

Research Publication (Journal papers)

[Capturing thematic intervention of nanotechnology in agriculture sector: A scientometric approach](#)

Madhulika Bhati, Kirti Bansal, Radhika Rai, 2019, Analysis, Fate, and Toxicity of Engineered Nanomaterials in Plants, 84, Elsevier

Agriculture has always been the backbone and consider as fuel to the economy of developing countries. It is always the most important and stable sector because it produces and provides raw materials for food and feed industries. Recent agriculture practices have greatly increased the global food supply. But they have also had an inadvertent, adverse impact on ecosystem services, highlighting the need for more sustainable agricultural methods. Excessive and inappropriate use of fertilizers and pesticides has not increased nutrients but toxins also. Long term irrigation and drainage practices have accelerated the rate of weathering of soil minerals, turned soil acidic and eventual desertion of farming lands. Intensive use of fertilizers, pesticides and irrigation has also caused extensive damage to carbon profile in soils and contaminated with harmful trace metals and pesticide residues. Degraded ecosystem has become a serious threat to human health. It is not practically possible to clean these lands without relocating farmers. Nanotechnology in agriculture has gained momentum after realization that the drawbacks of conventional farming technologies as it neither help to increase productivity nor restore ecosystems damaged by existing technologies in conjunction with agriculture implementation practices like irrigation, fertilizers, and pesticides. These all have been questioned both at the scientific and policy levels and must be gradually phased out. Nanotechnology preceded the industrial revolution by around 90 centuries. However, seed of research on the application of nanotechnology in agriculture has been started in several countries is ...

[Commercialisation of Large-Scale Perovskite Solar Energy Technology and Scaling-Up Issues](#)

M Bhati, R Rai - Perovskite Photovoltaics, 2018

Description

Perovskite solar cell (PSC) showed the progress in achieving power conversion efficiency from 0 to beyond 20% in recent years. Perovskite use in solar cell technology can help in the efficient use of solar energy. Third generation of photovoltaic (PV) cells has come up with the technologies like dye-sensitized solar cells, PSCs, organic PV, and quantum dot PVs. Perovskite application in solar cells can help in improving efficiency, flexibility, and cost cutting. Concerns like instability, lead toxicity, and scale-up are still under development. Newer technologies to solve the problem of satisfying the flying demands of energy production created thriving ideas of devices and material development, consequently increasing patent filing activities. This chapter maps the progress of this technology through publications and patent analysis so far. This chapter provides an overview of patenting activity from a historical ...

[Nano-phytoremediation Application for Water Contamination](#)

Madhulika Bhati, Radhika Rai, 441-452,2018, Publisher Springer, Cham

Description

Nanotechnology and phytoremediation both have potential for water purification by removal of contaminants from water. Removal efficiency can be enhanced by combining both the technologies. Both technologies are complementary to each other. Nano-phytoremediation has more cumulative effect than the impact of individual technology. This chapter has provided in-depth overview regarding the progress in the use of nano-phytoremediation application for water purification. This paper highlights the contamination status in Indian context. Through the lens of bibliometric analysis, the research publications have been mapped in the field by different countries, and the analysis is further extended to know the existing technology based on nano-phytoremediation. Comprehensive information regarding international patent classes related to nano-phytoremediation through various patent databases has been ...

Nanotechnology and water purification: Indian know-how and challenges.

[Bhati M](#)¹, [Rai R](#)².

Abstract

Water contamination being ubiquitous problem across the world. A significant strata of population worldwide are still struggling to get drinkable water. This demand to develop technologies to provide clean water at affordable price is unveiling the need of rigorous research in this area. There are several technologies available for removal of persistent as well as emerging pollutants from water. Nanotechnology-based technology are providing the promising solution because of its extraordinary characteristics like large surface area, low cost maintenance and reuse, etc. During the past decade, there is an advancement in the field of nanotechnology and diligent efforts of researchers in achieving milestones in developing nanosorbents, nanostructured catalytic membranes, efficient photo catalysts, bioactive nanoparticles and new filtration regime. This article gives an overview of nanotechnology applications in water purification in India with an attempt to ponder indigenous technologies for implementation. A bibliometric approach is applied to bring the indigenous technologies available. In addition, we discuss some challenges associated with the development of convincing material and building water processing plants for purification of the wastewater.

KEYWORDS:

India; Nanotechnology; Patents; Water and wastewater; Water purification

[Innovation ecosystem of nano water research in India: Step towards basic research to commercialization](#)

Madhulika Bhati, 2013, Pure and Applied Chemistry

Description

In the last decade nanotechnology entered the policy arena as a technology that is promising solutions for most important issues for the world society in the XXI century such as ensuring a supply of safe drinking water for a growing population, as well as addressing issues in medicine, energy, and agriculture worldwide. This research paper is focused on exploring how nanotechnology applications could complement economic and social measures and contribute to addressing the range of global challenges presented by water (eg sustainable provision of clean drinking water) and how it is developing in country like India across the different sectors with special emphasis of water sectors.

This paper not only provide the overview of available prominent technologies in water sector in advanced as well as developing economies like India but also will draw insight how Nanotechnology interventions might be sought at specific junctures to alleviate the following challenges by integrating in water sector from the beginning (research) to end (commercialised product) of value chain.

[Nanotechnology: 'Risk Governance' in India](#)

AP Jayanthi, Koen Beumer, MADHULIKA BHATI, SUJIT BHATTACHARYA, 30-40, 2012, Economic and Political Weekly

Description

This article analyses the potential consequences of the application of nanotechnology in the Indian context and studies the institutional arrangements for "risk governance" of nanotechnology in other countries. It is argued that nanotechnology governance in India requires a separate agency-similar to the one established for biotechnology-to develop human resources, infrastructure, and research and to monitor issues and concerns in the field.

[China and India: The two new players in the nanotechnology race](#)

Sujit Bhattacharya, Shilpa, Madhulika Bhati, 93(1):59-87, 2012, Scentometrics

Nanotechnology is promising to be the 'transformative' technology of the 21st century with its boundless potential to revolutionize a wide range of industries. Stakes are high as projected estimate of market value and economic and social benefits are immense for countries that can attain competency in this technology. This has stimulated OECD countries as well as emerging economies to channel huge resources for developing core capabilities in this technology. Unlike, other key technologies, recent influential reports highlight China in particular and to some extent India, Brazil and other emerging economies competing with advanced OECD countries in 'nanotechnology'. The present paper investigates through bibliometric and innovation indicators to what extent China and India have been able to assert their position in the global stage. The paper also underscores the importance of capturing indications from ...

[China's emergence as a global nanotech player: Lessons for countries in transition](#)

S Bhattacharya, M Bhati - China Report, 2011

Description

Nanotechnology is developing as a strategic branch of science and engineering in the twenty-first century, a key technology that can fundamentally restructure the technologies currently used in varied industries. Nanotechnology appeals to developing economies as it can provide novel interventions in areas that are of pressing concern such as the environment, water purification, agriculture, energy and so on. Thus, it becomes important to assess the extent to which developing countries are creating capacity in this technology and whether it is providing a 'window of opportunity' for them to 'catch up' with the developed world. This study highlights the significant achievements by China in capacity creation which is already showing tangible outcomes. Government-affiliated research institutes and universities are playing a leading role in this endeavour and developing novel partnerships particularly with foreign firms.

Report on socio-economic survey on water, health and energy in household.

Madhulika Bhati and Kasturi Mondal

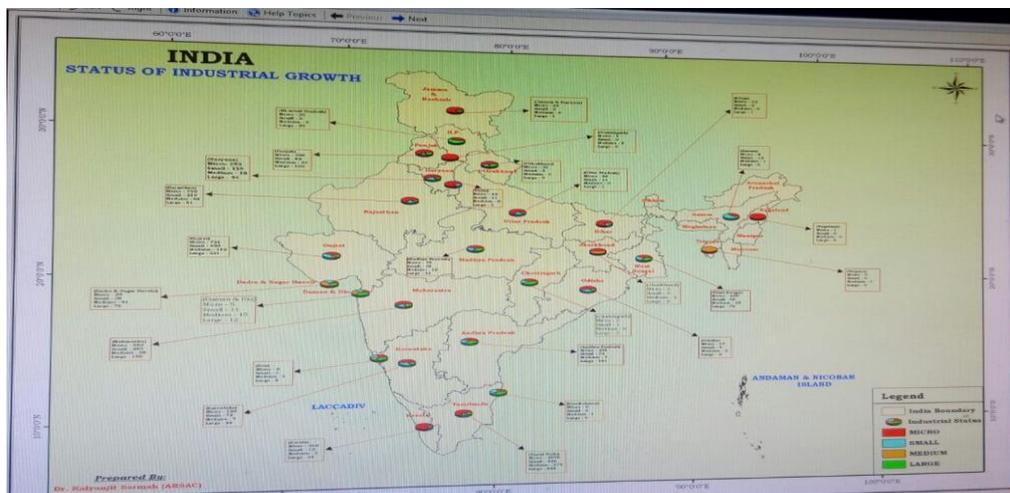
Executive summary

In this study the information is collected through set of questionnaires which have both qualitative and quantitative questions through stratified sampling. The survey provides information on demographics, health, hygiene, and availability of water and electricity in North, South, West and East India. A study is carried out district wise on a sample of 1 respondents. The major States covered by the survey in all the four zones.

Technological innovation capability of MSME in Textile sector in India

Dr. Madhulika bhati, Rehan Ahmed and Radhika

The Indian Textiles industries represent the diverse spectrum like power loom, Hosiery, Knitting, sectors the handicrafts segments and also cover a wide range of fibers which include man-made fiber, cotton, silk jute and wool. The textile industry plays a pivotal role through its contribution to industrial output and employment generation and the export earnings of the country. It contributes 10% of the manufacturing production, 2% of the India's GDP and 13% of the country's export earnings. With over 45 million people employed directly, textile industry is one of the largest source of employment generation in the country



Landscape of Micro, Small and Medium Enterprises in India

Madhulika Bhati, Rehan Ahmed and Radhika

Abstract: Micro, Small and Medium Enterprises (MSMEs) in India have evolved considerably since independence. Referred to merely as the Small Scale Industries (SSI) sector in the 60s and 70s, the MSME sector has progressed in scale and made their presence felt across India's key sectors. Today, MSMEs are present across sectors (manufacturing, trade and services) in India, thereby constituting a formidable component of the country's economic growth. The present paper analyses the regional pattern of organized manufacturing sector in India. We intend to

examine the extent of spatial concentration of the same across the states at selected disaggregated four digit industry codification levels. The paper provides a road representation of MSMEs in the country delineated sector wise. Among other, results suggest the geographical distribution of these MSMEs across the states are not uniform.

Keywords: Manufacturing industry; ASI database; geographical distribution; regional spread

Small Hydro Power Plant: A Promising Renewable Energy Technology to Arrest Energy Scarcity in India and Emerging Technologies

Konchok Ishey, Madhulika Bhati, Rehan Ahmad

Description

There is no universal standard definition of small hydro development. Different country adopts different specifications. Definition of SHP varies worldwide. In India install capacity less than 25MW is considered as small hydro. Although SHP technology is considered as a matured, reliable, environmental friendly and do not create any pollution during operation and offer highly reliable power with low running and maintenance cost. But India is lacking in implementing such projects effectively in spite of having good potential of 20,000 MW. India is need to go for structural change in SHP investment policies and funding practices for research and development in SHP in order to reach parity with China which is fastest growing country in overall hydro power sector including SHP. The paper is addressing present scenario of SHP in India, about its achievements, gaps in harnessing the untapped potential and emerging technologies. Furthermore it also emphasis on existing policies and its implementation in every hydro rich states. so that by encouraging SHP we can take our country on the path of inclusive and sustainable development.

[Solar Technology: A Comprehensive State of Art of Technology, Achievements, Challenges and Suggestions: An Indian Perspectives](#)

Madhulika Bhati, Rehan Ahmad, Konchok Ishley

Description

Green technologies are playing vital role to solve the challenges faces worldwide related to energy security and independency. Solar technologies are one of the emerging technologies. Developed as well as developing nations are spending substantial investment to promote this technology. This paper gives a comprehensive state of the art of solar technologies with special emphasis on solar Photovoltaic. It also draws insight about the policy environments to support this technology in China, a world leader in this technology. In this paper, we discuss the regulations, policy, strategies led by government as well as private stakeholder for the promotion of this technology. We also highlight the main barriers in adoption and successful implementation of this technology and suggested some ways so that this technology can provide a successful alternative to solve issues faces by using conventional energy sources.

Thematic Intervention of Nanotechnology in Water Sector Opportunities and Risks

Madhulika Bhati, Saurabh Ram Kumar, Pushkar Bansal

Description

In the last decade nanotechnology entered the policy arena as a technology that is presumably well known promising candidate for solving one of the most important issues such as ensuring the quality and quantity of potable water for the world society in the 21st century.

This research paper gives the comprehensive overview of state of art technologies available for water purification, worldwide. It draw insight the recent contamination scenario of water and challenges ahead and how nanotechnology is developing in country like India across the this water sector from the beginning to end of value chain to solve this pressing concern. It also addresses the potential nanotechnology risks and outlines risk data gaps challenges for existing regulatory framework. This paper also identified some ways to integrating nanotechnology in water industry in a responsible manner.

[Growth and mineral accumulation in *Eucalyptus camaldulensis* seedlings irrigated with mixed industrial effluents](#)

Authors

M Bhati, G Singh, 2003. *Bioresource Technology*, 88 (3) : 221-228, Publisher Elsevier

Description

Effects of mixed industrial effluents on growth, dry matter accumulation and mineral nutrient in *Eucalyptus camaldulensis* seedlings were studied. The objective was to evaluate the adaptability of *E. camaldulensis* to effluent, tolerance to excess/deficiency of mineral elements and ultimately to determine suitable combinations of industrial/municipal effluent for their use in biomass production in dry areas. Different irrigation treatments were: T₁: good water; T₂: municipal effluent; T₃: textile effluent; T₄: steel effluent; T₅: textile effluent+municipal effluent in 1:1 ratio; T₆: steel effluent+municipal effluent in 1:2 ratio; T₇: steel+textile+municipal effluent in 1:2:2 ratio; and T₈: steel+textile effluent in 1:2 ratio. High concentrations of metal ions and low concentrations of Ca, Mg, K, Na, N and P in soil and seedlings of T₄ resulted in mortality of the seedlings within a few days. Addition of the textile/municipal effluent increased the ...

Total citations :70

[Growth of *Dalbergia sissoo* in desert regions of western India using municipal effluent and the subsequent changes in soil and plant chemistry](#)

G Singh, M Bhati, 2005, Bioresource Technology 96 (9) :1019-1028, Publisher Elsevier

Description

Increasing demand for fodder and fuelwood and the scarcity of a good quality water in arid areas has resulted in a search for an alternative source of water for biomass production. An experiment utilizing municipal effluent in growing *Dalbergia sissoo* was conducted. Five treatments included T_1 , municipal effluent at 1 PET (Potential evapo-transpiration) (without plant); T_2 , municipal effluent at 1/2 PET; T_3 , municipal effluent at 1PET; T_4 , municipal effluent at 2 PET; and T_5 , canal water at 1 PET. Observations included plant height, collar diameter at one-month intervals and plant mineral composition, mineral uptake and changes in soil properties at 24 months of plant age. Application of municipal effluent produced better growth in *D. sissoo* seedlings. Concentrations of nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), copper (Cu), iron (Fe), manganese (Mn) and zinc (Zn) were greater in ...

Total citations :56

[Growth, biomass production, and nutrient composition of eucalyptus seedlings irrigated with municipal effluent in loamy sand soil of Indian desert](#)

G Singh, M Bhati, 2003, Journal of plant nutrition 26 (12) : 2469-2488, Publisher Taylor & Francis Group

Description

An experiment comprised of five treatments [T₁ = municipal effluent @ 1 PET (without plant), T₂ = municipal effluent @ (1/2) PET, T₃ = municipal effluent @ 1PET, T₄ = municipal effluent @ 2 PET, and T₅ = good (canal) water @ 1 PET] was carried out with *Eucalyptus camaldulensis*. The aim was to utilize sewage water in growing tree plantation and to increase the supply of fuel wood to the growing urban population. Height, collar diameter, and number of branches were monitored periodically. Biomass and leaf and root growth were recorded at 24 months of age. Mineral composition and uptake were monitored to observe their removal from the soil. Increase in rate of municipal effluent application was associated with better tree growth compared to irrigation with canal water. At 24 month age, the T₄ was the best treatment in which *E. camaldulensis* attained 393 cm height and 6.6 cm collar diameter. Height and ...

Total citations : [Cited by 24](#)

[Mineral Accumulation, Growth, and Physiological Functions in *Dalbergia sissoo* Seedlings Irrigated with Different Effluents](#)

Genda Singh, Madhulika Bhati, 2003; Journal of Environmental Science and Health, Part A, 38 (11)

:2679-2695, Publisher Taylor & Francis Group

Description

Present study aimed to observe the mineral accumulation added through effluent application and their influence on physiological functions and growth of *Dalbergia sissoo* and ultimately to find out suitable combination of industrial and municipal effluent for their utilization in raising tree plantation. *Dalbergia sissoo* seedlings were irrigated with: canal water (T₁); municipal effluent (T₂); textile effluent (T₃); steel effluent (T₄); textile + municipal effluent in 1:1 ratio (T₅); steel + municipal effluent in 1:2 ratio (T₆); steel + municipal + textile in 1:2:2 ratio (T₇); and steel + textile in 1:2 ratio (T₈). Mineral accumulation, water relations and gas exchange, growth and biomass production were the recorded observations. Mortality occurred within a day for the seedlings in T₄, 45 days in T₆, and 60 days in T₇ and T₈ treatments. This was probably the result of high ($P < 0.01$) Mn, Fe, Cu, and Zn and low N, P, K, Ca, and Mg concentration ...

Total citations : [Cited by 13](#)

[Mineral toxicity and physiological functions in tree seedlings irrigated with effluents of varying chemistry in sandy soil of dry region](#)

G Singh, Madhulika Bhati, 2003, Journal of Environmental Science and Health, Part C,21 (1) :45-63, Publisher Taylor & Francis Group

Description

Effluents namely canal water as control (T₁); municipal effluent (T₂); textile effluent (T₃); steel effluent (T₄); textile + municipal effluent in 1:1 ratio (T₅); steel + municipal effluent in 1:2 ratio (T₆); steel + municipal + textile in 1:2:2 ratio (T₇); and steel + textile in 1:2 ratio (T₈) were added to the seedlings of *Acacia nilotica* and *Eucalyptus camaldulensis*. The aim was to monitor the toxic effect of the accumulated mineral ions on the physiological functions and ultimately to utilize these effluents in tree plantation. Foliage mineral concentration, leaf water potential (LWP), rate of photosynthesis (P_n), rate of transpiration (T) and stomatal conductance (g) were recorded. Mineral accumulation increased in the seedlings of T₂ treatment. However, the accumulation of Mn, Fe, Cu and Zn was the highest ($p < 0.001$) in the seedlings of T₄, T₆, T₇, and T₈ treatments affecting N, P, K, Ca, Mg, and Na concentration. The seedlings of T₃ ...

Total citations : [Cited by 12](#)

[Soil and plant mineral composition and productivity of *Acacia nilotica* \(L.\) under irrigation with municipal effluent in an arid environment](#)

G Singh, Madhulika Bhati, 2004, Environmental conservation, 31 (4) : 331-338, Publisher Cambridge University Press

Description

Municipal effluent is becoming an increasing environmental threat and needs appropriate disposal measures to safeguard soil and environmental quality. As an important source of water and nutrients, municipal effluent could be used to increase productivity in nutrient deficient dry areas. *Acacia nilotica* L. (Babool) seedlings were grown using municipal effluent. Five treatments comprised: irrigation of soil (without seedlings) with municipal effluent at potential evapotranspiration (PET) (treatment T₁), irrigation of seedlings at 0.5 PET (T₂), PET (T₃), and 2 PET (T₄), and canal water irrigation of seedlings at PET (T₅). Seedlings in the T₃ and T₄ treatments attained greater height and collar diameter and produced 22% and 54% more biomass than those in T₅. After 24 months, biomass production was 7.43–12.96 t ha⁻¹ as compared to 5.73 t ha⁻¹ in T₅. Nutrient concentrations in the seedlings were positively correlated ...

Total citations : [Cited by 6](#)

[Changing effluent chemistry affect survival, growth and physiological function of *Acacia nilotica* seedlings in northwestern region of India](#)

Genda Singh, M Bhati ,2008 , The Environmentalist, 28 (3) : 175-184, Publisher Springer US

Description

Recycling and conservation efforts for water are the need of the day because of the lack of new water sources and the ever-increasing demand for drinking water. Seedlings of *Acacia nilotica* L. were irrigated with: canal water (T₁, control); municipal effluent (T₂); textile effluent (T₃); steel effluent (T₄); textile + municipal effluent in 1:1 ratio (T₅); steel + municipal effluent in 1:2 ratio (T₆); steel + textile in 1:2 ratio (T₈) and steel + municipal + textile in 1:2:2 ratio (T₇) with views to observe effluents effect on the seedlings and its adaptability and to recommend safe disposal of these effluents. Seedlings in T₆, T₇ and T₈ showed 50% lesser height and collar diameter than those in control. Seedlings in T₂ attained greatest height, collar diameter, numbers of branches and produced 140 g dry biomass seedling⁻¹. Highest concentration of manganese (Mn), iron (Fe), copper (Cu) and zinc (Zn) and lowest concentration ...

Total citations : [Cited by 4](#)

[Physiological responses to nutrient accumulation in trees seedlings irrigated with municipal effluent in Indian desert](#)

G Singh, Madhulika Bhati, TR Rathod, UK Tomar, 2014, Physiology Journal, Publisher Hindawi

Description

Leaf water potential (ψ), net photosynthesis rate (P_n), transpiration rate (E), stomatal conductance (g_s), and water use efficiency (WUE) are greatly influenced by the nutrient composition of water which is used for irrigating trees. The above-mentioned physiological variables and foliage mineral concentrations were observed for *Eucalyptus camaldulensis*, *Acacia nilotica*, and *Dalbergia sissoo* plants irrigated with municipal effluent (ME) at 1/2 PET (potential evapotranspiration; T1), 1 PET (T2), and 2 PET (T3) rates and the control plants irrigated with canal water at 1PET (T4). Increased mineral concentrations in order $T1 < T2 < T3$ enhanced ψ , P_n , and g_s . Relatively greater increase in ψ than reduced WUE. Available nutrient in ME enhanced physiological function in T2, whereas reduced quantity of water lowered it in T1 than in T4 plants. Differential minerals uptake increased concentrations of N and P in *D. sissoo*, Mn in *E. camaldulensis*, and the rest in *A. nilotica*. was more sensitive to environment than *E. camaldulensis*. Enhanced mineral concentration through ME was beneficial but its differential uptake and accumulation influenced physiological functions and WUE. *E. camaldulensis* is better for high and continuous loading of effluent and *A. nilotica* is best for high nutrient uptake. *D. sissoo* is efficient water user.

Total citations : [Cited by 1](#)

