cent during June 2008 to October 2008.

Geography and Climate of Nanded District

Geographically Nanded district is situated between 18°15′ to 19°55′ North latitude and 77°7′ to 78°15′ East longitude having an latitude of 362.24 m above mean sea-level. Nanded district is situated on the South-East portion and has extensive mountain range and barren areas. Godavari is the main river in Nanded district. It arrives from Western side and flows centrally of the district.

Geography and Climate of Latur District

Geographically Latur district is situated in the South-Eastern part of Maharashtra state at 19.7° latitude and 73.25° longitude on the Balaghat plateau at 540 m to 638 m above mean sea-level.

Geography and Climate of Buldhana District

Buldhana is a district in the State of Maharashtra situated in the Amaravati division. The Tapiriver and the Godavari river pass through the district. The Lonar crater, is the second largest hyper velocity meteorite crater in the world, is located in this district.

Survey and Collection of Soil Samples

Our body is made up of Panchmahabhutas (Earth, Air, Water, Fire and Akash). Earth is our primary life support system supplying materials like minerals, water and air. Ancient history says that the people uses special soils to cure various diseases and physiological disorders. Even today some acts are practiced. Keeping this in mind it was decided to collect the soils of varied nature which has special kind of use and study these soils scientifically. Therefore twelve different kinds of surface soils were collected from various location. The details of

locations are presented in Table 1. and the reason of collection of particular soil samples are given below in Table 2.

Table 2
Soil samples collected and their special kind of use

Sr. No.	*Soil*	*Use*
1.	Soil from sulphur deposits	As disinfectant in skin disease
2.	Soil from Lonar crater	As mud therapy during swelling
3.	Soil of Gadhi	Pregnant women eat it
4.	Multani soil	For face pack in cosmetic industry
5.	Soil from ant's living home	To wash the hairs
6.	Calcium carbonate rich soil	To wash clothes
7.	Red soil	Pregnant woman eat it
8.	Soil from Janwal Butte	Support medicinal plant's
9.	High clay soil	To wash hairs
10.	Forest soil	Support flora and fauna
11.	Soil under banyan tree	Used to improve quality of crop produce (organic farming)
12.	Normal soil	For comparison

Each soil sample is collected by using wooden peg up to the plough depth (20 cm).

Processing of Soil Samples for Soil Properties and Nutrient Content

The soil samples were processed for estimation of pH, EC, OC, $CaCO_3$ N, P, K, Fe, Zn, Cu, Mn. Collected soil samples were dried, pounded in wooden mortar and pastel and were passed through 2 mm sieve. Each sample was thoroughly mixed to make it homogeneous and preserved in properly labeled polythene bags for a laboratory analysis (for free $CaCO_3$ soil samples were retained before pounding the soil).

RESULTS AND DISCUSSION

Food concerns everyone and thereby, even if we do not realize, the soil which concerns everyone. A healthy soil produces a healthy plant by supplying all its essentials and protecting it from diseases and pests (Ganeshmurthy *et al.*, 2008). Soil enters human body through various direct and indirect channels. Hence, the health whether of soil, plant, animal or human being is one and indivisible. If this is accepted then we must look at the mechanisms or processes that transmit the health within the soil to animals and human beings. Soil inherits the properties from its parent material or may get changed due to other factors. In general, the endo-dynamomorphic soil inherits the properties of parent material which decides their utilization.

Physico-Chemical Characteristics of Soils

The data on pH, EC, organic carbon and free calcium carbonate equivalent are presented in Table 3.

Table 3
Physico-chemical characteristics of selected soil samples

Sr. No.	*Sample name*	*pH*	*EC (dSm^{-1})*	*Organic carbon ($g\ kg^{-1}$)*	*$CaCO_3$ ($g\ kg^{-1}$)*
1.	Soil from sulphur deposits	7.73	1.14	15.3	40.0
2.	Soil from Lonar Crater	7.16	0.605	1.55	6.50
3.	Soil from Gadhi	7.65	1.78	8.76	39.00
4.	Multani soil	7.62	3.23	1.94	16.50
5.	Soil from Ant's living home	7.83	0.154	4.87	36.00
6.	Calcium carbonate rich soil	7.80	9.907	2.60	249.00
7.	Red soil	7.59	0.134	2.92	11.50
8.	Soil from Janwal Butte	7.40	0.854	19.3	16.00
9.	High clay soil	7.89	1.25	3.21	75.00
10.	Forest soil	7.35	0.088	24.96	35.00
11.	Soil under Banyan tree	7.64	0.177	26.80	32.00
12.	Normal soil	7.00	0.335	4.87	44.50

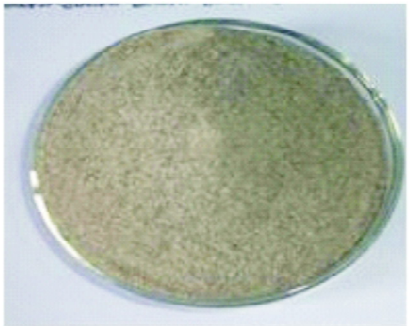
The pH of the selected soil samples was slightly acidic in most of the cases except soil from Lonar

Soil from sulphur deposits

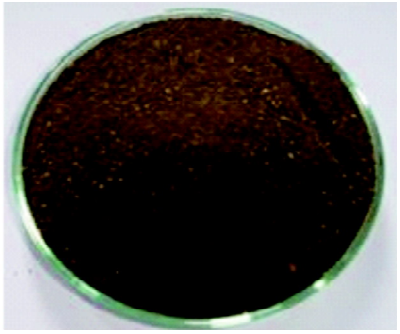
Soil from ant's living home

High clay soil

Soil from lonar crater



Calcium carbonate rich soil



Forest soil

Soil from Gadhi

Red soil

Soil under banyan tree

Multani soil

Soil from Janwal butte

Normal soil

Plate 1: Different soils collected from various locations

crater (7.2), Multani soil (7.62), calcium carbonate rich soil (7.80), high clay soil (7.89) and normal soil (7.00).

The activity of soil organisms, pathogens and parasites and their survival in soil is profoundly influenced by soil pH. As pH of soil goes down the activity and survival chances of fungi increases while, when pH remain in neutral range (6.5 to 7.5) growth and development of bacterial population enhances. In general, as pH of soil goes down (within certain limit) the activity and survival chances of pathogens and parasites increases. This is probably due to the influence of pH on the adsorption characteristics of both soil and clay surface and pathogens and parasites. The inactivation rate of pathogens are higher in neutral and alkaline soils and lower in acid soils (Santmaria and Taranzos, 2003). Soil from ant's living home and high clay soil are used by village women to wash and clean the hair. This might be because of the fact that pH of these two soils (7.83 and 7.89) is comparable with shampoo and toilet soaps, respectively. Hydrated sodium ions which are present in alkaline soil exchanges the oily and dust particles of hairs. This exchange phenomenon might be working in the process of hair cleaning.

The electrical conductivity is a measure of total soluble salt concentration of soil. The total soluble salt (EC) accumulation and pH of soil are interrelated. The salts in the selected soils were distributed in wide range of 0.08 $dSm^{-1}$to 3.23 dSm^{-1}. The maximum electrical conductivity was shown by Multani soil while lowest was indicated by soil from ant's living home. Soils having relatively lower pH value presents low salt concentration and vice-versa. Similarly soils showing higher organic carbon and contain less salts (0.08 dSm^{-1}). This shows that organic matter acidulation helps to reduce the salt concentration of the soil. Therefore, soil under banyan tree, forest soil, soil from ant's living home possessed low electrical conductivity.

The data on organic carbon content of different soils are presented in Table 3. It was evidenced that all virgin/uncultivated soils (*viz*., soil from sulphur deposits, soil from Gadhi, soil from Janwal butte, forest soil and soil under banyan tree) recorded higher organic carbon content (15.30, 8.76, 19.3, 24.96 and 26.8 g kg^{-1}, respectively). While other soils *viz*., soil from Lonar crater, Multani soil, soil from ant's living home, calcium carbonate rich soil, red soil, high clay soil and normal soil contain 1.55, 1.94, 4.87, 2.60, 2.92, 3.21 and 4.87 g kg^{-1} organic carbon, respectively. Amongst all soils, forest soil and soil under banyan tree had highest organic matter content which was to the tune of 4.30 and 4.62 per cent (24.96 and 26.80 g kg^{-1} of organic carbon); followed by Janwal butte's soil and soil from sulphur deposits (19.3 and 15.3 g kg^{-1}). The higher organic carbon content in these soils might be because of the virgin nature of soil. These soils are uncultivated soils. Forest soil showed higher organic matter content due to1 fall of plant leaves, twigs, flowers, fruits and other residues while the soil under ban+yan tree was rich in organic matter due to fall of ripened banyan fruits and excreta of birds. Further the low temperature under banyan tree helps to accumulate the organic carbon content of soil. Soil collected from Janwal butte shown 19.30 g kg^{-1} organic carbon. The Janwal butte is uncultivable area having grasses and shrubs. This might be the reason of high content of organic carbon at Janwal butte's soil.

The data on free lime content of soil are presented in Table 3 revealed that soils were varied in free $CaCO_3$ content. All the soil samples collected from varied locations were non-calcareous except calcium carbonate rich soil and high clay soil. Calcium carbonate rich soil had 24.9% calcium carbonate, which is rated as highly calcareous. It was observed during survey that these soils are used for washing the clothes. This might be because of its carbonate content, which helps to clean the adsorbed dust and had caustic effect.

Macronutrient Status of Selected Soil Samples

The data on available nitrogen, phosphorus and potassium content are presented in Table 4.

The available nitrogen content was relatively higher in the forest soil, soil from Janwal butte, soil under banyan tree, normal soil which was to the extent of 542.52, 417.00, 382.59 and 315.00 kg ha^{-1}, while high clay soil had 228.92 kg ha^{-1}, followed by soil from sulphur deposits (220.00 kg ha^{-1}) and Gadhi's soil (213.24 kg ha^{-1}) in available N. The lowest available nitrogen was recorded in Multani soil, red soil and $CaCO_3$ rich soil. The higher available nitrogen content was attributed to high organic carbon content of these soils.

These results revealed that undisturbed/ uncultivated soils had high nitrogen reserves, while in the cultivated soils, available N content was reduced. The official report of the Earth Summit (1992) concluded that 'there is deep concern over continuing major declines in the mineral values in farm and range soils throughout the world.' This statement was based on data showing that over the last 100 years, average mineral level in agricultural soils had fallen worldwide by 72% in Europe, 76% in Asia and 85% in North America (Ganeshmurthy *et al.*, 2008). Plant which absorb minerals from soil are either directly entered in the food chain of man or fed to animals and through animals they enters in human. Thus plant availability of mineral nutrients in the soil is the prime factor of mineral supply to human beings. Hence, in soil health parameters particularly nitrogen is more important. It's availability found to be influenced by parent material, climate and pedogenic factors (Deckers and Steinners, 2004).

The available P_2O_5 content of selected soil samples followed the trend of available N content. The highest P content was in forest soil (18.825 kg ha^{-1}) followed by soil from Janwal butte (15.90 kg ha^{-1}), soil from ant's living home (11.80 kg ha^{-1}), soil under bandian tree (10.89 kg ha^{-1}), red soil (10.4 kg ha^{-1}), high clay soil (9.40 kg ha^{-1}), soil from Gadhi (8.2 kg ha^{-1}), normal soil (8.06 kg ha^{-1}), soil from Lonar crater (6.08 kg ha^{-1}), Multani soil (6.01 kg ha^{-1}) and soil from sulphur deposits (5.79 kg ha^{-1}) and lowest available phosphorus was noticed in calcium carbonate rich soil (1.496 kg ha^{-1}). The lowest available P_2O_5 in calcium carbonate rich soil might be because of high free calcium carbonate which might have precipitated the phosphorus as calcium phosphate and reduced the available P content in this soil. Depletion of soil phosphorus content leads to decrease in food phosphorus content. Further historical cultivars found to have more mineral content than modern cultivars. Ganeshmurthy*et al.* (2008) also reported that P content of historical cultivars was 3797 mg kg^{-1}. While modern cultivars had 3492.7 mg kg^{-1}. This shows nearly 9 per cent reduction in P content of recent cultivars. Phosphorus compounds are the important energy sources of human and animal in the form of ADP and ATP. Forest soil and soil from Janwal butte found to have good reserves of phosphorus. Normal soil

Table 4
Available Nitrogen, Phosphorus and Potassium Content of soil samples

Sr. No.	*Sample name*	*Available N (kg ha^{-1})*	*Available P (kg ha^{-1})*	*Available K_2O (kg ha^{-1})*
1.	Soil from sulphur deposits	220.00	5.79	735.84
2.	Soil from Lonar Crater	178.75	6.08	360.64
3.	Soil from Gadhi	213.24	8.20	209.44
4.	Multani soil	9.40	6.01	232.96
5.	Soil from Ant's living home	417.00	11.80	674.80
6.	Calcium carbonate rich soil	95.00	1.496	210.56
7.	Red soil	25.08	10.40	165.2
8.	Soil from Janwal Butte	417.00	15.90	471.63
9.	High clay soil	228.92	9.40	255.36
10.	Forest soil	542.52	18.82	2487.72
11.	Soil under Banyan tree	382.59	10.89	458.64
12.	Normal soil	315.00	8.06	394.88

and high clay soil which are low in phosphorus acts as a medium for growth of crop. Therefore, food material produced in these soils will have low P content.

Potassium plays a very important role in maintenance of water balance in plant and animal cell. Therefore, optimum available potassium content is necessary in soil. Soils of present investigation hence exposed for K analysis and report there is presented in Table 4. As reported earlier Virgin soils in general and forest soil in particular contains reasonably high concentration of potassium (2487.72 kg ha^{-1}) while cultivated soils showed low content. This indicates that potassium content of soil was decreased due to cultivation practices which results in to less accumulation of potassium in crops. Ganeshmurthy (2009) also reported that from 1940 to 1991, potassium content in vegetable, fruits and meat was reduced by 16%, 19% and 16%, respectively. These findings cautionary for potassium nutrition of soil health and human health.

The DTPA Extractable Micronutrients

The data on DTPA extractable micronutrients *viz*., Zn, Cu, Fe and Mn are presented in Table 5.

The varied soils under study showed differential content of these micronutrients. DTPA extractable zinc varied between 0.610 mg kg^{-1} to 5.04 mg kg^{-1}. The soil from Janwal butte had highest zinc concentration (5.04 mg kg^{-1}) followed by soil from Gadhi (3.66 mg kg^{-1}) soil from sulphur deposit (3.24 mg kg^{-1}) and soil under banyan tree (2.36 mg kg^{-1}). The higher range of zinc content in above soils might be due to endo-dynamomorphic nature of soil. These soils are relatively young and therefore zinc content was high. Further during the pedogenesis zinc containing minerals like zinckite might have released zinc from the basaltic parent material. In general, except calcium carbonate rich soil rest of the soil had fairly good reserves of zinc as per the critical limit 1.0 mg kg^{-1} suggested by Jones (1980) for calcareous soil. Normal soil, high clay soil and red soil showed zinc concentration below the critical limit. Among the calcareous, high clay and red soil high clay soil showed higher zinc concentration (0.96 mg kg^{-1}) than rest of the two soils.

Table 5
Micronutrient status of selected soil samples

		Micronutrient status (mg kg^{-1})			
Sr. No.	*Sample name*	*Zn*	*Fe*	*Cu*	*Mn*
1.	Soil from sulphur deposits	3.24	3.78	6.40	12.20
2.	Soil from Lonar Crater	1.15	7.37	4.40	11.54
3.	Soil from Gadhi	3.66	0.284	4.00	6.05
4.	Multani soil	0.94	0.27	Traces	Traces
5.	Soil from Ant's living home	1.44	2.43	0.80	1.79
6.	Calcium carbonate rich soil	0.61	1.68	0.50	2.66
7.	Red soil	0.62	4.61	2.20	Traces
8.	Soil from Janwal Butte	5.04	3.86	8.60	12.20
9.	High clay soil	0.96	0.84	0.74	Traces
10.	Forest soil	0.96	2.53	0.60	Traces
11.	Soil under Banyan tree	2.36	1.42	3.80	7.90
12.	Normal soil	0.83	2.20	4.20	0.31

The clays with higher CEC and higher saturation level have greater ability to supplement trace elements like Zn, Cu, Mn, Fe, Se, etc. (WHO, 1996) than clays with lower CEC and lower saturation. Further, calcium rich soil had adverse effect on zinc utilization. As observed in this investigation, calcium carbonate rich soil content very low zinc content. Similar trend was recorded in respect of iron content. However, soil from Lonar crater, soil from sulphur deposits, soil from ant's living home, red soil, soil from Janwal butte and forest soil had greater DTPA iron than rest of the soils. It contained low DTPA iron. Even though our soils are formed from ferro-magnesium minerals the available Fe content was low and iron deficiency in crop is common. Hence, anemia is a common disorder observed in the population of

Marathwada. Above results are indicated that due to high Fe content in red soils pregnant woman eat the red soil so as to lower down the effect of Fe anemia. Prasad (1991) reported that zinc deficiency may cause geophagia. His study involved several young Iranian men who suffered from stunted growth and slower sexual development of all whom ate clays every day. When they were given zinc supplements they matured sexually and they lost the desire to eat clays.

Cu and Mn concentration in different soils are presented in table 5.revealed that, the Cu content was highest in Janwal butte's soil followed by soil from sulphur deposit (8.6 mg kg^{-1} and 6.4 mg kg^{-1}, respectively). Normal soil and soil under banyan tree recorded 4.2 mg kg^{-1} and 3.8 mg kg^{-1} Cu concentration. The lowest Cu content was found in soil rich in calcium carbonate and Multani soil. While Mn concentration was highest in soil from sulphur deposits, followed by soil of Janwal butte, soil from Lonar crater, soil under banyan tree and soil from Gadhi (12.2, 12.2, 11.4, 7.9 and 6.05 mg kg^{-1}, respectively). The higher content of Cu and Mn in soil under sulphur deposits, Janwal butte and Lonar crater was might be due to the parent material formed in situ. This parent material had the genetical inheritance of these elements. Further the lower content of Cu and Mn in normal soil, calcium carbonate rich soil, red soil and Multani soil might be due to the human intervention and using the soils for crop production which pumped out the nutrients from soil. It was noticed by Ganeshmurthy in 2009 that, there was decrease in nutrition concentration specially Cu from 1940 to 1991 in vegetables and fruits by 76% and 20%, respectively. The deficiency of Cu in children and infants shows hyper-cuprimicanaemia neutropenia, leucopenia and hyper-pigmentation of hair and skin. Further in adults Cu deficiency results into coronary heart disease and arthritis. The lower content of Cu in soil might have been resulted into decrease in Cu content of plant. This may be the reason of increased heart disease and arthritis disorders among the population of India during recent era.

CONCLUSIONS

1. Soils having higher pH *viz*., soil from ant are living home used for washing of hairs due to presence of swell-shrink clay and sodium (high pH).
2. Soils containing high organic matter is a resource for antibiotics. Multani soil contains lowest organic matter and high salt concentration, hence suitable for cosmetic industry.
3. Due to presence of high calcium carbonate highly calcareous soil used for cloth washing.
4. Depletion of nutrients especially N, P and K in cultivated soil may possess a problem of malnutrition. Calcium carbonate content rich soil contained low zinc and iron which is one of the reasons of prevalence of anemia in the region.
5. Soil from sulphur deposits are used as a disinfectant due to its high content of sulphur.

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