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Evaluation of the Phytochemical and Mineral Characteristics of Some Selected Sapotaceae Plants

Suryakant Chakradhari[1], Manas Kanti Deb[2], Khageshwar Singh Patel[2*], Jesús Martín-Gil[3], Erick K. Towett[4] and Pablo Martín-Ramos[5]

[1]School of Studies in Environmental Science, Pt. Ravishankar Shukla University, Raipur-492010, India.
[2]School of Studies in Chemistry, Pt. Ravishankar Shukla University, Raipur-492010, India.
[3]Department of Agriculture and Forestry Engineering, ETSIIAA, Universidad de Valladolid, Avenida de Madrid 44, 34004 Palencia, Spain.
[4]World Agroforestry Centre, P.O.Box 30677, Nairobi, 00100, Kenya.
[5]Department of Agricultural and Environmental Sciences, EPS, Instituto de Investigación en Ciencias Ambientales de Aragón (IUCA), University of Zaragoza, Carretera de Cuarte, s/n, 22071 Huesca, Spain.

Authors' contributions

This work was carried out in collaboration among all authors. Author SC collected the plant samples, prepared and preserved them, and analyzed the starch, polyphenol, flavonoid and oil contents. Author MKD collected the surface soil samples and measured their physical parameters. Author KSP designed the investigation and coordinated the analyses and paper writing. Author EKT conducted the XRF measurements. Authors JMG and PMR carried out the FTIR characterization and thermal analyses of the samples. Authors KSP and PMR wrote the original draft. Author PMR took care of the manuscript review and editing. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Aims: To study the spectral and thermal characteristics, and the oil, starch, polyphenol and mineral contents of seeds and leaves from three Sapotaceae species, provided that trees and shrubs of this family are an important source of nutritional and functional products.

**Corresponding author: E-mail: patelkhagrshwarsingh@gmail.com, patelkhageshwarsingh@gmail.com;*

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Nutritional and Spectral Characteristics of *Terminalia* Plants

Suryakant Chakradhari[1], Keshaw P. Rajhans[1], Khageshwar S. Patel[2*], Erick K. Towett[3], Jesús Martín-Gil[4] and Pablo Martín-Ramos[5]

[1]School of Studies in Environmental Science, Pt. Ravishankar Shukla University, Raipur-492010, India.
[2]School of Studies in Chemistry, Pt. Ravishankar Shukla University, Raipur-492010, India.
[3]World Agroforestry Centre, P.O.Box 30677, Nairobi, 00100, Kenya.
[4]Department of Agriculture and Forestry Engineering, ETSIIAA, Universidad de Valladolid, Avenida de Madrid 44, 34004 Palencia, Spain.
[5]Department of Agricultural and Environmental Sciences, EPS, Instituto de Investigación en Ciencias Ambientales de Aragón (IUCA), University of Zaragoza, Carretera de Cuarte, s/n, 22071 Huesca, Spain.

Authors' contributions

The present work was carried out in collaboration among all authors. Author KSP designed the research study and supervised the whole research work. Author SC collected the plant samples and performed experimental work. Author KPR managed the literature and statistical work. Author EKT generated the mineral data. Author JMG collected the FTIR spectra. Author PMR wrote the and revised manuscript. All the Authors read and approved the final manuscript.

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ABSTRACT

Aims: *Terminalia* spp. is medicinal plants that belong to Combretaceae family, widely used in traditional Ayurvedic medicine. In this work, the nutritional constituents of the leaves, seed kernel and seed coat from four *Terminalia* species (*T. arjuna*, *T. bellirica*, *T. catappa* and *T. chebula*) are reported.

**Corresponding author: E-mail: patelkhagrshwarsingh@gmail.com, patelkhageshwarsingh@gmail.com;*

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Chemical Composition of Caesalpinioideae Seeds

Suryakant Chakradhari[1], Khageshwar Singh Patel[2*], Erick K. Towett[3], Jesús Martín-Gil[4] and Pablo Martín-Ramos[5]

[1]School of Studies in Environmental Science, Pt. Ravishankar Shukla University, Raipur-492010, India.
[2]School of Studies in Chemistry/Environmental Science, Pt. Ravishankar Shukla University, Raipur-492010, India.
[3]World Agroforestry Centre, P.O.Box 30677, Nairobi, 00100, Kenya.
[4]Department of Agriculture and Forestry Engineering, ETSIIAA, Universidad de Valladolid, Avenida de Madrid 44, 34004 Palencia, Spain.
[5]Department of Agricultural and Environmental Sciences, EPS, Instituto de Investigación en Ciencias Ambientales (IUCA), University of Zaragoza, Carretera de Cuarte, s/n, 22071 Huesca, Spain.

Authors' contributions

This work was carried out in collaboration among all authors. Author SC collected, dried, preserved and prepared the plant and soil samples for the analysis, analyzed the polyphenol, oil and starch contents. Author KSP designed the study and coordinated the analyses and paper writing. Author EKT determined the mineral content of the seeds and soils by XRF. Authors JMG and PMR collected and interpreted the FTIR spectra and thermograms. Authors KSP and PMR wrote the original draft. Author PMR took care of the Ms. revision. All the authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Aims: Caesalpinioideae species have important medicinal and food values. In this study, six Caesalpinioideae species that grow abundantly in central India were selected for chemical investigation: *Delonix regia, Entada gigas, Leucaena leucocephala, Mimosa pudica, Parkia javanica* and *Senna siamea*. The objective of the present work is to describe the phytochemical and mineral composition and the bioaccumulation potentialities of the seeds from aforementioned species.

**Corresponding author: E-mail: patelkhageshwarsingh@gmail.com, patelkhagrshwarsingh@gmail.com;*

Case Study

Winter Particulate Pollution over Raipur, India

Nitin Kumar Jaiswal[1]; Shobhana Ramteke[2]; Khageshwar Singh Patel[3]; Harald Saathoff[4]; Silvia Nava[5]; Franco Lucarelli[6]; Eduardo Yubero[7]; and Mar Viana[8]

Abstract: Particulate air pollution during the winter season in the urban regions of India is severe due to substantial fuel and mineral combustion in adverse climatic conditions. In this work, chemical characteristics and sources of coarse particulate matter (PM_{10}) and particulates associated chemicals during winter period of years 2006–2013 in the polluted city of Raipur, Chhattisgarh, India, are reported. The ambient air coarse particulate (PM_{10}) concentration during the winter period of 2006–2007 ranged from 221 to 760 $\mu g\, m^{-3}$. The major fraction of the PM_{10} was composed of organic carbon, elemental carbon, iron, calcium, and sulfate. Their concentrations were remarkably reduced in the rainy season due to high wind speeds (around 10 kmh^{-1}) and removal with rain. The concentration variations and sources of PM and associated chemical species (i.e., carbons, ions, and metals) in the ambient air are discussed. **DOI: 10.1061/(ASCE)HZ.2153-5515.0000444.**

Author keywords: Particulate matters; Carbons; Metals; Ions; Sources.

Introduction

Particulate matter (PM) is composed of a wide variety of airborne materials (i.e., dust, smoke, and soot, among others), which are directly emitted into the air or result from the transformation of gaseous pollutants due to natural and anthropogenic sources (WHO 2006). PM has been reported as criteria pollutants by the USEPA (USEPA 2010). PM ($\leq$10 μm) is of most concern for its effects on human health, i.e., chronic lung disease and asthma, lung cancer, heart attacks, exacerbation of chronic obstructive pulmonary disease (COPD), premature death, preterm birth, and low birth weight, among other (Ferrante et al. 2015). Some metals interact with enzymes, cell components, or DNA, for example, to cause adverse health effects (Fortoul et al. 2015). The optically active components (e.g., elemental and organic carbon and sulfate) of the particulates affect precipitation and cloud-cover events (Bell and Holloway 2007). High particulate concentrations in ambient air have caused synoptic weather in several parts of the world (Awad and Mashat 2016; Ding et al. 2016; Han et al. 2015; Sati and Mohan 2014; Guttikunda et al. 2013). The distribution, composition, and origins of particulates in ambient air of several regions have been reported (Zeb et al. 2018; Ding et al. 2016; Pan et al. 2015; Xu et al. 2015; Tao et al. 2014; Satsangi et al. 2013; Singh et al. 2013; Yadav and Satsangi 2013; Khillare and Sarkar 2012; Kulshrestha et al. 2009; Lakhani et al. 2008; Gupta et al. 2007; Yttri et al. 2007; Begum et al. 2006; Mouli et al. 2006; Oanh et al. 2006; Gupta and Kumar 2006; Duan et al. 2005; Sillanpaa et al. 2005). The aerosol dynamics (i.e., distribution, composition, sources, and impacts) in developing countries like India are complicated due to scarce aerosol data, high emissions, and severe health hazards. In this work, concentration variations, composition, and sources of the chemical species associated with ambient particulates in the most polluted city, Raipur, during the winter season of years 2006–2013 are described.

[1]Assistant Professor, Dept. of Chemistry, Institute for Technology and Management Univ., Uparwara, Raipur 493661, India. Email: jaiswalnitink@gmail.com

[2]Ph.D. Student, School of Studies in Environmental Science, Pt. Ravishankar Shukla Univ., Raipur 492010, India. Email: shubrmtk21@gmail.com

[3]Professor Emeritus, School of Studies in Chemistry, Pt. Ravishankar Shukla Univ., Raipur 492010, India (corresponding author). Email: patelkhageshwarsingh@gmail.com

[4]Scientist, Institute for Meteorology and Climate Research, Karlsruhe Institute of Technology, Karlsruhe 76131, Germany. Email: harald.saathoff@imk.fzk.de

[5]Scientist, Dept. of Physics, Univ. of Florence and Istituto Nazionale di Fisica Nucleare, I-50019 Florence, Italy. Email: nava@fi.infn.it

[6]Associate Professor, Dept. of Physics, Univ. of Florence and Istituto Nazionale di Fisica Nucleare, I-50019 Florence, Italy. Email: lucarelli@fi.infn.it

[7]Professor, Atmospheric Pollution Laboratory, Dept. of Applied Physics, Miguel Hernandez Univ., Avda de la Universidad S/N, 03202 Elche, Spain. Email: eyubero@umh.es

[8]Scientist, Institute for Environmental Assessment and Water Research, Institute of Environmental Assessment and Water research Spanish National Research Council, C/Jordi Girona 18, 08034 Barcelona, Spain. Email: mar.viana@gmail.com

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Materials and Methods

Study Area

The capital city of the Indian state of Chhattisgarh, Raipur (21°24′N; 81°63′ E) is surrounded by coal- and mineral-based industries and was therefore selected for the proposed investigation. The Urla industrial area is spread over around 300 ha in the northeast direction, with installation of wide range of various industries. Another industrial area, Silrara, is spread over around 900 ha in the east direction and is home to industries such as sponge iron units and ferroalloy plants, among others. Similarly, many cement plants are located in the east direction of the city within an approximate 70-km radius. The largest steel plant (Bhilai) is located around 20 km away in the northwest direction from Raipur. The Borai, Durg industrial area (around 192 ha) is located approximately 40 km away from Raipur in the north–south direction. At least 300 rice mills are running in neighboring cities such as Durg,

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Chemical Composition of *Abrus precatorius* L. Seeds

Suryakant Chakradhari[1], Khageshwar S. Patel[2*], Erick K. Towett[3], Pablo Martín-Ramos[4] and Adam Gnatowski[5]

[1]School of Studies Environmental Science, Pt. Ravishankar Shukla University, Raipur-492010, India.
[2]School of Studies in Chemistry, Pt. Ravishankar Shukla University, Raipur-492010, India.
[3]World Agroforestry Centre, P.O.Box 30677, Nairobi, 00100, Kenya.
[4]Department of Agricultural and Environmental Sciences, EPS, Instituto de Investigación en Ciencias Ambientales de Aragón (IUCA), University of Zaragoza, Ctra, Cuarte, s/n, 22071, Huesca, Spain.
[5]Institute of Mechanical Technologies, Czestochowa University of Technology, Czestochowa-42200, Poland.

Authors' contributions

This work was carried out in collaboration between all authors. Author SC collected the plant samples, prepared and preserved them and analyzed the starch, polyphenol, flavonoid and oil contents. Author KSP designed the investigation and coordinated the analyses. Author EKT conducted the XRF measurements. Author AG collected the thermograms. Authors KSP and PMR wrote the original draft. Author PMR took care of the manuscript revision. All authors read and approved the final manuscript.

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Original* Research *Article

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ABSTRACT

Aims: *A. precatorius* seed powder is traditionally used in Ayurveda, Siddha and Unani medicine. The objective of present work is to describe the oil, starch, protein, polyphenol and mineral composition of *A. precatorius* seeds.
Methodology: Legumes from *A. precatorius* were collected, and seeds were manually separated. Dried seeds in powder form were employed for the various analyses: solvent extraction was used

**Corresponding author: E-mail: patelkhagrshwarsingh@gmail.com, patelkhageshwarsingh@gmail.com;*

Case Study

Distribution, Sources, and Hazards of Ambient Carbonaceous Particulates in Central India

Nitin Kumar Jaiswal[1]; Shobhana Ramteke[2]; Suryakant Chakradhari[3]; Khageshwar Singh Patel[4]; Harald Saathoff[5]; Saritha Karnae[6]; and Kuruvilla John[7]

Abstract: Complex environmental and health issues are on the rise in India because of the country's huge emissions of carbonaceous particulates. The aim of this study was to describe concentration variation, segregation, composition, and sources of carbonaceous particulates—elemental carbon (EC) [also known as black carbon (BC)], organic carbon (OC), and carbonate carbon (CC) associated with coarse (PM_{10}) and fine particulate matter ($PM_{2.5}$)—from 2005 to 2013 in India's most polluted city, Raipur. Raipur, located in central India, is surrounded by coal-based heavy industry. Annual ambient air concentrations ($n = 40$) of $EC_{2.5}$, $OC_{2.5}$, and $CC_{2.5}$ varied 0.5–64.7, 0.1–52.1, and 0–9.1 $\mu g\,m^{-3}$, respectively, during the study period. EC_{10}, OC_{10}, and CC_{10} concentrations were higher than $C_{2.5}$ concentrations and ranged 0.9–74.9, 2.2–56, and 0–29.8 $\mu g\,m^{-3}$, respectively. The composition and segregation of particulate matter are discussed here. The potential source contribution function (PSCF) analysis model was used for apportioning distant carbon sources. **DOI: 10.1061/(ASCE)HZ.2153-5515.0000447.** *© 2019 American Society of Civil Engineers.*

Author keywords: Carbonaceous particulate; Elemental carbon; Organic carbon; Carbonate carbon; Ambient air; Distribution; Sources; Impact.

Introduction

Carbonaceous particles are a major combustion by-product of particulate matter (PM) in the air and are recognized to play a crucial role in radiative transfer, air quality, and human health because of their micrometric nature (Brunekreef and Holgate 2002; Ramanathan and Carmichael 2008). They exert a negative radiative force with cooling effects, causing numerous health hazards such as coughing and shortness of breath, asthma, chronic obstructive pulmonary disease, congestive and ischemic heart disease, and increased risk of premature death. (Bond et al. 2013; Matsui et al. 2018; Verma et al. 2013; Vineis et al. 2006). PM comprises a large number of chemical constituents—organics, elemental carbon (EC), carbonate, sulphate, nitrate, ammonia, chloride, minerals, and metals (Cao et al. 2003; Giri et al. 2013; Wang et al. 2005). Total carbonaceous matter is a large contributor to the particulate burden in the urban atmosphere and in heavily industrialized areas (Cao et al. 2003; Wang et al. 2005).

Organic carbon (OC) containing polycyclic aromatic hydrocarbons and other components generated during combustion processes may cause mutagenic and carcinogenic effects (Ruchirawat et al. 2006). It is emitted directly from different sources (primary OC) or produced from atmospheric reactions involving gaseous organic precursors (secondary OC) that influence the properties and impacts of particulate matter (PM) on human health, regional visibility, and global climate (Pandis et al. 1992; Pang et al. 2006; Turpin and Huntzicker 1995). EC is a pure carbon, linked in several geometric forms, that causes human morbidity and premature mortality (Jacobson 2001). It is the second most important component of global warming in terms of direct forcing after CO_2 (Anenberg et al. 2012; Menon et al. 2002). They absorb and reflect incoming sunlight by exerting a regional cooling influence on Earth's surface that is approximately three times greater than the warming effect of greenhouse gases (Deepshikha et al. 2005). Airborne carbonate (CO_3^{2-}) in ambient aerosol particles is of great importance because of its role in atmospheric chemistry, global climate, and radiative forcing (Li et al. 2000). Emissions of carbonaceous particles are large in Asian countries because of the use of solid fuels such as wood, field residue, animal dung, and coal for cooking and heating (Oanh et al. 2006; Tiwari et al. 2015). Concentrations and emission sources of carbonaceous aerosol, including black and organic carbon particles, have been studied in various parts of the world (Babu and Moorthy 2002; Begum et al. 2012; Bisht et al. 2015; Briggs and Long 2016; Cheng et al. 2013, 2014; Dan et al. 2004; Duan et al. 2005; Gong et al. 2016; Gramsch et al. 2014; Guha et al. 2015; Helin et al. 2018; Hernández-Mena et al. 2011; Kim et al. 1999, 2006; Klompmaker et al. 2015; Latha and Badarinath 2003, 2005; Li et al. 2006; Lin and Tai 2001; Liu et al. 2018; Moloi et al. 2002; Ozdemir et al. 2014; Parashar et al. 2005;

[1]Asistant Professor, Dept. of Chemistry, ITM Univ., Uparwara, Raipur 493661, India. ORCID: https://orcid.org/0000-0003-3786-6521. Email: jaiswalnitink@gmail.com

[2]Ph.D. Student, School of Studies in Environmental Science, Pt. Ravishankar Shukla Univ., Raipur, Chhattisgarh 492010, India. Email: shubrmtk21@gmail.com

[3]Ph.D. Student, School of Studies in Environmental Science, Pt. Ravishankar Shukla Univ., Raipur, Chhattisgarh 492010, India. Email: suryachakradhari99@gmail.com

[4]Professer Emeritus, School of Studies in Chemistry, Pt. Ravishankar Shukla Univ., Raipur, Chhattisgarh 492010, India (corresponding author). Email: patelkhageshwarsingh@gmail.com

[5]Scientist, Institute for Meteorology and Climate Research, Atmospheric Aerosol Research, Karlsruhe Institute of Technology, Karlsruhe 76021, Germany. Email: harald.saathoff@imk.fzk.de

[6]Asistant Professor, Dept. of Environmental Engineering and Earth Sciences, Wilkes Univ., 84 West South St., Wilkes-Barre, Pennsylvania, PA 18766. Email: saritha.karnae@wilkes.edu

[7]Professor, Frank H. Dotterweich College of Engineering, Texas A&M Univ., Kingsville, MSC 188, 700 University Blvd., Kingsville, TX 78363-8202. Email: kuruvilla.john@unt.edu

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Nutritional, Spectral and Thermal Characteristic of Lamiaceae Seeds

Pravin Kumar Sahu[1], Suryakant Chakradhari[1], Khageshwar Singh Patel[2*], Jesús Martín-Gil[3], Erick K. Towett[4] and Pablo Martín-Ramos[5]

[1]*School of Studies in Environmental Science, Pt. Ravishankar Shukla University, Raipur-492010, India.*
[2]*School of Studies in Chemistry and Environmental Science, Pt. Ravishankar Shukla University, Raipur-492010, India.*
[3]*ETSIIAA, Universidad de Valladolid, Avenida de Madrid 44, 34004, Palencia, Spain.*
[4]*World Agroforestry Centre, P.O.Box 30677, Nairobi, 00100, Kenya.*
[5]*Department of Agricultural and Environmental Sciences, EPS, Instituto de Investigación en Ciencias Ambientales (IUCA), University of Zaragoza, Carretera de Cuarte, s/n, 22071 Huesca, Spain.*

Authors' contributions

This work was carried out in collaboration among all authors. Authors PKS and SC collected and prepared the seed and soil samples for the analyses and analyzed the polyphenol, oil and starch contents. Author KSP designed the study and coordinated the analyses and paper writing. Author EKT determined the mineral content of the seeds and soils by XRF. Authors JMG and PMR collected and interpreted the FTIR spectra and thermograms. Authors KSP and PMR wrote the original draft. Author PMR took care of the Ms. revision. All the authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Aims: Species of the family Lamiaceae possess a rich tradition of use for flavoring and medicinal purposes. This paper focusses on the nutritional and thermal characteristics of the seeds from eight species belonging to this family: *Gmelina arborea* Roxb. ex Sm., *Hyptis suaveolens* (L.) Poit., *Leonotis nepetifolia* (L.) R.Br., *Ocimum americanum* L., *Ocimum sanctum* L. (Rama Tulsi), *Ocimum*

**Corresponding author: E-mail: patelkhageshwarsingh@gmail.com;*

Contamination, Sources, and Environmental Hazards of Groundwater in Bemetara District, Chhattisgarh, Central India

Nohar Singh Dahariya, Ph.D.[1]; Ankit Yadav[2]; Suryakant Chakradhari[3]; Khageshwar Singh Patel[4]; Jose Nicolás[5]; Eduardo Yubero[6]; Matini Lautent[7]; and Pablo Martín-Ramos[8]

Abstract: The groundwater of the the Bemetara district of Chhattisgarh in central India over a large area is hard in nature due to its high mineral content. An elevated concentration of Na^+, Mg^{2+}, Ca^{2+}, and SO_4^{2-} in the groundwater has been observed, falling within the ranges ($n = 16$) 30–437, 43–341, 169–660, and 254–2,330 $mg\,L^{-1}$ with a mean value of 107 ± 93, 117 ± 69, 387 ± 171, and $1{,}059 \pm 595$ $mg\,L^{-1}$, respectively. The temporal and spatial variations in the groundwater concentration of species, i.e., SO_4^{2-}, Cl^-, NO_3^-, Na^+, K^+, Mg^{2+}, Ca^{2+}, Al, and Fe, during the period 2010–2016 are described. The sources of the contaminants and quality of the groundwater are discussed. The environmental hazards of the contaminated water, i.e., land degradation, rusting of buildings and pipes, physiological drought, and ill health of aquatics, birds, and animals, in the Bemetara area are discussed. **DOI: 10.1061/(ASCE)HZ.2153-5515.0000474.** *© 2019 American Society of Civil Engineers.*

Author keywords: Groundwater quality; Gypsum; Mineralization; Environmental hazard.

Introduction

Sulfates occur naturally in numerous minerals, including gypsum ($CaSO_4 \cdot 2H_2O$), epsomite ($MgSO_4 \cdot 7H_2O$), and barite ($BaSO_4$), and their dissolved minerals contribute to the mineral content of many drinking waters (Greenwood and Earnshaw 1984). Sulfur is important for humans because it is part of the amino acid methionine, which is an absolute dietary requirement. The permissible limit of SO_4^{2-} in water is 150 $mg\,L^{-1}$. Sulfates can contribute to an undesirable taste in water, and intake of sulfate-contaminated drinking water has effects on human health, for example, neurological effects and behavioral changes, disturbance of blood circulation, heart damage, effects on eyes and eyesight, reproductive failure, damage to the immune system, stomach and gastrointestinal disorders, damage to liver and kidney function, hearing defects, disturbance of the hormonal metabolism, dermatological effects, and suffocation and lung embolism (Backer 2008; Burgess et al. 2010). Sulfate solution in contact with concrete can cause chemical changes to the cement, which can lead to significant microstructural effects, resulting in a weakening of the cement binder (Atasoy and Yesilnacar 2010; Lorente et al. 2011; Pradhan 2014). Naturally occurring sulfate-contaminated water has been reported in some regions of the world (Seller and Canter 1980; MDH 2008; Horst et al. 2011; Mubarak et al. 2015; Han et al. 2016; Stanton et al. 2017). Similarly, groundwater containing high concentrations of Cl^-, Na, Mg, and Ca in other locations of the world has been observed (Kukillaya et al. 2004; Hajalilou and Khaleghi 2009; van Weert et al. 2009; Yamakanamardi et al. 2011; Razowska-Jaworek 2014; Bhandary et al. 2018).

In the Bemetara district of central India, there is a high incidence of gastrointestinal disorders in humans and livestock, together with serious impacts on wet and bush land ecosystems and a marked corrosion of materials (e.g., houses, pipelines, buildings, roads, water supply systems), all attributable to water pollution. Nonetheless, a detailed investigation of the mineral contamination of water in this region has not been reported to date. In this work, the contamination variations, sources, and toxicity of groundwater from this region of central India are discussed.

[1]School of Studies in Chemistry, Pt. Ravishankar Shukla Univ., Raipur, CG 492010, India. Email: nohardahariya@yahoo.in

[2]Ph.D. Student, School of Studies in Environmental Science, Pt. Ravishankar Shukla Univ., Raipur, CG 492010, India. Email: yadavankit.yadav9@gmail.com

[3]Ph.D. Student, School of Studies in Environmental Science, Pt. Ravishankar Shukla Univ., Raipur, CG 492010, India. Email: suryachakradhari99@gmail.com

[4]Professor Emeritus, School of Studies in Chemistry, Pt. Ravishankar Shukla Univ., Raipur, CG 492010, India (corresponding author). Email: patelkhageshwarsingh@gmail.com

[5]Professor, Dept. of Applied Physics, Miguel Hernandez Univ., Elche, Alicante 03202, Spain. Email: j.nicolas@umh.es

[6]Professor, Dept. of Applied Physics, Miguel Hernandez Univ., Elche, Alicante 03202, Spain. Email: eyubero@umh.es

[7]Professor, Dept. of Exact Sciences, Marien Ngouabi Univ., Brazzaville BP 69, Congo. Email: matinilaurent@yahoo.fr

[8]Professor, Dept. of Agricultural and Environmental Sciences, Escuela Politécnica Superior, Instituto de Investigación en Ciencias Ambientales, Univ. of Zaragoza, Carretera de Cuarte, s/n, Huesca 22071, Spain. ORCID: https://orcid.org/0000-0003-2713-2786. Email: pmr@unizar.es

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Materials and Methods

Study Area

The Bemetara district in the Indian state of Chhattisgarh (21.70° N 81.53° E) was selected for the proposed investigation owing to the high salt content in the water (Fig. 1). The district consists of four blocks, Bemetara, Nawagarh, Saja, and Berla. The area is occupied by mesoproterozoic sedimentary hard rocks over approximately 2.8×10^3 km^2, with a population of around 1 million

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ORIGINAL PAPER

Profiling of the bioactive components of safflower seeds and seed oil: cultivated (*Carthamus tinctorius* L.) vs. wild (*Carthamus oxyacantha* M. Bieb.)

Suryakant Chakradhari[1] · Ingus Perkons[2] · Inga Mišina[3] · Elise Sipeniece[3] · Elżbieta Radziejewska-Kubzdela[4] · Anna Grygier[4] · Magdalena Rudzińska[4] · Khageshwar Singh Patel[1] · Monika Radzimirska-Graczyk[5] · Paweł Górnaś[3]

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Abstract
The composition of lipophilic and hydrophilic components in cultivated (*C. tinctorius*) and wild (*C. oxyacantha*) safflower seed oils was studied. By LC–HRMS/MS^2, a total of seven highly abundant bioactive compounds with hydrophilic nature, a lignan glycoside (tracheloside), two flavonoids (acacetin–glucuronide pentoside and acacetin-7-*O*-D-glucuronide), and four alkaloids (N-coumaroylserotonin glucoside, N-feruloylserotonin glucoside, N-coumaroylserotonin, and N-feruloylserotonin), in seeds of both species, were identified. Only a minor part of the hydrophilic compounds (≤0.05%) present in the seeds was transferred into the seed oil during the extraction. The linoleic (~78%), oleic (~15%), palmitic (~5%), and stearic (~2%) acids—constituted 99% of all detected fatty acids in both species. α-Tocopherol was a main form of tocochromanols (over 94%) in both safflower seed oils. β-Sitosterol was the predominate form (over 36%) of phytosterols, while high levels were also recorded for gramisterol (17.1%) and avenasterol (19.6%) in *C. oxyacantha* and *C. tinctorius* seed oils, respectively. Zeaxanthin was a predominated form of carotenoids (over 37%), while high levels were recorded for lutein and β-carotene 15 and 25%, mainly in *C. oxyacantha.* The total amount of minor lipophilic compounds such as tocochromanols, carotenoids and sterols in *C. oxyacantha* vs. *C. tinctorius* seed oil was 57.9 vs. 58.2, 0.76 vs. 0.5, and 185.5 vs. 274 mg/100 g oil, respectively. The presence of squalene was detected only in *C. oxyacantha* (10.4 mg/100 g oil). Despite the similar composition and levels of fatty acids and tocochromanols, species differed by the phytosterols, carotenoids, and bioactive compounds with hydrophilic nature.

Keywords Fatty acids · Tocopherols · Phytosterols · Carotenoids · Squalene · Lignan glycosides · Flavonoids · Alkaloids

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s00217-019-03414-w) contains supplementary material, which is available to authorized users.

✉ Paweł Górnaś
pawel.gornas@llu.lv

1 School of Studies in Chemistry/Environmental Science, Pt. Ravishankar Shukla University, Raipur, CG 492010, India

2 Institute of Food Safety, Animal Health and Environment "BIOR", Lejupes iela 3, Riga 1076, Latvia

3 Institute of Horticulture, Graudu 1, Dobele 3701, Latvia

4 Faculty of Food Science and Nutrition, Institute of Food Technology of Plant Origin, Poznań University of Life Sciences, Wojska Polskiego 31, 60-624 Poznan, Poland

5 Department of Food and Nutrition, Poznan University of Physical Education, Królowej Jadwigi 27/39, 61-871 Poznan, Poland

Abbreviations

AOCS	American Oil Chemists' Society
DW	Dry weight basis
FID	Flame ionization detector
GC	Gas chromatography
HPLC	High-performance liquid chromatography
PFP	Pentafluorophenyl
RP	Reverse phase
SFC	Supercritical fluid chromatography
T	Tocopherol
T3	Tocotrienol

Introduction

The genus *Carthamus* (Asteraceae) includes thistle-like plants cultivated and wild grown in the Mediterranean region, and central as well as western Asia. *Carthamus*

SHORT COMMUNICATION

European Journal of Lipid Science and Technology

www.ejlst.com

Fatty Acids, Tocopherols, Tocotrienols, Phytosterols, Carotenoids, and Squalene in Seed Oils of *Hyptis suaveolens*, *Leonotis nepetifolia*, and *Ocimum sanctum*

*Pravin Kumar Sahu, Suryakant Chakradhari, Elise Sipeniece, Inga Mišina, Ying Qian, Ania Grygier, Magdalena Rudzińska, Khageshwar Singh Patel, and Paweł Górnaś**

The oil yield and composition of fatty acids, tocopherols, tocotrienols, sterols, carotenoids, and squalene in the seeds of three species—*Hyptis suaveolens*, *Leonotis nepetifolia*, *Ocimum sanctum*—belonging to the Lamiaceae family, are studied. The oil yields are 12.1%, 16.1%, and 29.0% in *O. sanctum*, *H. suaveolens,* and *L. nepetifolia*, respectively. The unsaturated fatty acids are a predominant group (86.8–92.1%) in all three investigated plants; however, the profile for each species is unique. The main fatty acid differs as follows: *H. suaveolens*—linoleic acid (85.8%), *L. nepetifolia*—oleic acid (58.3%), and *O. sanctum*—α-linolenic (48.6%). γ-Tocopherol accounts for over 97%, 90%, and 93% of the total tocochromanol content (sum of tocopherols and tocotrienols) in *H. suaveolens*, *L. nepetifolia*, and *O. sanctum*, respectively. Two tocotrienol homologues, α and γ, are detected only in *L. nepetifolia*. β-Sitosterol is the main detected sterol (38–59%) in all three species. High levels of campesterol (18–20%), Δ5-stigmasterol (9–21%), and Δ5-avenasterol (7–12%) are also detected. Squalene is detected only in *O. sanctum* (45.8 mg/100 g oil). The content of sterols, tocochromanols, and carotenoids in the investigated Lamiaceae plant seed oils ranges between 279.5–576.3, 54.5–66.7, and 0.3–3.1 mg/100 g oil, respectively.

Practical Applications: **Lamiaceae plants are of medicinal interest due to the presence of a broad spectrum of bioactive molecules. The present study demonstrates that seeds of the species *H. suaveolens*, *L. nepetifolia*, and *O. sanctum* are rich sources of bioactive compounds of lipophilic nature. There is limited knowledge associated with the composition of tocopherols, tocotrienols, sterols, carotenoids, and squalene. The results of the studied medicinal plants may enhance future targeted applications in various sectors.**

1. Introduction

Several plant species, including *Hyptis suaveolens, Leonotis nepetifolia*, and *Ocimum sanctum*, from the Lamiaceae family have important properties applicable for industrial sectors that include but are not limited to horticultural, culinary, medicinal, pharmaceutical, and cosmetics. For example, the essential oils extracted from Lamiaceae plants have demonstrated antifungal activity.[1] Additionally, *H. suaveolens* seeds were proposed as a good source of dietary protein,[2] neutral oligo- and polysaccharides with prebiotic potential,[3] and seed oil with antimicrobial properties.[4] *L. nepetifolia* seed oil was reported to be a source of laballenic acid (5,6-octadecadienoic acid).[5] *O. sanctum* seeds were found to be a source of gum with functional properties,[6] while the seed oil was characterized with antidiabetic, antihypercholesterolemic, and antioxidative activity.[7] The fatty acid composition for those three species is well known;[4,5,8] however, the information about the profile and content of minor lipophilic bioactive compounds in those seed oils is still limited. To the best of our knowledge, the minor lipophilic compounds (tocopherols, tocotrienols, carotenoids, sterols, and squalene) in the species *L. nepetifolia*, *H. suaveolens* and *O. sanctum* have not yet been reported. The determination

Dr. P. K. Sahu, Dr. S. Chakradhari, Prof. K. S. Patel
School of Studies in Chemistry/Environmental Science
Pt. Ravishankar Shukla University
Raipur 492010, India

E. Sipeniece, I. Mišina, Dr. P. Górnaś
Institute of Horticulture
Graudu 1 Dobele LV-3701, Latvia
E-mail: pawel.gornas@llu.lv

Y. Qian, Dr. A. Grygier, Prof. M. Rudzińska
Institute of Food Technology of Plant Origin
Faculty of Food Science and Nutrition
Poznań University of Life Sciences
Wojska Polskiego 31 Poznań 60-624, Poland

The ORCID identification number(s) for the author(s) of this article can be found under https://doi.org/10.1002/ejlt.202000053

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Case Study

Assessment of Arsenic and Heavy Metal Pollution in Chhattisgarh, India

Ankit Yadav[1]; Parvin Kumar Sahu[2]; Khageshwar Singh Patel[3]; Lesia Lata, Ph.D.[4]; Huber Milosh[5]; Warren T. Corns, Ph.D.[6]; Jasmina Allen, Ph.D.[7]; and Pablo Martín-Ramos[8]

Abstract: Natural contamination of arsenic (As) and heavy metals (HMs) poses a health threat in many regions. Ambagarh Tehsil, Rajnandgaon, Central India, is a heavily polluted area due to mineralization of geogenic As and HMs in the environment, i.e., water, plants, and soil. In this work, contamination extents and sources of As and HMs (Cr, Mn, Cu, Zn, and Pb) in water, soil, and common plants were investigated to understand the main entry route of these toxic elements in human and domestic animals. The mean concentrations of total As in surface water, groundwater, surface soil, plant leaves, and animal stool samples of 0.031 ± 0.009 mg mL^{-1}, 0.360 ± 0.114 mg mL^{-1}, 192 ± 65 mg kg^{-1}, 5.61 ± 4.78 mg kg^{-1}, and 51.0 ± 7.6 mg kg^{-1}, respectively, were found. The speciation, sources, enrichment, and toxicities of the As and other HMs are discussed, together with some associated health hazards, exemplified in domestic animals exposed to the contaminated water and food. **DOI: 10.1061/(ASCE)HZ.2153-5515.0000478.** © *2019 American Society of Civil Engineers.*

Introduction

Arsenic and other elements are widely distributed in the Earth's crust. Among them, As is a carcinogenic environmental and occupational pollutant, known to be very hazardous to health (Hong et al. 2014). Several countries of the world are reported to be most affected by arsenic contaminations (Chaurasia et al. 2012; Mukherjee et al. 2006). Many countries' surface water (SW) and groundwater (GW) are severely contaminated with As (Ahoulé et al. 2015; Shankar et al. 2014). The As contamination of soils and its impact on eocosystem have been reported in many countries (Middleton et al. 2017; Gillispie et al. 2015; Shrivastava et al. 2015; Moreno-Jiménez et al. 2012; Casentini et al. 2011; Belluck et al. 2003; Smith et al. 1998). Arsenic contamination in foods, for example, rice, wheat, pulses, and vegetables, in various regions has been identified (Shrestha et al. 2017; Bandaru et al. 2016; Karimi and Alavi 2016; Rahman and Hasegawa 2011; Bhattacharya et al. 2010; Jean et al. 2010; Roychowdhury 2008; She and Kheng 1992; Smith et al. 2006). Arsenic hazards to humans, plants, and animals from gold mining has been observed (Eisler 2004). DNA methylation from As exposure was reported by Lambrou et al. (2012).

In the case of Central India, arsenic contamination has been reported at hazardous levels over an area of 3,000 km^2 in Rajnandgaon District (Chhattisgarh), and it has been shown to cause serious health hazards due to polluted water and food consumption (Patel et al. 2005; Pandey et al. 2002). The contamination appears to derive mainly from geogenic sources (Acharyya et al. 2005).

The contamination of As and other HMs are spreading over various environmental compartments due to human activities. Arsenic can get into the human body through drinking water as well as eating contaminated foods. Arsenic in drinking water and contaminated food are absorbed through the intestine into the bloodstream through which it reaches the various organs. Continuous injection of contaminated water and food lead to Arsenicosis through inhibition of essential enzymes, which ultimately leads to death from multi-system organ failure. The objective of this study is to consolidate the information and database on the water and plant leaves resources for exploitation of As and HMs for safe drinking water and plant food in the affected areas of Rajnandgaon district, Central India. Hence, in this work, environmental contamination with elements i.e., As Cr, Mn, Cu, Zn and Pb has been investigated in which is believed to be the most contaminated site in this region (Ambagarh *tehsil*) by monitoring the concentrations of these pollutants in water, soil, plants and animals. In the latter, since excess metals are excreted out through urine and stool, hence, stool samples have been used as bio-indicators (Gupta 2013).

Materials and Methods

Study Area

Ambagarh Tehsil of Rajnandgaon district is densely covered with forest and has a total population of 108,334 as per the 2011 census. The area is severely contaminated by toxic elements such as

[1]Ph.D. Student, School of Studies in Environmental Science, Pt. Ravishankar Shukla Univ., Raipur 492010, India. Email: yadavankit .yadav9@gmail.com

[2]Ph.D. Student, School of Studies in Environmental Science, Pt. Ravishankar Shukla Univ., Raipur 492010, India. ORCID: https://orcid .org/0000-0002-3622-1695. Email: sahu.pravin89@gmail.com

[3]Professor Emeritus, School of Studies in Chemistry, Pt. Ravishankar Shukla Univ., Raipur 492010, India (corresponding author). Email: patelkhageshwarsingh@gmail.com

[4]Dept. of Soil Science, Maria Curie-Skłodowska Univ., Kraśnicka av, Lublin 20-718, Poland. Email: lata@poczta.umcs.lublin.pl

[5]Professor, Dept. of Geology, Maria Curie-Skłodowska Univ., Kraśnicka, Lublin 20-718, Poland. Email: miloh@interia.pl

[6]PS Analytical Ltd., Arthur House, Unit 11 Cray fields Industrial Estate, Orpington, Kent BR5 3HP, UK. Email: wtc@psanalytical.com

[7]PS Analytical Ltd., Arthur House, Unit 11 Cray fields Industrial Estate, Orpington, Kent BR5 3HP, UK. Email: ja@psanalytical.com

[8]Professor, Dept. of Agricultural and Environmental Sciences, Escuela Politécnica Superior, Instituto de Investigación en Ciencias Ambientales, Univ. of Zaragoza, Carretera de Cuarte, s/n, Huesca 22071, Spain. ORCID: https://orcid.org/0000-0003-2713-2786. Email: pmr@unizar.es

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Determination of Fenpyroximate Acaricide in Vegetables, Soil and Water Samples using UV-Visible Spectroscopy

D.K. SAHU[1,2], C. BHATT[1], J. RAI[2], M.K. RAI[1,*], J. GOSWAMI[1], A.K. SAHU[1], T.V. SINGH[3], S. RAMTEKE[3], M. NIRMAL[1], K. WANI[1] and P. MUNDEJA[1]

[1]School of Studies in Chemistry, Pt. Ravishankar Shukla University, Raipur-492010, India
[2]Chhattisgarh Council of Science and Technology, Raipur-492014, India
[3]School of Studies in Environmental Science, Pt. Ravishankar Shukla University, Raipur-492010, India

*Corresponding author: E-mail: manishrsu111@gmail.com

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Modern agriculture makes use of chemical pesticides to increase the crop productivity so as to meet the daily needs of uncontrolled population growth. These increase the productivity neglecting the fertility of soil and food quality, hence risking the health of human beings including animals. Fenpyroximate is a kind of acaricide which attacks and kills mites and decreases the growth of larvae. A method is established for the detection of fenpyroximate and stop excessive use of pesticide. After performing several tests on various wavelengths, the λ_{max} for the detection of fenpyroximate was 435 nm for azo dye. Limit of detection (LOD) and limit of quantification (LOQ) was found to be 0.687 µg mL^{-1} and 2.083 µg mL^{-1}, respectively. Furthermore, molar absorptivity, Sandell′s sensitivity were calculated to be 2.3 × 10^{-7} mol^{-1} cm^{-1} and 1 × 10^{-5} µg cm^{-2}, respectively. The azo dye follows Beer′s law in the range 5 µg to 14 µg in 10 mL that can be easily detected by using spectrophotometric analysis. This method is very sensitive, low cost and less time consuming. The present method is applied successfully in various vegetables (*i.e.* apple, cucumber, potato, spinach, *etc.*) soil and water samples.

Keywords: Pesticides, Fenpyroximate, UV-Vis spectrophotometry.

INTRODUCTION

Pesticides such as acaricides, insecticides and herbicides are used to improve the production of crops by killing the pests, mosquitoes, mice and rats [1-6]. Fenpyroximate is pyrazole acaricide chemically known as *tert*-butyl 4-[[(1,3-dimethyl-5-phenoxypyrazol-4-yl)methylideneamino]oxymethyl]benzoate [7] and first synthesized in the laboratory by Halvorsen *et al.* [8]. Fenpyroximate is widely used to prevents acaricides and effective against mites and it also inhibits the growth of nymph, larva [9]. Fenpyroximate target site is mitochondrial of mite and stops feeding of mites [10]. It is basically used to control mites in apple, orange, pears, tomato, spinach, cucumber, potato, *etc*. [11,12] and widely used in China [13]. The toxic effect of fenpyroximate in the human body is very low by dermal but it effects moderately by inhalation [14,15] and causes irritation of eyes and skin [16,17].

Due to the adverse effect of pesticides many techniques were developed to determine the presence of pesticides in different environmental samples. The techniques such as nuclear magnetic resonance (NMR) [18], gas chromatography (GC) [19], high-performance liquid chromatography (HPLC), Fourier transforms infrared spectroscopy (FTIR) [20,21], *etc*. which are time-consuming and very expensive. Al-Rahman *et al.* [22] determined fenpyroximate acaricide in citrus fruits, grapes and apples by HPLC techniques. Hammad [23] determined fenpyroximate residue in grapes using HPLC and photodiode array. Kim and Myung [24] performed an experiment in different types of honey by tandem mass spectroscopy and liquid chromatography and used solid-phase extraction. Ma *et al.* [25] have reported the determination of pyrazole fenpyroximate by SPE using HPLC in different environmental water samples. In the present work, low cost, highly sensitive, simple and selective method was developed. In this method, a coupling reaction with fenpyroximate is performed by using *p*-dimethylamino benzaldehyde reagent as a coupling agent with sodium nitrate and hydrochloric acid. The present method is applied

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Original Article

Studies on Composition of Stool Samples in Korba Area

Shobhana Ramteke[1], Bhaskar Sharma[2], Bijnaneswar Mondal[2], Bharat Lal Sahu[2*]

[1]School of Studies in Environmental Science, Pt. Ravishankar Shukla University, Raipur (C.G.), India-492010
[2]Department of Chemisrty, Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur (C.G.), India -495509
*Corresponding Author: bharatred007@gmail.com

Abstract: The ecosystem of Korba basin is contaminated with fluoride and other toxic elements due to coal burning. There contaminated water and food are taken by domestic animals. The clinical sample such as urine and stool are bio indicator for contamination of water and food. In this work stool of domestic animals such as cattle and buffalo were analyzed to investigate the content of pH, EC, F^-, Na^+, K^+, and Cl^- the range of 6.02 – 6.77, 411 – 622 µs/cm, 160 – 225 mg/kg, 375 – 675 mg/kg, 2125 – 3500 mg/kg, and 2625 – 4025 mg/kg.
Keywords: *Stools samples, fluorosis, fluoride pollution.*

1. Introduction

Industrialization, urbanization, and modern civilization have lead to fast degradation of our natural resources like water, soil, and air mainly. Plants and animals are dependents on the soil for the supply of nitrogen and mineral elements. The composition of plants and animals is also influenced by presence of a wide range of essential and non-essential element present in the soil [1-9]. Soil type and the plants and crops grown on them are highly variable. Many nutrients tend to be over applied and highly generated wastes and pollution resulting in imbalance in the animal's body and harmful effects on the environment. An excess of nitrogen, flurried and other elements can cause leaching, March 2019. The population of this area was 583,338 according to Census 2012 [19]. Korba District falls under the hot temperature dry climate zone. The industry. Apart from the power plants, Korba is surrounded by two sites hills and forest. Other sides are flats and soil profile mainly sandy.

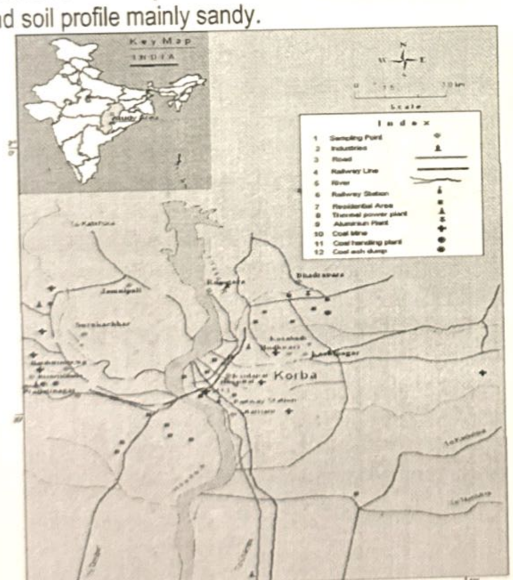

Figure 1: Representation of the sampling location of Korba region

groundwater, air, and soil contamination. Low values of cation and anion which suggest minimal pollution due to geogenic and anthropogenic sources in this study [10-18].

1.1. Materials and Method

1.2. Study Area

The Korba (22⁰ 21′ N, 82⁰ 42′ E) area was selected for study of stool chemical and physical parameters by stool analysis during

1.3. Sample Collection

Total 10 stool samples were collected from Korba area in March 2019.The fresh samples of cattle and buffalo stool were collected. The samples should be placed in clean, labeled container or leak-proof plastic bags [20-21]. Figure 2 and Table 1

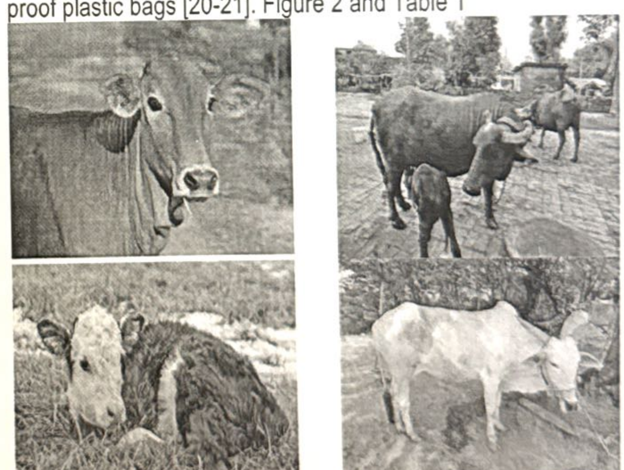

Figure 2: Representation of the various animal

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Novel coronavirus disease 2019 (COVID-19) pandemic: Considerations for the biomedical waste sector in India

Shobhana Ramteke [a,*], Bharat Lal Sahu [b]

[a] School of Studies in Environmental Science, Pt. Ravishankar Shukla University, Raipur, 492010, CG, India
[b] Department of Chemistry, Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur, 495009, CG, India

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ABSTRACT

In late December 2019, the world woke to a truth of a pandemic of Coronavirus Disease (COVID-19), inspired by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which has a place with a gathering of beta-coronavirus. As of July 21 India is still fighting to survive against the SARS-CoV-2 as called coronavirus disease. The contaminations, first constrained in the Kerala state, have inevitably spread to every single other area. The possibility to cause dangerous respiratory disappointment and quick transmission puts COVID-19 in the rundown of the Public Health Emergency of International Concern (PHEIC). There is a flow overall break out of the novel coronavirus Covid-19, which started from Wuhan in China and has now spread to more than 212 countries including 14,753,034 cases, as of 12:20 AM on July 21, 2020. Governments are feeling the squeeze to prevent the outbreak from spiralling into a worldwide wellbeing crisis. At this stage, readiness, straightforwardness, and sharing of data are vital to hazard evaluations and starting explosion control exercises. Since the episode of serious intense respiratory disorder (SARS) 18 years back, an enormous number of SARS-related coronaviruses (SARSr-CoVs) have been found in their regular repository have, bats.

During this epidemic condition, expulsion of biomedical waste created from crisis facilities treating COVID-19 patients in like manner demands unprecedented thought as they can be potential bearers of the disease SARS-CoV-2. This article discusses the potential consequences of the COVID-19 pandemic on biomedical waste administrations, concentrating on basic focuses where option working methodology or extra moderation measures might be fitting.

1. Introduction

A third of the global population is on coronavirus lockdown, as of May, 2020. Another coronavirus malady, formally named COVID-19 by the World Health Organization (WHO), has caused a worldwide pandemic with significant changes in numerous parts of human life. On 11 February 2020, the International Committee on Taxonomy of Viruses declared serious intense respiratory disorder coronavirus (SARS-CoV-2) as the name of the new infection [1]. The main instance of the novel coronavirus was accounted for on December 30, 2019, in Wuhan city, 2 Hubei regions, P.R. China. Quick moves were made by the Centre for Disease Control and Prevention (CDC), Chinese wellbeing specialists, and analysts. The WHO briefly named these pathogen 2019 novel coronavirus (2019-nCoV) [2]. During December 2019, a novel Beta-coronavirus temporarily named 2019 novel coronavirus (2019-nCoV), and along these lines authoritatively renamed extreme intense respiratory disorder coronavirus 2 (SARS-CoV-2) by the International Committee on Taxonomy of Viruses (ICTV), causing coronavirus ailment 2019 (or COVID-19), was related with a group of respiratory tract diseases in Wuhan, Hubei Province, China and has quickly spread across main land's [3].

The family Coronaviridae incorporates a wide range of creatures and human infections, all portrayed by an unmistakable morphology. Virions are encompassed and round (coronaviruses) or plate, kidney, or pole molded (toroviruses). Every molecule is encircled by a periphery or "crown" speaking to the bulbous distal parts of the bargains glycoproteins [4].

In India, the principal research centre affirmed instance of COVID-19 was accounted for from Kerala on January 30, 2020. As of July 21, 2020, an aggregate of 11,118,206 confirmed cases, 700,087 recovered cases and 27,497 passing were accounted for in India. As per data available on various websites regarding COVID-19 infections worldwide, the cases are increasing exponentially. On July 21, 2020, there were 14,753,034

* Corresponding author.
E-mail address: shubrmtk21@gmail.com (S. Ramteke).

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Phenolic and Mineral Characteristics of Seed Coats and Kernels from 24 Species from Raipur Area, India

Pravin Kumar Sahu[1], Suryakant Chakradhari[1], Manas Kanti Deb[2], Khageshwar S. Patel[2*], Erick K. Towett[3] and Pablo Martín-Ramos[4]

[1]School of Studies in Environmental Science, Pt. Ravishankar Shukla University, Raipur-492010, India.
[2]School of Studies in Chemistry, Pt. Ravishankar Shukla University, Raipur-492010, India.
[3]World Agroforestry Centre, P.O.Box 30677, Nairobi, 00100, Kenya.
[4]Department of Agricultural and Environmental Sciences, EPS, Instituto de Investigación en Ciencias Ambientales de Aragón (IUCA), University of Zaragoza, Carretera de Cuarte, s/n, 22071 Huesca, Spain.

Authors' contributions

The sample collections, processing and analysis of proximate parameters and polyphenols were performed by authors PKS, SC and MKD. The mineral contents of seed coats and kernels were quantified by author EKT with use of the XRF technique. The paper was written and edited by authors KSP and PMR. All authors read the paper and approved its publication.

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ABSTRACT

Aims: The objective of the present work is the investigation of the physicochemical characteristics of seed coats and kernels from 24 species with medicinal and food applications.
Methodology: Seeds from 24 species (2 herbs, 11 vines and 11 trees), belonging to 13 families, were sampled in Raipur (India) in 2017. The collected seeds were dried and weighed, after which seed coats were manually peeled and separately weighed. Phenolic and mineral contents in the seed coats and kernels were analyzed by spectrophotometric and X-ray fluorescence (XRF) techniques, respectively.

**Corresponding author: E-mail: patelkhageshwarsingh@gmail.com;*