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Novel luminescent paper based calix[4]arene chelation enhanced fluorescence- photoinduced electron transfer probe for Mn^{2+}, Cr^{3+} and F^-

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Abstract

A novel structurally simple calix[4]arene attached 1-aminoanthraquinone associated lower rim calix[4]arene conjugate was synthesized and has been used as turn on/off/on fluorescence probe for Mn^{2+}, Cr^{3+} and F^-. This chelation enhanced fluorescence - photoinduced electron transfer (CHEF-PET) based TAAC probe has been applied for its analytical application in real samples such as Mn^{2+} from blood serum, Cr^{3+} and F^- from industrial effluent with 94 - 99 % recovery. The limit of detection of this sensor is found to be 11 nM for Mn^{2+}, 4 nM for Cr^{3+} and 19 nM for F^- with the concentration range of 0-120 nM. Further, we report an easy-to-use, low cost and disposable paper-based sensing device for rapid chemical screening of Mn^{2+}, Cr^{3+} and F^-. The device comprises fluorescent sensing probes embedded into a nitrocellulose matrix where the resonance energy transfer phenomenon seems to be the sensing mechanism. It opens up new opportunities for simple and fast screening in remote settings where sophisticated instrumentation is not always available. The MOPAC-2016 software package has been used to optimize the TAAC using PM7 well established method and calculates the HOMO-LUMO energy band gap for structure TAAC and TAAC with Mn^{2+}, Cr^{3+} and F^- ion based structures.

Key Words: calix[4]arene, PET,CHEF, paper based analytical device, computational study

1. Introduction

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Luminescent behavior of pyrene-allied calix[4]arene for highly pH selective recognition and determination of Zn^{2+},Hg^{2+} and I^- via CHEF-PET mechanism: Computational experiment and paper based device

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In this article, we have reported for the first time a novel CHEF-PET fluorescence sensor L, based on calix[4]arene containing four pyrene groups as binding sites which is highly selective and sensitive towards Zn^{2+}, Hg^{2+} and I^-. This fluorescence probe has been synthesized, characterized by emission study, UV-vis titration, ^1H NMR spectroscopy and ESI-MS investigation. The linear concentration range at pH 7 of L for Zn^{2+}, Hg^{2+} and I^- is 0-135 nM, 0-140 nM and 0-120 nM respectively with the detection limit of 6.43 nM for Zn^{2+}, 2.94 nM for Hg^{2+} and 20.93 nM for I^-. The binding ability was determined through benesi-hildebrand equation which was found to be 7.535×10^8 M^{-1} for Zn^{2+}, 9.001×10^8 M^{-1} for Hg^{2+} and 8.139×10^8 M^{-1} for I^-. Further, we report an easy-to-use, low cost and disposable paper-based sensing device for rapid chemical screening of Zn^{2+}, Hg^{2+} and I^-. The device comprises luminescent sensing probes embedded into a cellulose matrix where the resonance energy transfer phenomenon seems to be the sensing mechanism. It opens up new opportunities for simple and fast screening in remote settings where sophisticated instrumentation is not always available. The MOPAC-2016 software package has been used to optimize the L using PM7 well established method and calculates the HOMO-LUMO energy band gap for structure L and L with Zn^{2+}, Hg^{2+} and I^- ion based structures. The molecular docking study has been carried out using HEX software.

1. Introduction

At present, the scientific community is taking much interest in a large and mature family of supramolecular chemistry having cyclodextrins, cucurbiturils, cryptands, crownethers and calixarenes as family members. Among them, calixarenes[1], a methylene bridged cyclic oligomer of phenol, has drawn a great attention due to its flexible arrangement. There are variety of calixarene derivatives but calix[4]arene has been found to be outstanding platform as the host molecule because it can provide the space adequate in the realm of host-guest chemistry and can be excellent and versatile ionophore. Calix[4]arene can be modified by functionalizing at upper and lower rim of it which turns it into an effective host compound for a wide variety of guest molecules such as cations, anions and neutral molecules with well-defined binding core[2-5].

Considerable efforts have been done on exploring efficient and economic artificial molecular receptor for targeted cations, anions and neutral molecules recognition and sensing through direct visual observation. To sense an ion, a chemosensor should be more selective, rapid and cost-effective. Fluorometry technique fulfills all these criteria and a chemosensor based on fluorescence acts as an attractive host molecule. The calix[4]arene based fluorescent chemosensor possesses mainly two parts i.e. an ionophore which is responsible for guest ion binding and a fluorophore responsible for signal transduction. The mechanism of fluorescence involved in calix[4]arene system is mainly photoinduced electron transfer (PET)[6-8], fluorescence resonance energy transfer (FRET)[9-11], photoinduced charge transfer (PCT)[12-13], metal-ligand charge transfer (MLCT)[14], proton transfer[15], formation of an excimer[16] and chelation-enhanced fluorescence (CHEF)[17] for the molecular recognition.

Among various transition metals, Zn^{2+} is the second most abundant transition metal ion in human body after iron. It is very essential element in many biological processes such as protein synthesis, neural transduction, gene transcription, immune functions, brain function and pathology and mammalian reproduction. Failure to maintain zinc homeostasis causes alzheimer's disease, epilepsy, low blood sugar, ischemic stroke and infantile diarrhea[18-20]. The detection of heavy metals is receiving ever-increasing attention by researchers nowadays. Mercury is considered as one of the most notorious toxic metals to environment which causes severe neurotoxic, genotoxic and immunotoxin effects and thus poses severe risk

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Single-step fluorescence recognition of As^{3+}, Nd^{3+} and Br^- using pyrene-linked calix[4]arene: application to real samples, computational modelling and paper-based device†

Pinkesh G. Sutariya, *[a] Heni Soni,[a] Sahaj A. Gandhi[b] and Alok Pandya[c]

A new fluorescence sensor, namely, TDPC, which is composed of a pyrene group connected to calix[4]arene as the fluorogenic unit, has been synthesized, characterized and analyzed with regard to its selective sensing ability for As^{3+} (0–150 nM), Nd^{3+} and Br^- (0–120 nM), with detection limits of 11.53 nM, 0.65 nM and 11.25 nM, respectively. The binding constant (K_s) was found to be 7.842×10^8 M^{-1} for As^{3+}, 6.877×10^8 M^{-1} for Nd^{3+} and 6.311×10^8 M^{-1} for Br^-. Furthermore, we report an easy-to-use, low-cost and disposable paper-based sensing device for rapid chemical screening of As^{3+}, Nd^{3+} and Br^-. The device comprises a luminescent sensing probe embedded in a cellulose matrix in which resonance energy transfer seems to be the sensing mechanism. It opens up new opportunities for simple and fast screening in remote settings where sophisticated instrumentation is not always available. The MOPAC2016 software package was used to optimize TDPC using the well-established PM7 method, and the HOMO–LUMO energy band gap was calculated for TDPC and TDPC with structures based on As^{3+}, Nd^{3+} and Br^- ions. To determine the influence of different metal ions on TDPC, a molecular docking study was carried out using HEX software. Furthermore, to assess its analytical applicability, the prepared sensor was successfully used for the analysis of two different real samples (an industrial soil sample for Nd^{3+} and industrial waste water for As^{3+} and Br^-) to validate the proposed method, with recoveries of ions of 95–99%.

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1. Introduction

The design and development of a reliable and economic molecular receptor for the detection of cations, anions and neutral molecules by direct visual observation is an intriguing feature of modern science. Because of the increasing use of toxic metals in numerous fields, it is essential to manufacture a sensor that can detect toxic metals. As arsenic compounds are known to be toxic to humans and animals, they have proved to be an issue of global concern. Although arsenic compounds are present in different chemical forms in groundwater, such as arsenite (AsO_2^-, As^{3+}) and arsenate ($HAsO_4^{2-}$, As^{5+}), As^{3+} is 50 times more toxic than any other form of arsenic because of its interaction with enzymes in human metabolism. Arsenic causes several major health hazards including dermal changes, respiratory, cardiovascular, gastrointestinal and carcinogenic effects, *etc.* and may even cause liver, bladder and lung cancer. West Bengal (India) and Bangladesh, together with 20 other nations worldwide, are affected by arsenic contamination, mostly in drinking water, which is spreading rapidly through groundwater.[1–3] Although neodymium is the second most abundant rare earth element, its content in the human body is quite small, and it can adversely affect certain body parts. In nature, it is found in minerals such as monazite and bastnasite. However, although neodymium compounds are less toxic, neodymium dust and salts are irritating to the eyes and can affect the liver and cause lung embolisms. In addition, neodymium is used in the development of permanent magnets that are used in microphones, professional loudspeakers, headphones and computer hard disks. It is used for coloring glass to make goggles for welders and glassblowers. Furthermore, neodymium acts as an anticoagulant, especially when given intravenously.[4] In the same way as cations, anions need to be detected rapidly using chemosensors owing to their importance in the fields of chemical, biological and environmental sciences.

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Novel luminescent paper based calix[4]arene chelation enhanced fluorescence- photoinduced electron transfer probe for Mn^{2+}, Cr^{3+} and F^-

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Abstract

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1. Introduction

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Literary Aesthetics and Ethnicity in Fictions of Bharati Mukherjee

Hardik S. Bhatt
Research Scholar

Abstract

The term *ethnicity* has its own values and importance in literature and society. It is debated and used with different dimensions. It is also used in a large scale in fictions in English literature. United States of America is a continent where authors used ethnicity in their works. One of them, is Bharti Mukherjee, an Indian origin who also wrote on ethnic issues through her fictions. This article intends to study literary aesthetics and ethnicity in context to selected fictions of Bharati Mukherjee. *Jasmine*, *The Tigher`s Daughter,Wife* and *Darkness* are mainly studied with a view to assess the level of literary aesthetics and ethnicity for the purpose of this study. The method of study is critical literary analysis of aspects concern to the selected fictions. To conclude, the power conflict operating between different ethnic groups, change of attitudes towards ethnicities, rhetoric of ethnicity, self-repositioning, travel as a metaphor, autobiographical elements, deterritorialization, realism, violence and aesthetics of the ethnic female literary tradition are evaluated in her fictions.

Key Words: Literary aesthetics, ethnicity, self-repositioning, deterritorialization, realism.

Introduction

The critical theorists agree with connection between literature and aesthetics. These two disciplines are some times observed as indirectly associated with each other in literature. It is also argued that aesthetic of literature one must avoid emphasizing only incentre textual properties such as figurative language, imagery and so forth. The surface meaning should also not be given priority and, finally, the debate about literary aesthetics should never be reduced to mere perspectives of plot and character. These areas can be congenial to the literary critics but one has to admit that there exists an overlapping of critical views over aesthetic ones. One possible connection between literature and aesthetics is when literary works are treated as objects of aesthetic appraisal and such appraisal is promoted through them. This idea helps to resist the reduction of literature to something else such as ethics or pure philosophy. But if literature rests within the limits of the idea of literature as art and adheres to the conception of literary works as having distinctive characteristics in contrast with other art works, then an aesthetics of literature is possible.

The word 'ethnicity' is derived from the older adjective and noun form 'ethnic," which in turn *can* be traced to the Greek word"Ethnikos". In the Greek Bible, ethnikos refers to non-Israelites orgentiles. In the Christian era (after the fourteenth century) 'ethnic"came to be defined as "pagan, heathen or non-Christian." Only in the mid - nineteenth century did the more familiar meaning of ethnic as 'peculiar to a

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Solvent effect on neutral Co (II) complexes of paeonol derivative —qualitative and quantitative studies from energy frame work and Hirshfeld surface analysis

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ABSTRACT

Co (II) Complex of 1-(2-hydroxy-4-methoxyphenyl)ethanone has been synthesized and crystallized as solvates. The crystallization solvents used are β-picoline and pyridine. However, from β-picoline the metal complex crystallized without solvent as $Co[(C_9H_9O_3)]_2$(A) in monoclinic space group $P2_1/c$ with lattice parameters $a = 6.576(1)$Å, $b = 11.6897(18)$Å, $c = 10.8788$ (17)Å, $\beta = 97.124$ (2)° and $Z = 4$. From pyridine, complex crystallizes with two solvent molecules as $Co[(C_9H_9O_3)_2(C_5H_5N)_2]$(B) in the monoclinic space group C2/c with $Z = 4$ and lattice parameters as $a = 17.698(2)$Å, $b = 14.4312(16)$Å, $c = 10.8803(12)$Å, and $\beta = 116.94(2)°$. In both unsolvated (A) and solvated (B) complexes Co occupies the special position (000). In solvated complex (B) the nitrogen (N_1, N_2) and carbon (C_{12}, C_{15}) of both the solvent pyridines lie on symmetry axis along with Co thereby generating other half of both the pyridines symmetrically. In unsolvated complex (A), molecular geometry around Co is distorted tetrahedral with Co coordinating to all four oxygens of bidentate ligand (Paeonol) forming a pseudo square planer configuration where as in the solvated complex (B) Co forms a pseudo square planer configuration along with nitrogens of the solvent pyridines occupying apexial position to complete the octahedral sphere. Similarities and differences in the molecular packing of unsolvated and solvated Co complex are established through the investigation of qualitative and quantitative contribution of intermolecular interactions using Hirshfeld surface and energy frame work analysis. The quantitative contributions of each intermolecular interaction towards molecular stability reveals comparatively higher value of energy (negative) for the solvated complex (B) than those of unsolvated complex (A) highlighting the significant contributions of solvent molecule in molecular stability.

1. Introduction

The presence of solvent in the lattice drastically influences the molecular packing. Different crystallographic environments enforce the molecule to crystallize in different space group leading to different packing mode. Paeonol, a herbal medicine found a place in medicine in Asian countries since ancient times, due to its analgesic, anti-pyretic, anti-inflammatory, antihypertensive and antibacterial properties and also used in the treatment of arthritis and collagen-induced human blood platelet aggregation in a dose-dependent manner [1]. The use of transition metal complexes of organic ligand molecule as promising therapeutic compounds has become more and more pronounced due to the wider and diversified biological spectrum of the metal complex compare to free ligand [2–4]. In this paper, we focus to the geometry of Co complex of a novel Paeonol derivative in two different unsolvated and solvated crystallographic environments. In unsolvated complex, metal Co observed to form a distorted tetrahedral geometry whereas the presence of solvent in the lattice of solvated complex, directly participating in coordination with metal Co, thereby compelling metal Co to form a stronger octahedral coordination sphere resulting in comparatively stronger packing of solvated complex than the unsolvated one. Both the structures are worked out by X-Ray crystallography. Differences in the molecular structure in terms

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ORIGINAL PAPER

Structural analysis and charge transfer properties of a novel pyrazoline derivative: potential energy scan, XRD, DFT and molecular docking studies

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Abstract: The title molecule, 1-[3-(6-bezyloxy-2-hydroxy-4-methyl-cyclohexa-2, 4-dienyl)-5-phenyl-4, 5-dihydro-pyrazol-1-yl]-propan-1-one was synthesized and characterized by FTIR, ^{1}H NMR, ^{13}C NMR and single-crystal X-ray diffraction technique. The optimized geometry is calculated using density functional theory (DFT). A good linear correlation was observed between experimental data and theoretical structural parameters (DFT). Predicted vibrational frequencies were assigned and compared with the experimental IR spectra and they support each other. To determine conformational flexibility and hence to predict the stable geometry, potential energy scan of the molecule was obtained with respect to selected degree of freedom about O18–C19 torsional angle varied from − 180° to + 180° in steps 20°. NBO analysis was carried out for the molecule to check possible hydrogen bond interactions to correlate with those of X-ray data. Molecular stability is mainly due to weak but collective contributions of significant nonconventional C–H…π, π–π and C–H…O-type hydrogen bond interactions and those interactions also quantified by Hirshfeld surface analysis. The thermal stability of the compound was determined with the aid of thermo-gravimetric analysis and differential thermal analysis. The molecular docking study was carried out against the title molecule with 5DBM protein receptor active sites.

Keywords: Pyrazol; Single-crystal XRD; DFT; Conformational analysis; Hirshfeld surface; Molecular docking

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1. Introduction

Pyrazoline derivatives, prominent nitrogen containing heterocyclic compound, found to possess antidepressant [1], antioxidant [2], anti-inflammatory [3], anticonvulsant [4], antimicrobial [5], antiviral [6], monoamine oxidase (MAO-A and MAO-B) inhibitors [7] and anticancer [8] activities. Current literature reveals that some of aryl-pyrazoline possess non-nucleoside HIV-1 reverse transcriptase inhibitory activity and used in formation of pesticide products, intermediates as industrial products and in the development of drug enhancement [9–17]. Pyrazoline derivatives with a phenyl group possess good film-forming properties and exhibit excellent characteristics of blue photoluminescence, fluorescence and electroluminescence properties. Looking toward the significance of pyrazoline derivatives and as a part of our ongoing research work on X-ray crystallographic investigations and quantum chemical computational studies and their theoretical calculations [18–22] prompted us to synthesize a novel significant pyrazoline derivative, 1-[3-(6-Bezyloxy-2-hydroxy-4-methyl-cyclohexa-2,4-dienyl)-5-phenyl-4, 5-dihydro-pyrazol-1-yl]-propan-1-one and characterized spectroscopically using IR, NMR technique and by single-crystal X-ray diffraction study.

Literature survey revealed that the degree of accuracy of DFT methods is comparatively higher in reproducing the experimental values in terms of geometry, dipole moment, vibrational frequency, etc. [23–29], than the other methods. The present study aims to investigate the optimized

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Novel tritopic calix[4]arene CHEF-PET fluorescence paper based probe for La^{3+}, Cu^{2+}, and Br^{-}: Its computational investigation and application to real samples

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ABSTRACT

A calix[4]arene conjugate bearing 1-aminoanthraquinone with amide linkage (L) has been synthesized and characterized, and its ability to recognize three most important essential ions, viz., La^{3+}, Cu^{2+} and Br^{-} has been addressed by fluorescence technique. L shows a minimum detection limit 0.88 nM for La^{3+}, 0.19 nM for Cu^{2+} and 0.15 nM for Br^{-}. The sensor based on (L) exhibits the working concentration range 5–120 nM for (La^{3+}, Cu^{2+} and Br^{-}) with their binding constant(Ks) $10.21 \times 10^{8}\,M^{-1}$($La^{3+}$), $7.04 \times 10^{8}\,M^{-1}$($Cu^{2+}$), $7.96 \times 10^{8}\,M^{-1}$ (Br^{-}). Further, we report an easy-to-use, low cost and disposable paper-based sensing device for rapid chemical screening of La^{3+}, Cu^{2+} and Br^{-}. The device comprises luminescent sensing probe embedded into a nitrocellulose matrix where the resonance energy transfer phenomenon seems to be the sensing mechanism. The MOPAC-2016 software package has been used to optimize the L using PM7 popular method, analysed heat of formation which is −262.5572 kcals/mole and also determined the HOMO-LUMO energy band gap for L and composite of La^{3+}, Cu^{2+} and Br^{-} with L. Furthermore, to assess its analytical applicability the prepared sensor was successfully applied for determination of three different real samples (soil samples for La^{3+}, blood serum for Cu^{2+} and industrial water for Br^{-}) for validation of proposed method by recovery of ions with 94–99%.

1. Introduction

The recognition of cations, anions and molecular species has become the exciting areas of modern-day research significant to the receptor strategy and development. Among all lanthanoids metals, lanthanide has characteristic photo physical and electronic properties which, coupled with the inadequacy of these rare earths in living systems, can afford new insights in the biological and therapeutic fields [1,2]. Transition metal ions play a very important role in many fundamental biological processes. Copper is the third most abundant transition metal of the human body which assist as a cofactor by taking an active part in a large range of enzymes and its importance may be recognized to its redox nature [3–7]. Anions play many important roles in biological systems, the environment and in industrial applications. The biological essentiality of bromide for basement membranes assembly and tissue development have been recently revealed [8]. Moreover, several studies have been demonstrated its low degree of toxicity and reduced toxicological concern in nutrition [9]. However, it has also been reported in the literature that bromide, which is ubiquitously found in water, is a key matrix component in oxidative water treatment processes as it can promote the formation of undesired compounds [10]. Numerous methods have been established for the detection of La^{3+}, Cu^{2+} and Br^{-} individually but none of these techniques are amenable to real-time analysis, also they are expensive in terms of reagent consumption, cost of instrumentation, and time-consuming procedures with high detection limits. In contrast, fluorescent chemical sensors provides real-time analysis, no expensive reagents, low cost of instrumentation and accessibility. The mechanism of fluorescent chemical sensor depends upon binding with molecular ions which can be either fluorescence quenching or fluorescence enhancement. Designing of molecular receptor is a crucial aspect of this technique. The more number of aromatic fluorophores in the locality, the more they come adjacent enough to create van der waals contact with Π– Π stacking. This route of recognition comprises an ion sensing unit (ionophore) which is allied with a fluorophore whose photophysical properties are disturbed during the recognition process, producing

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ARTICLE

Luminescent behavior of pyrene-allied calix[4]arene for highly pH selective recognition and determination of Zn^{2+},Hg^{2+} and I^- via CHEF-PET mechanism: Computational experiment and paper based device

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In this article, we have reported for the first time a novel CHEF-PET fluorescence sensor L, based on calix[4]arene containing four pyrene groups as binding sites which is highly selective and sensitive towards Zn^{2+}, Hg^{2+} and I^-. This fluorescence probe has been synthesized, characterized by emission study, UV-vis titration, ^1H NMR spectroscopy and ESI-MS investigation. The linear concentration range at pH 7 of L for Zn^{2+}, Hg^{2+} and I^- is 0-135 nM, 0-140 nM and 0-120 nM respectively with the detection limit of 6.43 nM for Zn^{2+}, 2.94 nM for Hg^{2+} and 20.93 nM for I^-. The binding ability was determined through benesi-hildebrand equation which was found to be 7.535×10^8 M^{-1} for Zn^{2+}, 9.001×10^8 M^{-1} for Hg^{2+} and 8.139×10^8 M^{-1} for I^-. Further, we report an easy-to-use, low cost and disposable paper-based sensing device for rapid chemical screening of Zn^{2+}, Hg^{2+} and I^-. The device comprises luminescent sensing probes embedded into a cellulose matrix where the resonance energy transfer phenomenon seems to be the sensing mechanism. It opens up new opportunities for simple and fast screening in remote settings where sophisticated instrumentation is not always available. The MOPAC-2016 software package has been used to optimize the L using PM7 well established method and calculates the HOMO-LUMO energy band gap for structure L and L with Zn^{2+}, Hg^{2+} and I^- ion based structures. The molecular docking study has been carried out using HEX software.

1. Introduction

At present, the scientific community is taking much interest in a large and mature family of supramolecular chemistry having cyclodextrins, cucurbiturils, cryptands, crownethers and calixarenes as family members. Among them, calixarenes[1], a methylene bridged cyclic oligomer of phenol, has drawn a great attention due to its flexible arrangement. There are variety of calixarene derivatives but calix[4]arene has been found to be outstanding platform as the host molecule because it can provide the space adequate in the realm of host-guest chemistry and can be excellent and versatile ionophore. Calix[4]arene can be modified by functionalizing at upper and lower rim of it which turns it into an effective host compound for a wide variety of guest molecules such as cations, anions and neutral molecules with well-defined binding core[2-5].

Considerable efforts have been done on exploring efficient and economic artificial molecular receptor for targeted cations, anions and neutral molecules recognition and sensing through direct visual observation. To sense an ion, a chemosensor should be more selective, rapid and cost-effective. Fluorometry technique fulfills all these criteria and a chemosensor based on fluorescence acts as an attractive host molecule. The calix[4]arene based fluorescent chemosensor possesses mainly two parts i.e. an ionophore which is responsible for guest ion binding and a fluorophore responsible for signal transduction. The mechanism of fluorescence involved in calix[4]arene system is mainly photoinduced electron transfer (PET)[6-8], fluorescence resonance energy transfer (FRET)[9-11], photoinduced charge transfer (PCT)[12-13], metal-ligand charge transfer (MLCT)[14], proton transfer[15], formation of an excimer[16] and chelation-enhanced fluorescence (CHEF)[17] for the molecular recognition.

Among various transition metals, Zn^{2+} is the second most abundant transition metal ion in human body after iron. It is very essential element in many biological processes such as protein synthesis, neural transduction, gene transcription, immune functions, brain function and pathology and mammalian reproduction. Failure to maintain zinc homeostasis causes alzheimer's disease, epilepsy, low blood sugar, ischemic stroke and infantile diarrhea[18-20]. The detection of heavy metals is receiving ever-increasing attention by researchers nowadays. Mercury is considered as one of the most notorious toxic metals to environment which causes severe neurotoxic, genotoxic and immunotoxin effects and thus poses severe risk

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Financial Analysis of Nadiad Municipality-A Correlation Assessment of Income and Expenditure

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Abstract

Local self-Government is an integral and inalienable part of democratic government. It completes the three-tier system of a country's federal governmental structure. Which includes, sovereign national government, quasi-sovereign state governments, and intra-sovereign local governments. All three are working as partners in the great enterprise of securing a decent level of existence for the entire nation's citizen. Local government, created either by a national or state enactment, acts as an agent of development and provides certain services of immense importance to the people living under its jurisdiction, with a strong emphasis on popular initiative and participation. The importance of the subject of local finance follows logically and essentially from the growing importance of government activity in the modern world. Finance may be described as the lubricant for the smooth functioning of the local government machinery. The study is an assessment of income and expenditure of the Nadiad Municipality in Gujarat state, to suggest suitable strategies to sustain and improve its financial management. The performance is measured through a relative comparison of the various components of income and expenditure in terms of the logarithm. All the major heads of income and expenditure have been analyzed through descriptive and correlation analysis. Total Revenue is correlated with Total Expenditure positively and significantly. Surprisingly Loan is not correlated with any of the components of Expenditure and Revenue.

Key Word: Urban Finance, Nadiad Municipality, Total Revenue, Total Expenditure

JEL Code: H7, H72

Introduction

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India is experiencing an accelerated growth rate of urbanization. The urban population has been growing at a rate of 30-40 % per decade since 1961. The urban population is increasing from a stable decadal growth rate of 10% to the total population at the beginning of the 20th Century to the current decadal growth rate of around 30%.[3]

Growth of urbanization leads to the need for better communication, migration, floating population and mushrooming of slums. Thus, there is a need to provide housing, health, water supply, sanitation, and education. Urbanization is a job-creating process and contributes to the economy and overall growth of the country. The urban share of GDP was estimated at 62-63 per cent in 2009-10 by the 12thFive Year Plan. Also, increased demand for urban infrastructure is related to growing urbanization.

The importance of the subject of local finance follows logically and essentially from the growing importance of government activity in the modern world. Finance may be described as the lubricant for the smooth functioning of the local government machinery. The relation between local functions and local finance are inseparably intertwined. They are concurrent to each other, and one exists for the other. Local functions cannot be performed without local finance, and without functions, the need for finance does not arise.[4] Local finance, which is a branch of public finance, deals with the income and expenditure of the local government and with the adjustment of one to the other. Local finance deals with the process and principles of raising and spending money essential for the support of the local government in satisfying the collective wants of the people under its jurisdiction.

The study is an assessment of income and expenditure of the Nadiad Municipality in Gujarat state, to suggest suitable strategies to sustain and improve their financial management.

'Sudhrai' was established in Nadiad in 1866. Much of the development has been observed after the establishment of Sudhrai in this city. Nadiad Sudhrai was replaced by 'Municipality' on 1st April 1883.

[3] Census of India (1991) gives a distilled picture of the growth of cities, further details and analysis on urbanization patterns and trends can be found in Kundu (2006).

[4] Bardoli U. N., Local Finance in Assam, Dutta Branch & Co., Gauhati, 1972 p.1

Afterwards, this Municipality has been growing exponentially. The first survey of this town was completed during 1820-'26.

Nadiad, is located in Gujarat state, in India. It is not a city, but it is the administrative centre of Kheda district. The city has roots that go to the glorious past and stands as the epitome of well-administered cities in Gujarat. The city is also alternatively known as Sakshar Bhumi or the Land of the Educated. The town has historical importance in terms of freedom struggle, has an impressive literary and scholarly history and is an ancient place that has been ruled by various rulers.

Review of Literature

There have been very few attempts made to analyze the finances of local bodies. Jha (2002) has examined it in the context of rural local bodies, while Mathur and Thakur (2004) have done it in the urban context. There were more other isolated attempts by Pethe and Lalvani (2006), Bagchi and Chttopadhyay (2004), and are limited in their scope and approach for evaluating local governments.

A good amount of research is available so far as municipal finances of Gujarat are concerned. They distinguished on the basis and of the methodology used, the time period considered and the regions taken for the study. Important researches are from Joshi (1994), Parekh (2004), Oddedara (2005) and Joshi (1999) specifically for Gujarat Municipalities. These are the studies mainly deals with the income and expenditure analysis of the local bodies.

Data and Methodology

This paper is based on published secondary data and research materials, budgets of relevant urban governments, various reports, and discussion with concerned people in the Nadiad municipality.

For the present study, the detailed absolute data for the last twenty-one year relating to the financial condition of the Nadiad Municipality (NMC) is considered. The data on revenue and expenditure for the 21 years between 1996-97 and 2016-17 was obtained from the various annual accounts and annual budgets the municipality. Some information was not available with their sources and was obtained through discussions with officers of the account section and other departments of the NMC. To find the accuracy of data and association among the various components of Revenue and Expenditure of NMC, descriptive statistics and correlation analysis are used.

Limitations:

The major limitation of the study is that, all the statistical information required for intensive research on local finance which is not readily available. So, the study cannot be extended in many directions. This study is a case study for the finances of the Nadiad Municipality, so it is not a General study. The other limitation of the study is that it accounts for only twenty-one years of data. The analysis has been done keeping in mind the form in which data are available. All this may be considered as limitations of the study.

Table-1

Description of the Abbreviated Terms used in the Analysis

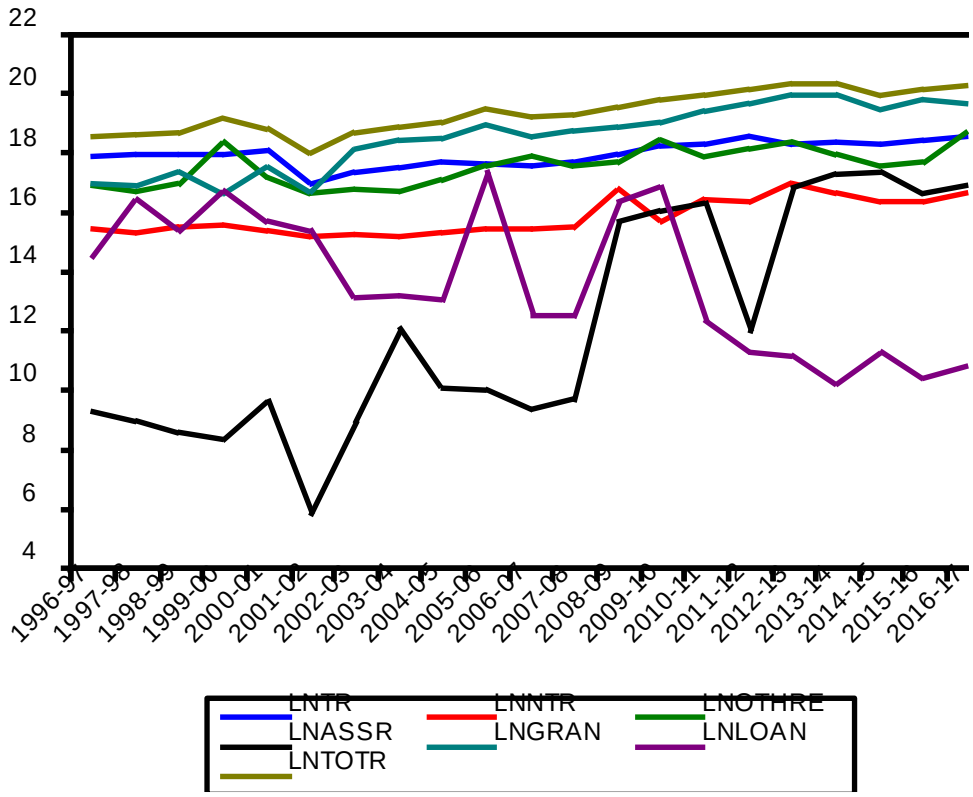
Sr. No.	Variable	Description
1.	LNTR	Total Revenue of Municipality
2.	LNNTR	Non-Tax Revenue of Municipality
3.	LNOTHRE	Other Receipts of Municipality
4.	LANSSR	Assigned Revenue of Municipality
5.	LNGRAN	Gran in Aid Received by Municipality
6.	LALOAN	Loan Taken by Municipality
7.	LNTOTR	Total Tax Revenue of Municipality
8.	LNEST	Establishment Expenditure of Municipality
9.	LNCA	Capital Expenditure of Municipality
10.	LNADM	Administrative Expenditure of Municipality
11.	LNOM	Operational and Maintenance Expenditure of Municipality
12.	LNOTHER	Other Expenditure of Municipality
13.	LNTOTEX	Total Expenditure of Municipality

Table-2

Descriptive Statistics of Total Revenue and Its Components (Log Value)

	LNTR	LNNTR	LNOTHRE	LNASSR	LNGRAN	LNLOAN	LNTOTR
Mean	17.96032	15.84943	17.56890	12.18784	18.52732	13.65167	19.37448
Median	17.96993	15.54006	17.59132	10.05750	18.76683	13.14326	19.28637
Maximum	18.58502	16.94043	18.78153	17.38844	19.97096	17.38092	20.36067
Minimum	16.95830	15.16526	16.64173	5.831882	16.60884	10.19839	18.01718
Std. Dev.	0.417286	0.603959	0.647731	3.799921	1.116209	2.373362	0.688490
Skewness	-0.518208	0.516303	0.125267	0.199402	-0.413741	0.101648	-0.101269
Kurtosis	2.758439	1.626059	1.879772	1.495044	1.867258	1.592228	1.897202
Jarque-Bera	0.990945	2.584741	1.152969	2.120945	1.721852	1.770259	1.100037
Probability	0.609283	0.274619	0.561870	0.346292	0.422770	0.412661	0.576939
Sum	377.1667	332.8381	368.9468	255.9447	389.0737	286.6851	406.8641
Sum Sq. Dev.	3.482552	7.295331	8.391121	288.7880	24.91846	112.6570	9.480368
Observations	21	21	21	21	21	21	21

Graph – 1
Line Graph of Total Revenue and Its Components



The above table no.2 provides a descriptive analysis of the Total Revenue and Its components in log value for the year 1996-97 to 2016-17 of Nadiad Municipality (NMC). It accounts for Mean, Median, Standard Deviation and Skewness for various components of Revenue of NMC. The table also provides information on the normality of the data. The value of Jarque-Bera statistics showed acceptance of the null hypothesis- the data are normally distributed. The graph of all the components of Revenue depicts the variability of various components. It is evident from the graph that the Grant-in-Aid received by the NMC accounts for the highest share in the total revenue.

Table -3

Correlation and Covariance Analysis

Covariance Analysis: Ordinary							
Correlation							
Probability	LNTR	LNNTR	LNOTHRE	LNASSR	LNGRAN	LNLOAN	LNTOTR
LNTR	1.000000						

LNNTR	**0.763986****	1.000000					
	0.0001	-----					
LNOTHRE	**0.686053****	**0.692574****	1.000000				
	0.0006	**0.0005**	-----				
LNASSR	**0.739244****	**0.857512****	**0.623979****	1.000000			
	0.0001	**0.0000**	**0.0025**	-----			
LNGRAN	**0.602897****	**0.760139****	**0.603410****	**0.840433****	1.000000		
	0.0038	**0.0001**	**0.0038**	**0.0000**	-----		
LNLOAN	**-0.435807***	**-0.556369****	-0.303913	**-0.544000***	**-0.697480***	1.000000	
	0.0483	**0.0088**	0.1805	**0.0108**	**0.0004**	-----	
LNTOTR	**0.811742****	**0.863500****	**0.817606****	**0.880020****	**0.915513****	**-0.604227****	1.000000
	0.0000	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0037**	-----

(** and * indicate significant level at 1 % and 5 % respectively)

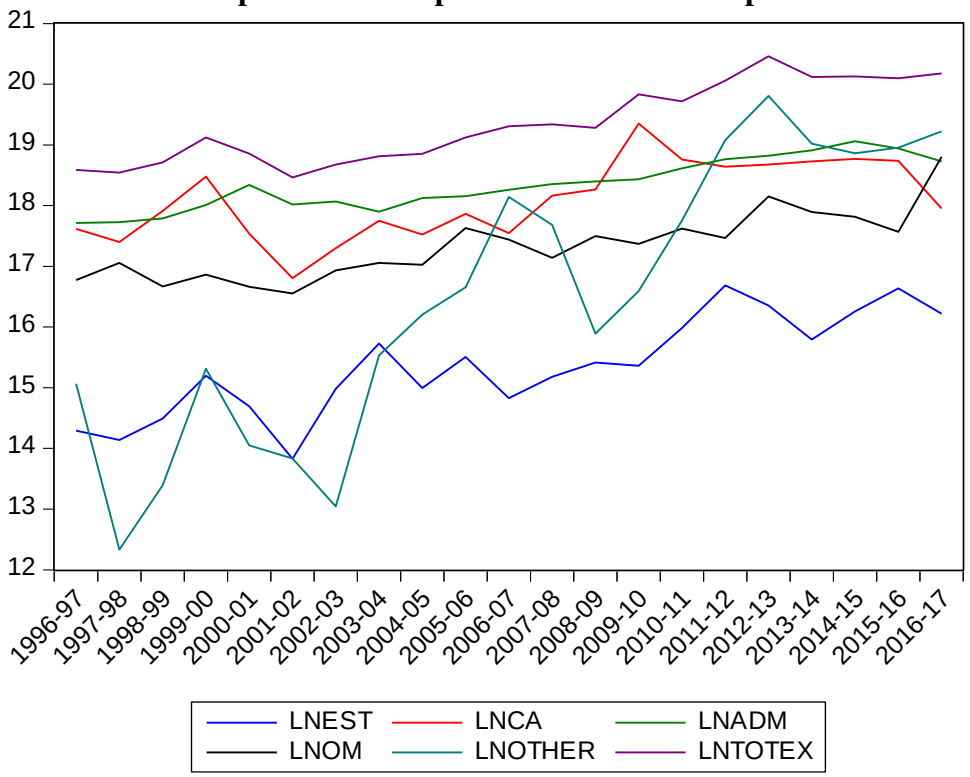
The table number 3 is on the Correlation analysis of various components of revenue. It is revealed from the table that Grant in Aid and Assigned Revenue are correlated, and it is statistically significant at a 5 % significant level. Total Revenue is significantly and positively correlated with Assigned Revenue, Grant in Aid and Tax Revenue. Nearly 96 % variation in the Total Revenue has been due to the Grant-in-Aid component of NMC. Tax Revenue is also significantly and positively correlated with Grant in Aid component of Revenue of NMC.

Table- 4

Descriptive Statistics of Total Expenditure and Its Components (Log Value)

	LNEST	LNCA	LNADM	LNOM	LNOTHER	LNTOTEX
Mean	15.36036	18.08459	18.33954	17.33236	16.49690	19.34655
Median	15.36170	17.95023	18.34225	17.36769	16.59424	19.27971
Maximum	16.68514	19.35172	19.05929	18.80275	19.80799	20.45893
Minimum	13.83106	16.80546	17.71375	16.55173	12.33135	18.46303
Std. Dev.	0.819686	0.643120	0.417804	0.553895	2.298224	0.644735
Skewness	-0.068653	0.018690	0.149911	0.782605	-0.239004	0.237197
Kurtosis	2.091275	2.213980	1.851047	3.486162	1.824862	1.615277
Jarque-Bera	0.739054	0.541821	1.233737	2.350457	1.408261	1.874694
Probability	0.691061	0.762685	0.539632	0.308748	0.494538	0.391666
Sum	322.5677	379.7764	385.1304	363.9796	346.4348	406.2776
Sum Sq. Dev.	13.43770	8.272064	3.491205	6.135985	105.6367	8.313656
Observations	21	21	21	21	21	21

Graph – 2
Line Graph of Total Expenditure and Its Components



The above table provides a Descriptive analysis of the Total Expenditure and Its components in absolute value for the years 1996-97 to 2016-17 of Nadiad Municipality (NMC). It accounts for Mean, Median, Standard Deviation and Skewness for various components of Revenue of NMC. The table also provides information on the normality of the data. The value of Jarque-Bera statistics showed acceptance of the null hypothesis- the data are normally distributed. The graph of all the components of Expenditure depicts the variability of various components. It is evident from the graph that the Other Expenditure by the NMC accounts for the highest share in the total expenditure.

Table No -5

Correlation Analysis

Covariance Analysis: Ordinary						
Correlation						
Probability	LNEST	LNCA	LNADM	LNOM	LNOTHER	LNTOTEX
LNEST	1.000000					

LNCA	**0.732733****	1.000000				
	0.0002	---				
LNADM	**0.828579****	**0.684757****	1.000000			
	0.0000	**0.0006**	---			
LNOM	**0.751657****	**0.513299***	**0.743378****	1.000000		
	0.0001	**0.0173**	**0.0001**	---		
LNOTHER	**0.832582****	**0.657918****	**0.851979****	**0.803868****	1.000000	
	0.0000	**0.0012**	**0.0000**	**0.0000**	---	
LNTOTEX	**0.877329****	**0.807224****	**0.928043****	**0.842154****	**0.913984****	1.000000
	0.0000	**0.0000**	**0.0000**	**0.0000**	**0.0000**	---

(** and * indicate the significant level at 1 % and 5 % respectively)

Table no. 5 is on the correlation analysis of various components of the total Expenditure of NMC. Administrative Expenditure, Establishment Expenditure, Other Expenditure and Operational and Maintenance Expenditure are significantly and positively correlated with Total Expenditure of NMC. Nearly 90 % of the variability in total expenditure is due to Other Expenditure of NMC.

Table -6
Correlation Analysis of Total Income and Expenditure

Covariance Analysis: Ordinary													
Correlation													
Probability	LNADM	LNASSR	LNCA	LNEST	LNGRAN	LNLOAN	LNNTR	LNOM	LNOTHER	LNOTHRE	LNTOTEX	LNTOTR	LNTR
LNADM	1.000000												

LNASSR	**0.820865**	1.000000											
	0.0000**	-----											
LNCA	**0.684757**	**0.773767**	1.000000										
	0.0006**	**0.0000****	-----										
LNEST	**0.828579**	**0.795469**	**0.732733**	1.000000									
	0.0000**	**0.0000****	**0.0002****	-----									
LNGRAN	**0.864062**	**0.840433**	**0.653725**	**0.876444**	1.000000								
	0.0000**	**0.0000****	**0.0013****	**0.0000****	-----								
LNLOAN	**-0.696633**	**-0.544000**	-0.294283	**-0.651026**	**-0.697480**	1.000000							
	0.0005**	**0.0108***	0.1954	**0.0014****	**0.0004****	-----							
LNNTR	**0.822506**	**0.857512**	**0.677129**	**0.753985**	**0.760139**	**-0.556369**	1.000000						
	0.0000**	**0.0000****	**0.0007****	**0.0001****	**0.0001****	**0.0088****	-----						
LNOM	**0.743378**	**0.805835**	**0.513299**	**0.751657**	**0.826199**	**-0.575040**	**0.794465**	1.000000					
	0.0001**	**0.0000****	**0.0173***	**0.0001****	**0.0000****	**0.0064****	**0.0000****	-----					
LNOTHER	**0.851979**	**0.732086**	**0.657918**	**0.832582**	**0.869481**	**-0.727201**	**0.741018**	**0.803868**	1.000000				
	0.0000**	**0.0002****	**0.0012****	**0.0000****	**0.0000****	**0.0002****	**0.0001****	**0.0000****	-----				
LNOTHRE	**0.656346**	**0.623979**	**0.730091**	**0.660586**	**0.603410**	-0.303913	**0.692574**	**0.733622**	**0.746908**	1.000000			
	0.0012**	**0.0025****	**0.0002****	**0.0011****	**0.0038****	0.1805	**0.0005****	**0.0002****	**0.0001****	-----			
LNTOTEX	0.928043	**0.861327**	**0.807224**	**0.877329**	**0.878379**	**-0.657991**	**0.859505**	**0.842154**	**0.913984**	**0.823094**	1.000000		
	0.0000	**0.0000****	**0.0000****	**0.0000****	**0.0000****	**0.0012****	**0.0000****	**0.0000****	**0.0000****	**0.0000****	-----		
LNTOTR	**0.887567**	**0.880020**	**0.814522**	**0.908135**	**0.915513**	**-0.604227**	**0.863500**	**0.869627**	**0.890324**	**0.817606**	**0.968562**	1.000000	
	0.0000**	**0.0000****	**0.0000****	**0.0000****	**0.0000****	**0.0037****	**0.0000****	**0.0000****	**0.0000****	**0.0000****	**0.0000****	-----	
LNTR	**0.688119**	**0.739244**	**0.765553**	**0.708081**	**0.602897**	**-0.435807**	**0.763986**	**0.629360**	**0.612521**	**0.686053**	**0.785477**	**0.811742**	1.00
	0.0006**	**0.0001****	**0.0001****	**0.0003****	**0.0038****	**0.0483***	**0.0001****	**0.0022****	**0.0032****	**0.0006****	**0.0000****	**0.0000****	-----

(** and * indicate significant level at 1 % and 5 % respectively)

The above table no. 6 shows the correlation matrix for all components of Total Revenue and Total Expenditure of NMC. So far as Total Revenue is concerned, it positively and significantly associated with Administration Expenditure, Assigned Revenue, Establishment Expenditure, Grant in Aid, Non-Tax Revenue, Other Expenditure, Operational and Maintenance Expenditure, Tax Revenue, and Total Expenditure. The majority variation in Total Revenue is due to Total Expenditure.

While, considering Total Expenditure of NMC, it is positively and significantly associated with Administration Expenditure, Assigned Revenue, Establishment Expenditure, Grant in Aid, Non-Tax Revenue, Other Expenditure, Operational and Maintenance Expenditure, Tax Revenue and Total Revenue. The majority variation in Total Expenditure is due to Total Revenue.

Looking to the correlation of Administration Expenditure with the various components, it is observed, that it is positively and significantly correlated with Establishment Expenditure, Grant in Aid, Other Expenditure, Tax Revenue, Total Expenditure, and Total Revenue. Assigned Revenue is significantly and positively correlated with Establishment Expenditure, Grant in Aid, Operational and Maintenance Expenditure, Total Expenditure and Total Revenue. Capital Expenditure is correlated with Non-Tax Revenue and Other Revenue significantly and positively.

Establishment Expenditure is correlated positively and significantly with Grant in Aid, Other Expenditure, Operational and Maintenance Expenditure, Tax Revenue, Total Expenditure, and Total Revenue. There is a significant and positive correlation observed between Grant in Aid and Other Expenditure, Operational and Maintenance Expenditure, Tax Revenue, Total Expenditure and Total Revenue.

Non Tax Revenue is significantly and positively correlated with Other Revenue and Total Revenue. Other Expenditure is significantly and positively correlated with Operational and Maintenance Expenditure, Total Expenditure and Total Revenue. Tax Revenue is correlated with Total Expenditure and Total Revenue with positively and significantly.

Surprisingly Loan is not correlated with any of the components of Expenditure and Revenue.

Findings and Conclusion

The analysis of the income and expenditure of the NMC for the past twenty-one years under Revenue, (Taxes, rents, fees, fines, etc. and grants) and expenditure (Salaries, wages, electricity charges, fuel charges, street lighting, etc.) revealed that the expenditure is increasing considerably. The trend growth in all major expenditure found significantly growing year after year.

While analysing Total Revenue and Total Expenditure of NMC, Total Revenue is positively and significantly associated with Administration Expenditure, Assigned Revenue, Establishment Expenditure, Grant in Aid, Non-Tax Revenue, Other Expenditure, Operational, Maintenance Expenditure, Tax Revenue, and Total Expenditure. The majority variation in Total Revenue is due to Total Expenditure. Tax Revenue is correlated with Total Expenditure, and Total Revenue are correlated positively and significantly. Surprisingly Loan is not correlated with any of the components of Expenditure and Revenue.

Reference

1. BagchiSoumen and Chattopadhyay S, 2004, "Decentralized Urban Government in India", Economic and Political Weekly, December 4, 2004.
2. Bardoli U. N., 1972, Local Finance in Assam, Dutta Branch & Co., Gauhati, p.1
3. Bhagwan J., 1983, "Municipal Finance in the Metropolitan Cities of India", Concept Publishing Company, New Delhi, p. 5.
4. Census of India, 1993, Emerging Trends in Urbanization in India: An Analysis of 1991 Census Results, Census of India, Government of India.
5. Jha, Shikha, 2002, "Strengthening Local Governments- Rural Fiscal Decentralization in India", Economic and Political Weekly, June 29, 2002.
6. Kundu, Amitabh, 2006, "Trends and Patterns of Urbanization in India", Economic and Political Weekly, July 10.
7. Mohanty P K, 1995, "Reforming Municipal Finances: Some Suggestions in the Context of India's Decentralization Initiative", Urban India, XV (1), January-June.
8. Pethe, Abhay and Mala Lalvan, 2006, "Towards Economic Empowerment of Urban Local Bodies in Maharashtra", Economic and Political Weekly, February 18, 2006.
9. Thakur Sandeep, 2006, "Evaluating the Financial Health of Indian Cities: A Diagnostic Report", (2006).
10. UNDP, 2002, "A Global Analysis of UNDP Support to Decentralization and Local Governance Programme", UNDP, WC.
11. www.egovamc.com
12. Drummond J. M., 1962, "The Finance of Local Governments", George Allen & Unwind Ltd., London. p.20.
13. Hicks U. K., 1947, "Public Finance", Nisbet & Co., p.232.
14. Maheshwari, S R., 1976, "Local Government in India", New Delhi, Orient Longman.
15. Marshall A. H., 1974, "Financial Management in Local Government", George Allen & Unwind Ltd., London. P.156.
16. Mathur, Om Prakash, and Sandeep Thakur, 2004, "India's Municipal Sector: A Study for the Twelfth Finance Commission", New Delhi: National Institute of Public Finance and Policy.
17. Nallathiga, Ramakrishna, 2008, "Trends and Perspectives of Urban Public Finances in Selected Countries and India", *ICFAI Journal of Urban Policy*, III(1):16-32.
18. Pethe, Abhay and Mala Lalvan, 2006, "Towards Economic Empowerment of Urban Local Bodies in Maharashtra", *Economic and Political Weekly*, February 18, 2006.

19. Thakur Sandeep, 2006, “Evaluating the Financial Health of Indian Cities: A Diagnostic Report”, (2006).
20. Vaidya, Chetan, and Brad Johnson, 2001, "Ahmedabad Municipal Bond: Lessons and Pointers", *Economic and Political Weekly*, July 28.
21. UNDP, 2002, “A Global Analysis of UNDP Support to Decentralization and Local Governance Programme”, UNDP, WC.

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'भूंसाता ग्रामचित्रो' : भूंसाय नहीं अेवा ग्रामचित्रो

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प्रस्तावना :

कवि, वार्ताकार, नवलकथाकार, निबंधसर्जक मणिलाल ह. पटेल 'भूंसाता ग्रामचित्रो' निबंधसंग्रहने 'अेकवीसमी सदीमां वांचवानुं पुस्तक' तरीके ओळखावे छे. अेमनुं आ विधान सर्जन संदर्भ करता, ग्रामजीवननी निसबतने व्यक्त करे छे. अेमनुं आ विधान सर्जन संदर्भ करता, ग्रामजीवननी निस्यतने व्यक्त करे छे. आ पुस्तकमां अेमणे भूतकाळ बनी गयेली अेक अवनवी ग्रामसंस्कृतिनी संस्मरणकथानो आलेख दोर्यो छे गुजरातनां लोकजीवननी धबकती चेतना समा गामडानुं जीवन, परिवेष, ग्रामसृष्टि अने तेनी साथे अभिन्नपणे जोडायेली कृषिसृष्टिनां षब्दचित्रो मळे छे. कोइने अहीं पेटलीकरना ग्रामचित्रो के जयंत पाठकना 'वनांचल'नुं स्मरण पण थाय, मणिलाल ह. पटेलनां 'भूंसाता ग्रामचित्रो' नवी आंख बतावे छे. अहीं व्यक्तिचित्रो आछां अने ओछां छे स्थळविषयक चित्रो वधु मळे छे.

पंचमहालनां छेवाडाना नानकडा वतनगामनुं जनपद आ निबंधोनी भोंय छे लेखक गामडानां जन्मेला–जीवतरनां जाणतल खेडूतपुत्र छे. बाळपणथी ज कृषिपरिवेष अने ग्रामजीवन अेमना लोहीमां धबके छे. वतनथी विच्छेद पामी नगरजीवननी जटाजाळमां गूंथायेला आ खेडुतपुत्रनी संवेदना पोताना मलकमां, घर, खेतर, पादर, सीम, वृक्षो, पंखीओ, ऋतुओ तरफ खेंचाती रहे छे. षैषव अने किषोरावस्थामां संवदेला ग्रामपरिवेषना बहुरंगी प्रकृतिरुपो हवे खूब सांभरे छे. अे रीते ग्राम संस्कृतिने अहीं मोकळुं मेदान मल्युं छे. षैषवनुं आ भातीगळ विश्व हवे लोप पामी रहयुं छे, त्यारे निबंधकारनुं मन अतीतने पुन: संवेदवानो तलसाट अनुभव छे, तेमांथी आ ग्रामचित्रो आपणने प्राप्त थाय छे. निबंधकार प्रस्तावनामां लखे छे : "हुं तूटतां गामडांने अने भूंसाता असल ग्रामीचत्रोने बहु सभानपणे वर्षोथी जीवतो अनुभवतो रहयो छुं. साचुं कहुं तो अे ज मारी पीडा छे, ने अे पीडा ठरीने संवेदनानुं रुप पामी त्यारे आ चित्रो लखतां जवानुं बन्युं छे." निबंधकार अहीं ग्रामजीवन तथा जनपदनां ताणावाणामां तणाइ नथी गया, बलके सभान छे, तेथी ग्रामजीवननी वास्तविकतानो वान पण जोवा मळे छे. 'भूंसाता ग्रामचित्रो'मां अे रीत सर्जकनो वतनराग–वतनझुरापो बळकट रीते व्यक्त थयो छे. निबंधकार गाम १९७० पछी छोडे छे, त्यारे अढी दायका पछी आ झुरापो केम व्यक्त थयो हषे ?! निबंधकार तेना प्रत्युत्तर रुपे दीकरीना आंतरज्ञातीय लगन अने परिणामरुप समाज तरफथी मळेला नातवटाने आगळ धरे छे. ज्ञातिना वट–वहेवारने लइन लां...बा समय सुधी गाम जवानुं न थतां लेखकनो वतनप्रेम उत्कट बने छे. अेक तरफ गाम जवानो हठ अने बीजी तरफ भूंसातुं जतुं गाम आ बेनी वच्चे निबंधकार जाणे खूब हिजराया छे. आरंभमां 'गाम जवानी हठ छोडी दे' काव्यमां आ वलवलाट व्यक्त कर्यो छे. जेमां ग्राम संस्कृतिनां प्रत्येकघटकनुं वषीकरण पण जोइ षकाय छे. निबंधकार लखे छे : "परंपराओ जेम विलाती–विसराती जाय अेम कोण जाणे केम व्हाली लागवा मांडे छे ! अेमांय प्रेम के लागणी जेवुं छे. पासे होय ने पामयां होइअे अेनी जाणे कषीविसात नथी रहेती ने जे छूटी जाय