Vol 4 Issue 1 Feb 2014

ISSN No : 2230-7850

International Multidisciplinary Research Journal

Indian Streams Research Journal

Executive Editor
Ashok Yakkaldevi

Editor-in-Chief
H.N.Jagtap

Welcome to ISRJ

RNI MAHMUL/2011/38595 **ISSN No.2230-7850**

Indian Streams Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial board.Readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

International Advisory Board

Flávio de São Pedro Filho
Federal University of Rondonia, Brazil

Kamani Perera
Regional Center For Strategic Studies, Sri Lanka

Janaki Sinnasamy
Librarian, University of Malaya

Romona Mihaila
Spiru Haret University, Romania

Delia Serbescu
Spiru Haret University, Bucharest, Romania

Anurag Misra
DBS College, Kanpur

Titus PopPhD, Partium Christian University, Oradea,Romania

Mohammad Hailat
Dept. of Mathematical Sciences,
University of South Carolina Aiken

Abdullah Sabbagh
Engineering Studies, Sydney

Catalina Neculai
University of Coventry, UK

Ecaterina Patrascu
Spiru Haret University, Bucharest

Loredana Bosca
Spiru Haret University, Romania

Fabricio Moraes de Almeida
Federal University of Rondonia, Brazil

George - Calin SERITAN
Faculty of Philosophy and Socio-Political Sciences Al. I. Cuza University, Iasi

Hasan Baktir
English Language and Literature Department, Kayseri

Ghayoor Abbas Chotana
Dept of Chemistry, Lahore University of Management Sciences[PK]

Anna Maria Constantinovici
AL. I. Cuza University, Romania

Horia Patrascu
Spiru Haret University,
Bucharest,Romania

Ilie Pintea,
Spiru Haret University, Romania

Xiaohua Yang
PhD, USA

......More

Editorial Board

Pratap Vyamktrao Naikwade
ASP College Devrukh,Ratnagiri,MS India

R. R. Patil
Head Geology Department Solapur University,Solapur

Rama Bhosale
Prin. and Jt. Director Higher Education, Panvel

Salve R. N.
Department of Sociology, Shivaji University,Kolhapur

Govind P. Shinde
Bharati Vidyapeeth School of Distance Education Center, Navi Mumbai

Chakane Sanjay Dnyaneshwar
Arts, Science & Commerce College, Indapur, Pune

Awadhesh Kumar Shirotriya
Secretary,Play India Play,Meerut(U.P.)

Iresh Swami
Ex - VC. Solapur University, Solapur

N.S. Dhaygude
Ex. Prin. Dayanand College, Solapur

Narendra Kadu
Jt. Director Higher Education, Pune

K. M. Bhandarkar
Praful Patel College of Education, Gondia

Sonal Singh
Vikram University, Ujjain

G. P. Patankar
S. D. M. Degree College, Honavar, Karnataka

Maj. S. Bakhtiar Choudhary
Director,Hyderabad AP India.

S.Parvathi Devi
Ph.D.-University of Allahabad

Sonal Singh,
Vikram University, Ujjain

Rajendra Shendge
Director, B.C.U.D. Solapur University, Solapur

R. R. Yalikar
Director Managment Institute, Solapur

Umesh Rajderkar
Head Humanities & Social Science
YCMOU,Nashik

S. R. Pandya
Head Education Dept. Mumbai University, Mumbai

Alka Darshan Shrivastava
Shaskiya Snatkottar Mahavidyalaya, Dhar

Rahul Shriram Sudke
Devi Ahilya Vishwavidyalaya, Indore

S.KANNAN
Annamalai University,TN

Satish Kumar Kalhotra
Maulana Azad National Urdu University

Address:-Ashok Yakkaldevi 258/34, Raviwar Peth, Solapur - 413 005 Maharashtra, India
Cell : 9595 359 435, Ph No: 02172372010 Email: ayisrj@yahoo.in Website: www.isrj.net

Indian Streams Research Journal
ISSN 2230-7850
Volume-4 | Issue-1 | Feb-2014
Available online at www.isrj.net

PROSPECTIVE STUDY OF THE IMPACT ON THE ENVIRONMENT OF A FERTILIZER COMPOST PRODUCED FROM COOKING OIL INDUSTRIAL RESIDUES:

-Application to the Rehabilitation of the Ouled Boudjemaa Quarry Degraded Soils. (Bioclimatic Station for the semi-arid areas of North-Western Algeria)

EL-HACHEMI Mohammed Fayçal[1], Pr (HDR) TSAKI Hassini [2], Pr GUENACHI Khadija ,[3]
Pr TALEB Safia[4] and Pr Bekki Abdelkader [1]

[1]Biotechnology Laboratory for Rhizobia and plant breeding, Department of Biotechnology,
Faculty of Natural Sciences and Life, University of Oran DZ.
[2]Eco pedology Laboratory, Department of Biology, Faculty of Natural Sciences and Life, University of Oran DZ.
[3]RITE Research Laboratory (Industrial, Environmental and Technology related Hazards), University of Oran DZ.
[4]Materials and Catalysis Laboratory (LMC), Department of Chemistry, Faculty of Exact Sciences,
University of Sidi Bel Abbes DZ.

Abstract:-The nutrient intake of plants through a process of natural fertilization, alternative to the use of chemical fertilizers (whose aggressive and non-sustainable impact on the environment has now been demonstrated) is a factor often overlooked in bioremediation and revegetation endeavours concerning natural landscapes altered by mining operations (sand quarries and pit-crushing, mining extraction fields, and industrial works , oil rigs, road and urban work embankments and backfills, cement works extraction sites). Several functions essential to the growth of newly relocated vegetation need an adequate supply of organic matter in cations exchange capacity (CEC) defined by a clay-humus complex involving calcium, magnesium, potassium and nitrogen elements. Nutritional deficiencies have serious consequences on the life and survival of newly planted vegetation, especially on disturbed landscape and soil. In order to rehabilitate degraded land located in a former sand quarry located at Ouled Boudjemaa, Ain Témouchent Wilaya (Algeria), we conducted an experimental study in a culture chamber (in vitro) and on the field (in vivo) for the development of a new methodological approach using compost fertilizer from recycled residues from edible oils and fats Industry. Such waste, rich in organic matter from plant origin, has also the advantage of enrichment in terms of cations exchange capacity (CEC) of the soil from these quarries and mines through the clay contained in "The Bleaching Earth" used in the refining process; which is lacking, particularly in these mineralized and highly degraded soils. Our preliminary results come down to some key parts that these neutralization and refining clay residues play an important role in the development attempts concerning new Acacia saligna plantations (legume originating from Australia which was chosen for its ability to adapt to poor and xeric soil as well as for its capacity to fix atmospheric nitrogen after its incorporation into the soil) which we have first subjected to experimental testing and monitoring in a culture chamber and then on the field for several months in order to assess the impact of their emission on the environment (soil, groundwater, etc ...) due to their content in heavy metals and other probable contaminants.

Keywords: Soil, Bleaching Earth, Acacia saligna, Compost, Recycling, Organic Matter, Calcium, Magnesium, Sodium, Mercury, Lead, Copper, Cadmium, Chromium, Antimony, Arsenic, Selenium, Pollution.

1. INTRODUCTION :

Biodiversity refers to the whole spectrum encompassing the diversity of living organisms. It includes all wildlife

EL-HACHEMI Mohammed Fayçal[1], Pr (HDR) TSAKI Hassini [2], Pr GUENACHI Khadija ,[3]Pr TALEB Safia [4]and Pr Bekki Abdelkader [1], " PROSPECTIVE STUDY OF THE IMPACT ON THE ENVIRONMENT OF A FERTILIZER COMPOST PRODUCED FROM COOKING OIL INDUSTRIAL RESIDUES: -Application to the Rehabilitation of the Ouled Boudjemaa Quarry Degraded Soils. (Bioclimatic Station for the semi-arid areas of North-Western Algeria)." Indian Streams Research Journal | Volume 4 | Issue 1 | Feb 2014 | Online & Print

within the animal and plant ecosystems in which they live and multiply. This flora standing for all plant species belonging in natural harmonized environments results from the balance between multiple and age old interactions involving climate, soil and the biosphere.

The soil lies on the thin top of the earth's crust following the transformation of the bedrock under the combined action of climatic factors and living organisms (LD BAVER HF and RHOADES, 1932).

The mineral part comprises all bedrock breakdown products yielded by physical and chemical degradation of same. The organic component is derived from humus, as well as from plant and animal decomposition. The movement of water and air are among the essential elements necessary to soil quality and its evolution. (AUBERT.J. 1963).

Besides, soil plays a part as a filter and water and pollutants storage area and is considered as the main reservoir of microorganisms (fungi, bacteria and viruses) in the rhizosphere. These microorganisms are crucially instrumental as far as the cycles of matter (carbon, nitrogen, phosphorus) are concerned, they are essential to life on Earth for the effective part they play at soil fertility and food production quality level. (Fary DIOME, 1996).

Rhizobia Bacteria in the rhizosphere which are capable of triggering a symbiotic interaction with legumes are involved in the formation of root nodules. These bacteria have the ability to fix atmospheric nitrogen via an enzyme complex, known as nitrogenase. Nitrogen plays an important role in the formation of biomolecules (proteins, nucleic acids, vitamins ...). Nevertheless, the lack of mineral nitrogen will often hamper plant growth. (FREIBERG et al., 1997).

There's a mutual advantage when the plant provides shelter and energy to its symbiont, while settling nitrogen from the atmosphere. Every year, these symbiotic associations can mutate 120 million tons of atmospheric nitrogen into ammonium (Fischer et al, 1996).

To support the implementation of sustainable agriculture it is necessary to put emphasis on the use of biological nitrogen inputs which are not involved in environmental contamination. Legumes associated with their symbiont will produce as much nitrogen as the global fertilizer industry (CRUTZEN et al, 2007).

Along with the challenge posed by growing agro-industrial waste, the development of relevant technologies and reprocessing sectors, itself driven by changes in regulations and by broadening environmental awareness, has witnessed an intensification in the recycling rate of residual waste. The release of agro-industrial waste occurring, more often than not, in the natural environment has become a significant environmental and health and safety issue. The recycling of composts from organic waste is no big problem thanks to their biodegradable properties, which allow for easy processing. Millions of tons of organic matter are being dissipated, raw materials wasted and substances which sometimes turn out to be hazardous to human health, such as dioxins, heavy metals, etc., are dumped into landfills without any control or monitoring. The concentration of these hazardous substances will impact the environment as they can contaminate soils, groundwater and then the entire food chain and be the source of multiple health problems (ALLOWAY BJ, 1995).

Moreover, the issue of soils and landscapes degraded by mining operations, oil exploration and aggregate material extraction quarries have now become a major concern. The secondary aim of our research work, in response to the above, is to investigate the possibility of developing, from the controlled waste packaging of local agro-industrial oils and fats, a fertilization compost that would come in handy for the revegetation of these sites.

2. MATERIALS AND METHODS :

a) Test site description:

Our on field compost experimental work relying on the recycling of agro-industrial waste oils was carried out in the sandpit & quarry of Ouled Boudjemaa (Northwestern Algeria), which belongs administratively to the Wilaya of Ain Témouchent and is part of the Mediterranean semi-arid bioclimatic geological tier according to Emberger's classification (Emberger, 1954). This is an area where the frost season is well marked and starts in early December. During the colder months, the average minimum temperature is 1.9 ° C, that of the warmer maximum temperature is 33.2 ° C, with rainfall averaging 417 mm yearly, and a rainy season from September to May and a dry summer. The winds usually blow from the West and the Northwest. Surface water and groundwater is low all over this area. Sandy soil and sandy loam cover the largest part of the study area.

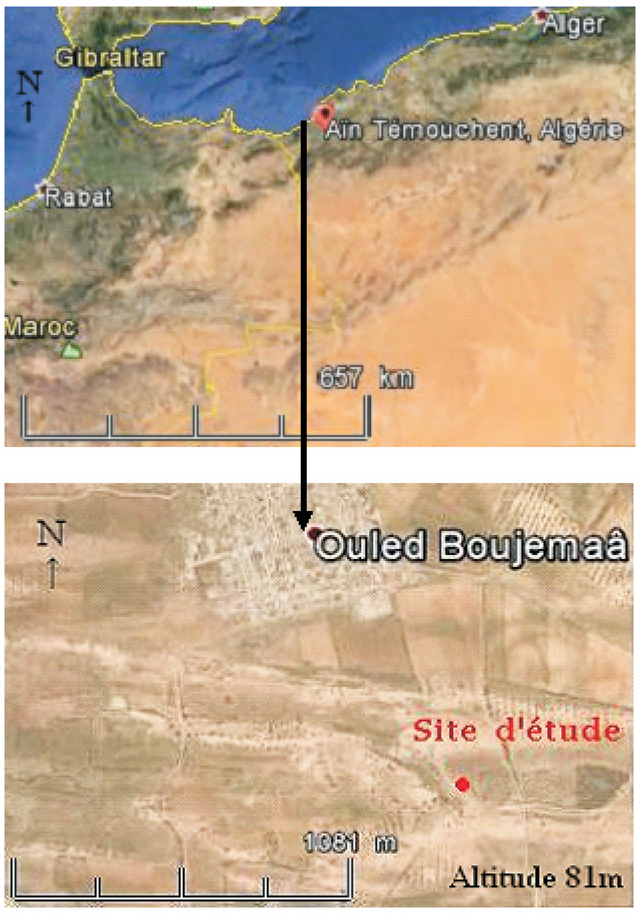

Fig.1: Location map of the Ouled Boudjemaa study area (red print) - Google MAP -.

b) Target Plant Species Selection:

The naturalized Acacia Saligna from the legume family which is available on the natural Terga site in Ain Témouchent has been selected as it is adapted to poor, dry alkaline soils. Besides, it is quick to grow and high in biomass content.

c) Samplings:

1 - The samples of soil from the plot of Ouled Boudjemaa were obtained at an average depth of 10 to 30 cm (Pauwels et al, 1992).
2 - Acacia saligna seeds were harvested at Terga, near Ouled Boudjemaa (6-8 kms).
3 - Clay or bleaching earth (used for refining crude oil) and depleted bleaching earth (agro-industrial waste) were recovered at the AFIA plant located in Hassi Ameur in the Oran region.
Soil samples and bleaching earth were dried at the open air for one week , then ground and sieved to a diameter of 2 mm to obtain the fine earth fraction to perform a set of physico-chemical analyses.
d) Physicochemical Analyses performed:

Physical analyses : ·

Texture characterization sieve analysis according to the International method;
pH (pH meter) measurement;
Electrical conductivity (conductivity meter) measurement;
X-ray Diffraction Analysis (XRD).

Chemical analyses :

Determination of total calcareous soil (Bernard calcimeter);
Cations Ca +, Na + and Mg + Analysis (flame photometric);
Organic material determination (calcination);
Heavy metals analysis (spectrophotometry);
Total nitrogen determination (Kjeldahl method).

e) Presentation of the protocol and of the various phases of experimentation:

The experiment required several mixtures of Soil - Bleaching earth at progressive bleaching clay integration rates (0%, 10%, 25%, 50%, 75%, 100%) to monitor and evaluate germination, seedlings growth at the same time biomass was being measured. The mixtures were dried in the open air for a week and then crushed and sieved to a diameter of 2 mm.

Acacia saligna seeds were washed with diluted sulphuric acid (1/10) for 90 minutes to remove any fungal contamination, then they were flushed several times with distilled water and kept out of direct sunlight at a temperature of 22 ° to 25 ° C .

After having been flushed several rinses with distilled water the seeds were germinated on 1% YEM agar media (Fig.2).

For each treatment, 30 In-Vitro and In-Vivo pots were watered with distilled water with a nutrient solution (BROUGHTON and DILWORTH, 1971). There were 3 seeds per In-Vivo pot (culture chamber); 3 seeds were sown in mid-February (after the frost) at the experimental plot of Ouled Boudjemaa to compare the growth of the two cultures, both In-Vitro and In-Vivo, while taking into account the specific climatic conditions in the natural environment.

f) Vegetable oil raw material, inputs and refining the protocol:

Crude import oils we collected at the AFIA plant consisted of soybean oil (95%) and corn oil (5%) and contained a number of unwanted impurities. To yield quality oil, these oils require going through an adequate refining process. This refining process aims to eliminate free fatty acids, oxidation products, unpleasant flavours, colouring agents, as well as phospholipids, metals present in trace amounts and usually associated with organic compounds (MOHTADJI LAMBALLAIS-1989; Jamil et al, 1998). The refining process includes a series of operations including degumming, neutralization, drying, bleaching, filtering and odour removal.

1.Degumming: For the elimination and hydrolysis of Gums in water or through the use of acid solutions -phosphoric acid or, as in the case of the AFIA plant, 30% to 90 ° C $C_6H_8O_7$ citric acid- (Ollivier et al., 2005). A small amount of water with a large amount of metal ions make it difficult to remove hard micelles. The swelling of these (increase in the oil / water interface) is provided by the addition of citric acid during the degumming stage, this being done through chelating with ions to allow for phospholipase penetration (Munck 2004).

2.Neutralization: To prevent acidification and oxidation, the oil coming out of this reactor receives the neutralizing solution of caustic soda (NaOH). The oil and soda mixture is sent to a speed mixer or a static mixer before being conveyed to the centrifuge for neutralization paste separation. Free fatty acids are neutralized through the formation of sodium soaps: R-COOH + NaOH+R-COONa +H2O (DENISE 1992). It is possible to couple the degumming and neutralization processes. In this case, phospholipids and soaps are separated in a single centrifugation step. Both operations are performed non stop at around 80 ° C (COSSUT et al., 2002). A separation step is carried out in a separator at 70 ° C to separate solids from liquids.

3.Washing : The operation that eliminates soaps and excess sodium (alkali) is that of washing. The washing water should be as hot as possible (90 ° C) (DENISE 1992). The washed neutral oil is dried to eliminate moisture in a vacuum of 50-80 mbar in order to avoid triglycerides hydrolysis.

4.Bleaching : To remove any unwanted pigment residues, any colouring matter, phospholipids, heavy metals traces, and peroxides, elimination is performed by physical means only through the use of earth materials or adsorbent charcoal (Ollivier et al, 2005.). For the AFIA plant, the neutralized oil is mixed with 17% citric acid and filtered through bleaching earth which clears oxidation products such as peroxides, toxic substances in a flammable environment from the bleached oil.

5.Vaporization (or odour neutralization): This operation allows for the removal of odorous and volatile products by injecting steam into hot oil (180 ° C - 240 ° C), this being done at low pressure (2-6 mbar) (FAO, 1994; Ollivier et al., 2005) to render the oil odourless and flavourless. The oil is kept away from the air, possibly through nitrogen (Cheftel 1992).

The processing of depleted bleaching earth material from different refining stages is an important operation for the protection of the environment. When the recovery of oil by solvent has not been included in the process, there remain but few ways to get rid of waste bleaching earth materials; after degreasing and drying, recycling into compost is possible for farming use in compliance with the available environmental regulatory provisions (PAGE, 1994).

3.RESULTS AND DISCUSSION :

It has been demonstrated through pH analysis that as far as the soil at Ouled Boudjemaa is concerned, we find ourselves in the presence of alkaline soils with a pH of 8.1. A near neutral to slightly acid pH for depleted clay (DC) with 6.8 and 6.7 for clean clay (CC) (Fig. 3.1). The degree of soil acidity or alkalinity plays a very important part in the assimilation of nutrients by the plant. Bleaching earth can affect soil pH. Most nutrients are absorbed within the pH range averaging 6 to 7 (GESTERMANS A. & DINON E., 2008). Analysis of total limestone has reported 20% for soil at Ouled boudjema, and no trace of any used clean bleaching earth (Fig. 3.2). A high degree of humidity of 7% for used bleaching earth, which feels quite moist when touched since it was used in the refining process, 3% for clean earth and 2% for soil (Fig. 3.3).

The conductivity analysis shows that the value of the electric charge of the ions in bleaching earth is much greater than that of the soil at Ouled Boudjemaa (Fig. 3.4). Which yields 1500 us / cm for soil, 8900 us / cm for depleted bleaching earth and 5600 us / cm for clean at 25 ° C. Indeed, the sum of the sodium, calcium, magnesium rates is higher in used and clean bleaching earth than it is for soil (Fig. 3.5, 3.6 and 3.7). Concerning sodium which is present as Na+ ion, it plays the part of secondary nutrient component compared to nitrogen. With 4.6% for depleted bleaching earth, 4.1% for clean bleaching earth, and 2.4% for soil (Fig. 3.5). Sodium amendment has a positive effect on the yield and sanitary quality of plants. Sodium promotes the formation of fructose and its conversion into glucose, it regulates the osmotic pressure of plant cells and leads to a more efficient use of water (MOHSEN H.; CAGNAC O. et al, 2009).

Calcium is one of minerals essential for the growth of a plant. With 368 ppm for the depleted bleaching earth, 120 dds for the virgin and 68 dds to the ground far below (Fig. 3.6). Calcium also plays an important role in the formation of plant tissues and helps plants grow better. It increases the resistance of plant tissues, allows root development, a better hold of the stem, and a better resistance to external aggressions. (KIRKBY, E.A. et D.J. PILIBEAM, 1984)..

As is the case for calcium, the plant cannot grow without an available magnesia source because of the multifarious usefulness of magnesium (MARSCHNER, H. 1986). With 290 ppm for the depleted bleaching earth, 240 ppm for clean, and 307 ppm for soil (Fig. 3.7), calcium values ??indicate the presence of a nutrient essential for plant growth. This item plays a major part in the formation of chlorophyll-based photosynthesis, as well as in the synthesis of amino acids and cellular proteins (ISMAIL C. et al, 2010).

At 2.39%, the soil at Ouled Boudjemaa is low in organic matter, much lower than that of the depleted bleaching earth which is 12.39% (Fig. 3.8). The organic material which is a source of nutrients and incidentally of humic molecules can form stable aggregates with the clay matter in the soil. The micro-organisms in the soil release CO2 into the atmosphere. The carbon which is not released into the atmosphere is essential to the plant, it forms humus molecules involved in the physical structure of the soil as long as it is not leached into groundwater. (Huber G. & Schaub C., 2011).

Sieve analysis (Fig. 3.9) was performed to classify the various particle sizes along with their sample percentages through the use of a series of sieves (FIES J.C. and STENGEL P. 1984). The soil of Ouled Boudjemaa is 80% fine sand, 12% coarse sand, 2.85% fine silt, 2% coarse silt and 3.15% clay. As this analysis would not allow for the determination of the bleaching earth particle nature, an XRD (X-ray Diffraction) analysis was carried out (Fig3.10) which made plain the following:

This is purified clay enriched with iron oxide which confers to it significant bleaching qualities. (ELSASS F. and D. Righi, 1996). When comparing the two spectra of the clean bleaching earth (black) and the depleted bleaching earth (red), we can distinguish an increase in inter-leaf distance (d) on the montmorillonite and illite specific peaks (silicate clay minerals). The clean clay contains a max (d) = 20.06. This is lower to that of depleted clay which includes max (d) = 47.33. This is evidence that the bleaching (cooking oil purification) and adsorption are effective.

This clay allows for soaking up oil colours in a particular way. The clay is activated by the silica which confers to it strong absorbency qualities on soaps, phospholipids and free fatty acids.

These results also reveal the presence of clay minerals and crystalline phases, mainly in quartz, calcite, and cristobalite forms.

The results of the In-Vivo mixtures experiment showed that the 75% soil 25% bleaching earth mixture yielded the highest average biomass with a fresh in-Vitro weight of 0.118 g (Fig. 3.11A) and 0.097 g In-Vivo (Fig. 3.11B). Clay played the part of a compost (Figures 3.12A and 3.12B) and boosted plant growth. Such clay helps fix water through adsorption on the surface and the volume increases by swelling. It thus constitutes an additional water reserve. Clays have special properties which are due to their very small size, their lamellar structure and the negative charge they carry (CAMAYOU H and J-P Legros, 1989). They form colloids, complex colloidal solutions that flocculate when the surface charges of the particles are neutralized by cations. This phenomenon is reversible: then the particles return to their dispersed state when the cations are removed by rinsing.

Clays provide soils with their particular structure and mechanical properties. They are associated with other components and form the clay-humus complexes (or organo-mineral materials) (CHRETIEN & TESSIER, 1988), which endow soils with their agronomic qualities: proper ventilation between aggregates, good air and water permeability. Soils whose clay materials are dispersed have culture adverse features: poor structural condition, poor air and water ventilation (BRONSWIJK .J J B, 1989).

We noticed that from a given threshold (mixture comprising 50% of depleted clay), it becomes suffocating for the plant, causing in-vivo and in-vitro growth decline.

Exchanges between plants and soil are highly dependent on clay-humic complexes flocculation quality. Such complexes flocculation causes the agglomeration of other fine soil components (silt, sand). The degree of flocculation is all the more important as it involves large cations highly lacking in charge qualities. Al + + + + + + +, Fe, Ca + +, Mn + +, Mg + +, Fe + + cations allow for stronger flocculation than K +, Na + ions ... The H + ion further yields, however, an even more acid reaction at soils level when in high concentration (C.BONNOT-COURTOIS & N. JAFFREZIC-RENAULT, 1982). Spectrophotometric analysis reveals the presence of some heavy metals (Fig. 3.13).

In 1971, a group of experts appointed by the WHO (World Health Organization) met in Geneva to implement an internationally agreed program aiming at setting allowable limits on the levels of acceptable heavy metals in view of a better preservation of the environment, especially as far as the health of exposed persons is concerned. Thus, the threshold limits were formally identified:

For drinking water, the maximum allowable concentration for mercury is 1 µg / L, 5 µg / L for cadmium, 50 µg / L for chromium, lead and arsenic, 10 µg / L for selenium and antimony, and 50µg / L for copper. The WHO reports that these heavy metals are highly toxic, and their presence in excess in the environment can affect people's health. Lead salts such as arsenate or chromate can prove carcinogenic. Experiments on animals have shown that several lead compounds are likely to cause benign or malignant tumours in several species.

In its issue No. 51 (20/08/2000), the Official Journal of the Algerian Republic states that the maximum allowable mercury concentration for natural mineral water is 1 µg / L for lead, 3 µg / L for cadmium, 50 µg / L for chromium and arsenic, 10 µg / L for lead, 50 µg / L for selenium, 5µg / L for antimony and 1000µg / L for copper.

According to our results, soil contains 1,055 mg / kg of lead, which is less than for depleted bleaching earth which is 1,325 mg / kg, 1.212 mg / kg for clean. The higher rate of metal is found in selenium, that is 1,135 mg / Kg for soil, 2,214 mg / Kg for depleted bleaching earth and 1,981 mg / Kg for clean. The rate of the latter is higher in depleted clay than it is in the other samples, which proves that clean clay containing montmorillonite (industrial protocol used in the refining of crude oil) has properly bound these metal elements (A. M. L. KRAEPIEL et al, 1999).

According to the results yielded, soil contains 0,336 mg / kg of antimony; 1.214 mg / Kg in depleted bleaching earth, and 1 mg / kg for clean.

Antimony is present in the lithosphere in the form of antimony sulphides, metallic antimonides or oxides antimony (EDWARDS et al. 1995).

Several authors acknowledge the fact that antimony geochemical behaviour in soils is not well known, although it can be compared to that of arsenic which comes quite close to it (ADRIANO, 1986 ; ATSDR, 1992 ; KABATA-PENDIAS & PENDIAS, 1992 ; EDWARDS et al., 1995). Antimony forms anionic compounds and its adsorption is higher in mildly acidic conditions. This adsorption is correlated with the levels of iron, manganese and aluminium in soil since antimony precipitates with these elements' hydroxides (ATSDR, 1992).

No nodular presence was revealed at root level during the experiment. This stands as evidence that the soil is very lacking in microorganisms at Ouled Boudjemaa. The percentage of total nitrogen in depleted or clean bleaching earth is very low (Fig. 3.14), which is not favourable for the plant.

Among the disadvantages of the 75% soil 25% clay mixture, no plant in an In-Vivo environment has exceeded 37 days. The same applies to the experiment conducted in a culture chamber. No plant grown in an in-vivo environment has exceeded 29 days.

The amount of peroxides fixed in the Bleaching earth mixed with citric acid accelerates plant mortality due to over sensitiveness to heavy metals (PRABHA K. et al, 2007), which goes to prove the toxicity of farming residues and the serious hazard they pose through their progressive accumulation in the environment (ALLOWAY B.J. 1995).

4.CONCLUSION AND PERSPECTIVES:

Clay plays an important role in the sustainability and development of soil structure, as well as for plant growth, but nowadays, possible contamination due to heavy metals from groundwater and the natural environment is a huge concern. The persistence of heavy metals such as lead, cadmium and mercury in the environmental sphere can affect the food chain in general and, in the long term, the health of humans and animals. These metals cannot be biodegraded. This study has opened several avenues of research and has left in the sideline many issues and concerns which need to be clarified. To complete this work, it would be interesting to assess the possibilities for the use as amendment compost soils with low exchange capacity and clay content following adequate conditioning and control taking into account the lowering of the tolerated heavy metals thresholds. This depleted clay can indeed constitute a possible compost following rigorous conditioning through an innovative recycling protocol; and among others, through the use of some suitable and resistant plants, such as radish, capable of soil remediation through the absorption of heavy metals (Raphanus sativus of the Cruciferae family).

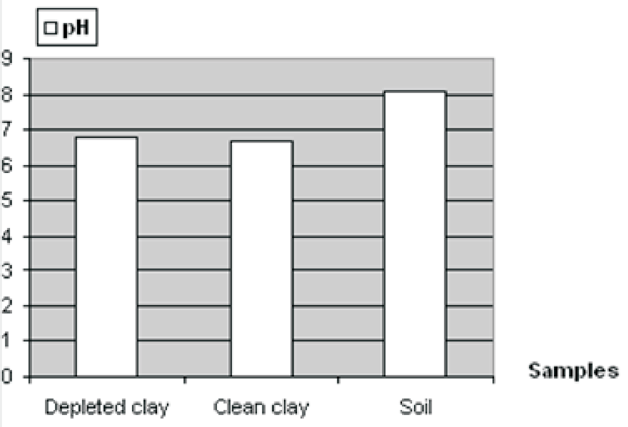

Figure 3.1 : Histogram of pH changes in depleted clay, clean clay, soil samples.

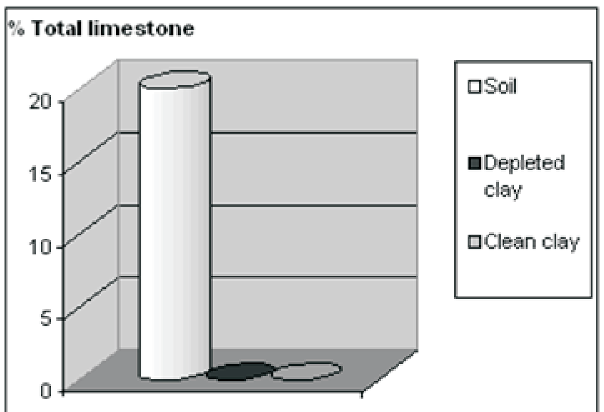

Figure 3.2 : Histogram of total limestone percentages of soil, depleted clay, clean clay samples.

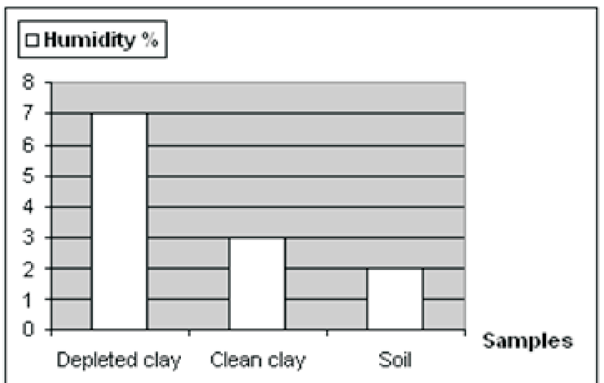

Figure 3.3: Histogram of humidity percentage of depleted clay, clean clay, soil samples.

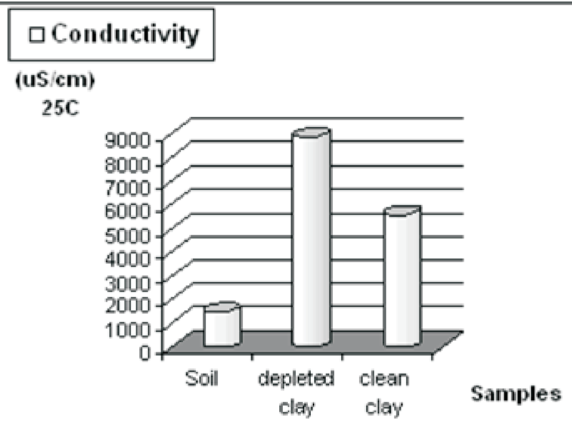

Figure 3.4 : Histogram of electrical conductivity of soil, depleted clay, clean clay

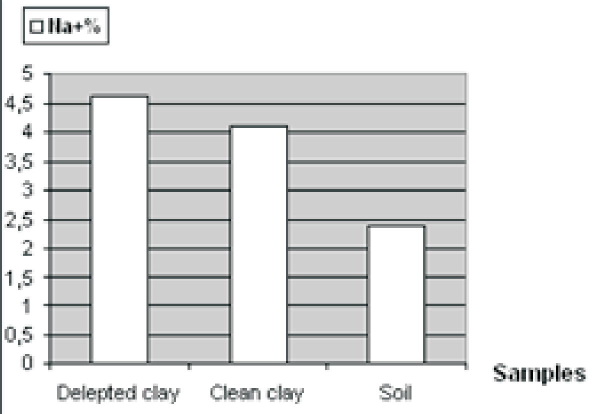

Figure 3.5: Histogram of Na percentages of depleted clay, clean clay, soil samples.

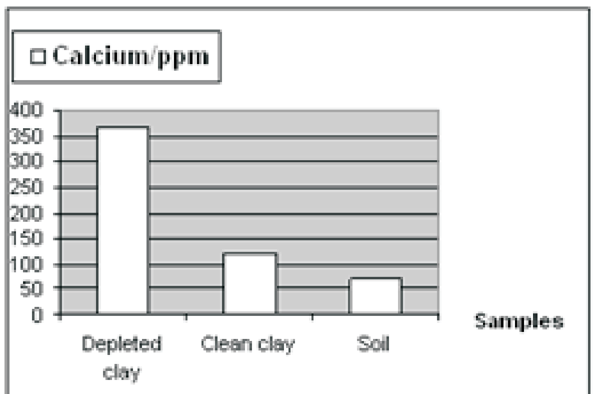

Figure 3.6: Histogram of calcium levels of depleted clay, clean clay, soil samples.

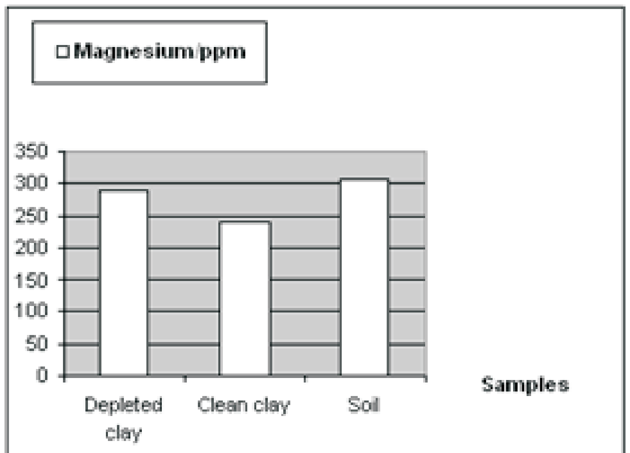

Figure 3.7 : Histogram of magnesium levels of depleted clay, clean clay, soil samples.

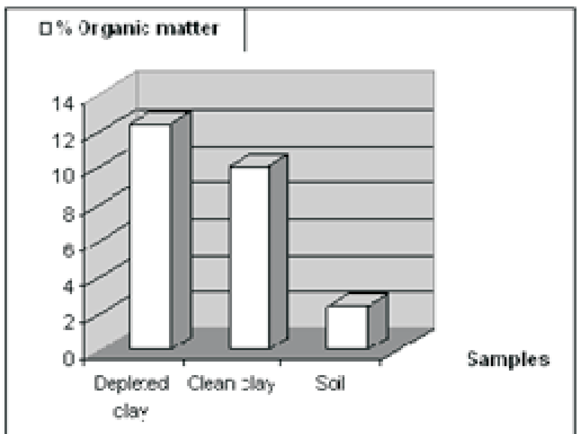

Figure 3.8 : Histogram of organic matter percenteges of depleted clay, clean clay, soil amples.

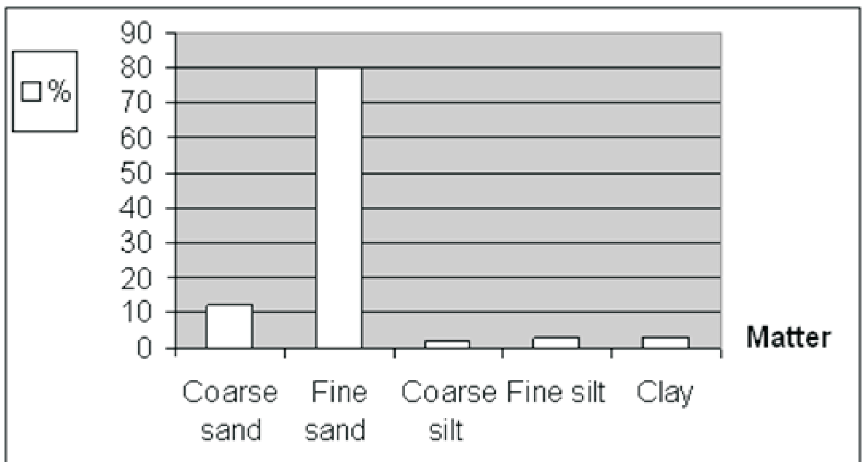

Figure 3.9 : Soil sieve analysis

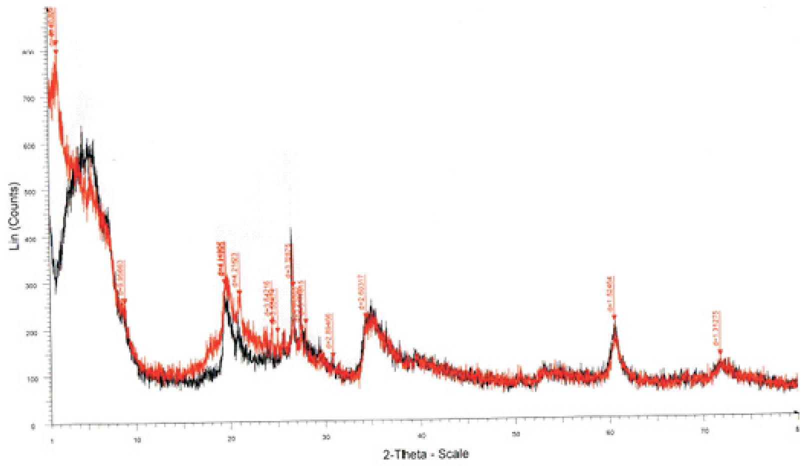

Figure 3.10: XRD analysis of the clean (black) and depleted (red)bleaching earth.

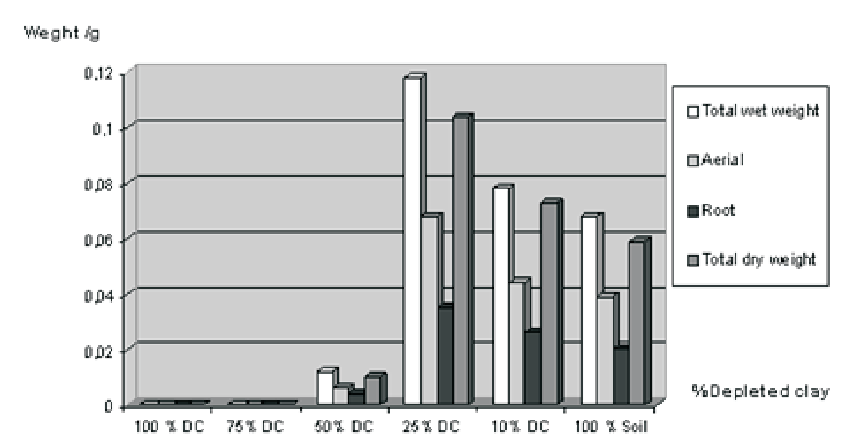

Figure 3.11A : Histogram of the average biomass as against the percentage of In-Vitro depleted clay

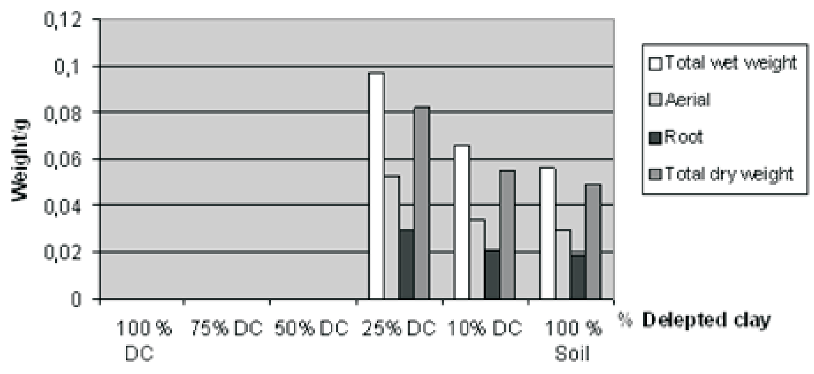

Figure 3.11B : Histogram of the average biomass as against the percentage of In-Vivo depleted clay.

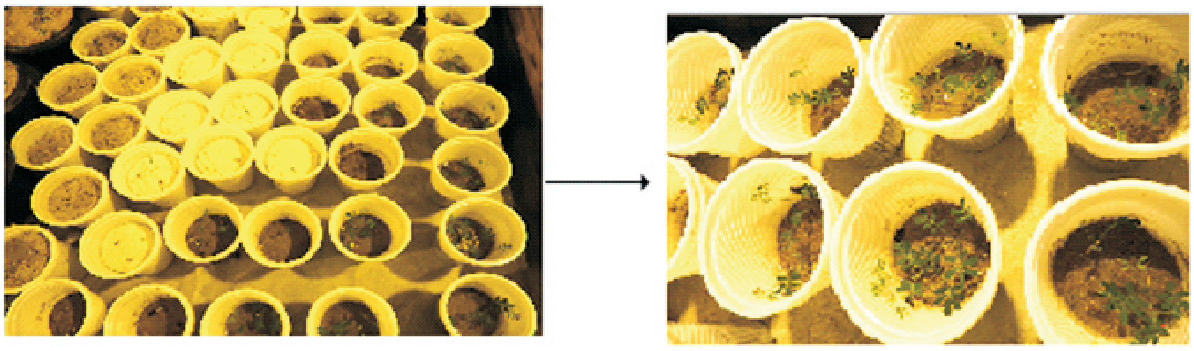

Figure 3.12A: Plant growth in the mixture 75% Soil - 25% in-vitro depleted clay.

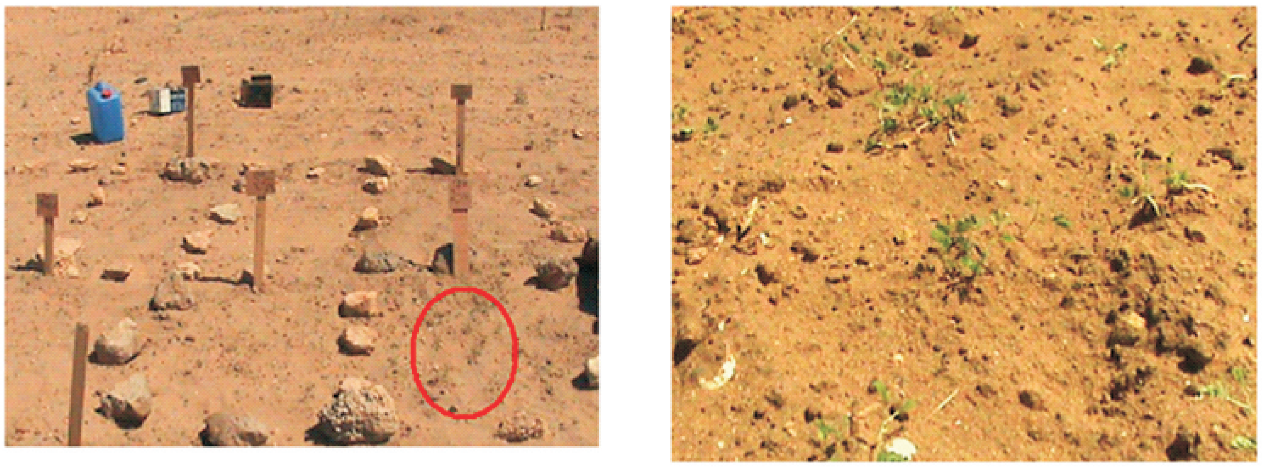

Figure 3.12B: Plant growth in the mixture 75% Soil - 25% in-vivo depleted clay.

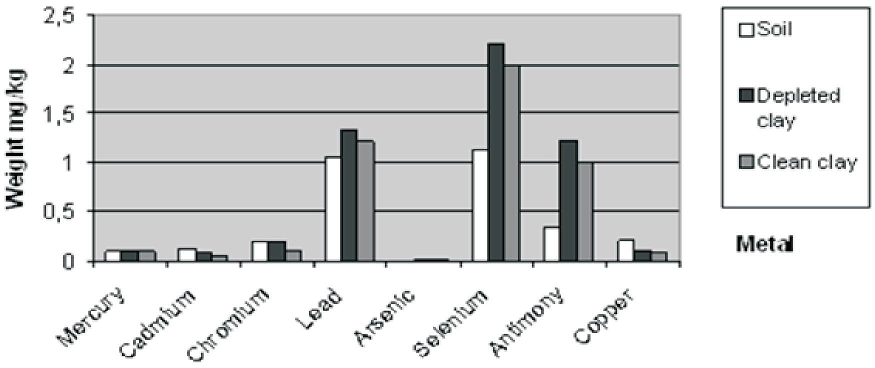

Figure 3.13 : Histogram of heavy metal levels in Soil, depleted clay, clean clay samples.

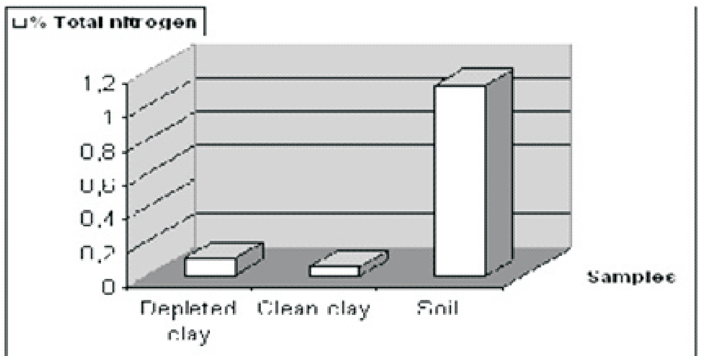

Figure 3.14 : Histogram of total notrogen percentages in depleted clay, clean clay, soil samples.

Figure 2: Acacia saligna seeds germination

REFERENCES BIBLIOGRAPHIQUES:

1.Adriano D.C. (1986) - Trace elements in the terrestrial environment New York (USA), Springer-Verlag.
2.Alloway BJ, 1995. Heavy Metals in Soils: Blackie Academic & Professional.
3.Anne M. L. Kraepiel, Klaus Keller, and François M. M. Morel, 1999: A Model for Metal Adsorption on Montmorillonite.
4.ATSDR (1992) - Toxicological Profiles for antimony and compounds. Agency for Toxic. Substances and Disease Registry, Atlanta, GA: U.S department of Health and Human Sevices, Public Health Services.
5.AUBERT. J (1963 - La classification des sols Classification pédologique française Cahiers ORSTOM, Pédologie n 3.
6.BAVER L D et RHOADES H. F (1932) - Aggregate analysis as an aid in the study of soil structure relationships.
7.BRONSWIJK .J J B (1989) - Prediction of actual cracking and subsidence in clay soils.
8.C. BONNOT-COURTOIS ET N. JAFFREZIC-RENAULT, 1982. ETUDE DES ECHANGES ENTRE TERRES RARES ET CATIONS INTERFOLIAIRES DE DEUX ARGILES.
9.CAMAYOU H et LEGROS, J -P (1989) - Les bases physiques, chimiques et minéralogiques de la Science du sol.
10.- Cheftel, J.-C. et Cheftel, H. 1992. Introduction à la biochimie et à la technologie des aliments. Volume 1. Ed. Tec et doc. Lavoisier. pp: 243-267.
11.CHRETIEN et TESSIER D (1988). Influence du squelette sur les propriétés physiques des sols hydratation, gonflement et aération Science du sol.
12.Cossut, J., Defrenne, B., Desmedt, C., Ferroul, S., Garnet, S., Roelstraete, L., Vanuxeem, M. et Vidal, D. 2002. Les Corps Gras: Entre Tradition et Modernité. Gestion de la Qualité Nutritionnelle et Marketing des Produits Alimentaires. pp: 2 1-64.
13.Crutzen, P.J., Mosier, A.R., Smith, K.A., and Winiwarter, W. (2007). N2O release from agro-biofuel production negates global warming reduction by replacing fossil fuels. Atmos. Chem. Phys. Discuss.
14.Denise, J. 1992. Raffinage des corps gras. In Manuel des corps gras. Volume 2. Ed. Tec et doc Lavoisier. pp: 789-881.
15.Dinon E. et Gerstmans A, 2008.L'Influence du pH sur l'assimilation des éléments nutritifs.
16.Edwards R, Lepp N.W. and Jones K.C. (1995) Other less abundant elements of potential environmental significance. vol, In: Heavy metals in soils, B. J. Alloway Eds, pp. 307-310.
17.Emberger L., 1954. Une classification biogéographique des climats. Rec. Trav. Lab. Bot. Géol. Zool. Univ. Montpellier.
18.FAO. 1994. Processing and refining edible oils. Food and agriculture organization of the united nations and the world health organization Rome. pp: 19-26.
19.Fary DIOME. 1996 : Rôle de la structure du sol dans son fonctionnement hydrique. Sa quantification par la courbe de retrait.
20.FI ES .J C et STENGEL P (1984) - Relations entre la constitution granulométrique et minéralogique et les caractéristiques de l'espace poral des sols. ln Livre jubilaire du cinquantenaire de l'AFES.
21.Fischer, H.M. (1996). Environmental regulation of rhizobial symbiotic nitrogen fixation genes. Trends Microbiol.
22.Freiberg, C., Fellay, R., Bairoch, A., Broughton, W.J., Rosenthal, A., and Perret, X. (1997). Molecular basis of symbiosis between Rhizobium and legumes.
23.Google MAP : https://maps.google.com/?ll=35.46835,-1.19423&z=15&t=h
24.Huber Gérald et Schaub Christiane, 2011: La fertilité des sols : L'importance de la matière organique.
25.Ismail Cakmak et Atilla M. Yazici.2010. Magnésium: Composante Oubliée de la Production Agricole.
26.Kabata-Pendias A. and Pendias H. (1992) Trace elements in soils and plants.London (UK), CRC Press. 2nd Ed.
27.Kirkby, E.A. et D.J. Pilbeam. 1984. Calcium as a plant nutrient. Plant Cell Environ.
28.Marschner, H. 1986. Mineral nutrition of higher plants. Chapitre 8 : functions of mineral nutrients : macronutrients.
29.Mohsen Hanana, Olivier Cagnac, Mokhtar Zarrouk et Eduardo Blumwald. 2009. Rôle biologique des antiports vacuolaires NHX : acquis et perspective d'amélioration génétique des plante.
30.Mohtadji-Lamballais, C. 1989. Les aliments. Ed. Maloine. pp: 94-102.
31.Münch, E.-W.2004. Enzymatic degumming processes for oils from soya, rape and sun. Lippro consulting: 1-47.
32.Ollivier, M. D., Bagni, M., Beugnot, N., Borgat, G., Cousyn, G., Daumas, A.,
33.Garcia, G., Gilles, C., Gominet, G., Huertas, A., Le Francois, P., Le Gonidec, D., Looten,C., Martins,E., Moretain, C., Morin, O., Simbelie, K. et Thegarid, D. 2005. Spécification technique n° E 4-05 du 31 mars 2005 relative aux huiles végétales alimentaires. Ministère de l'économie, des finances et de l'industrie. 29p.
34.Pages, X. 1994. Dossier marché mondial des oléagineux: Les isomères 18 :1 trans dans l'alimentation des européens. Oléagineux. Corps gras. Lipides. 3(1): 177-178.
35.Pauwels J.M., van Ranst E., Verloo M. &
36.Mvendo ZE A., 1992. Manuel de laboratoire de pédologie. Méthodes d'analyses des sols et des plantes, équipements, gestion de stocks de verrerie et de produits chimiques. Bruxelles : Administration Générale de la Coopération au Développement (AGCD).
37.Prabha K, Padmavathiamma and Loretta YLi. 2007. Hyper-acculation metals in plants. Water Air Soil Pollut.
38.Righi, D. and Elsass, F., 1996. Characterization of soil clay minerals: Decomposition of X-ray diffraction diagrams and high-resolution electron microscopy. Clays and Clay Minerals.

Publish Research Article
International Level Multidisciplinary Research Journal For All Subjects

Dear Sir/Mam,

We invite unpublished Research Paper,Summary of Research Project,Theses,Books and Book Review for publication,you will be pleased to know that our journals are

Associated and Indexed,India

- International Scientific Journal Consortium
- OPEN J-GATE

Associated and Indexed,USA

- Google Scholar
- EBSCO
- DOAJ
- Index Copernicus
- Publication Index
- Academic Journal Database
- Contemporary Research Index
- Academic Paper Databse
- Digital Journals Database
- Current Index to Scholarly Journals
- Elite Scientific Journal Archive
- Directory Of Academic Resources
- Scholar Journal Index
- Recent Science Index
- Scientific Resources Database
- Directory Of Research Journal Indexing

Indian Streams Research Journal
258/34 Raviwar Peth Solapur-413005,Maharashtra
Contact-9595359435
E-Mail-ayisrj@yahoo.in/ayisrj2011@gmail.com
Website : www.isrj.net