



A Peer Reviewed International Journal of Asian
Academic Research Associates

AARJMD

**ASIAN ACADEMIC RESEARCH
JOURNAL OF MULTIDISCIPLINARY**



A SUSTAINABLE WAY OF WASTE MANAGEMENT: A GREEN NANOTECHNOLOGY APPROACH

REENA JAIN¹; PRIYANKA SHARMA²; CHIRASHREE GHOSH³

¹Department of Chemistry, Hindu college, University of Delhi, Delhi, India

²Environmental Pollution Laboratory, Department of Environmental Studies, University of Delhi, Delhi, India

³Environmental Pollution Laboratory, Department of Environmental Studies, University of Delhi, Delhi, India

Abstract

The study was conducted to understand the type and quantity of waste that is generated in Asia's largest vegetable market, Azadpur Vegetable market. Further the utilization of waste for the synthesis of iron nanoparticles to degrade the dye was also evaluated. For this, initially a survey was conducted to infer the perception of vendors in the market regarding waste generation and the problems faced by them due to surrounding heap of waste. Secondly, a random collection of waste from the study site was done during winter months to quantify the most abundant vegetable waste. Lastly, the abundant wastes were used to synthesize "iron nanoparticle" and further prepared nanoparticles from each waste were studied for their efficiency to degrade most commonly used methyl orange dye. The outcome of the study depicted that most of the waste generated in vegetable market is thrown as garbage which results in acute problem of bad odor and piling of degradable waste in the adjoining commercial area. The abundant vegetable wastes generated at the time of sampling were radish Leaves, cauliflower, capsicum and Lettuce. Out of all the nanoparticles prepared from different waste material, nanoparticles from Radish leaves showed highest efficiency (89%) to degrade methyl orange dye. The study endorsed the hypothesis that green waste if utilized to prepare useful nanoparticle, will not only have application in waste water treatment but also gives solid waste management a sustainable direction.

Key words: Nanoparticle, waste, Dye, vegetable, sustainable, etc.

References

- Ahmed, S., Ahmad, M., Swami, B.L. and Ikram, S., 2016. Green synthesis of silver nanoparticles using *Azadirachta indica* aqueous leaf extract. *Journal of Radiation Research and Applied Sciences*, 9(1), pp.1-7.
- Das, A. and Mondal, C., 2013. Studies on the utilization of fruit and vegetable waste for generation of biogas. *Int. J. Eng. Sci*, 3(9), pp.24-32.
- Deb, S., 2014. Synthesis And Characterisation Of Silver Nanoparticles Using *Brassica oleracea capitata* (Cabbage) And *Phaseolus vulgaris* (French Beans): A Study On Their Antimicrobial Activity And Dye Degrading Ability. *Synthesis*, 6(7), pp.3909-3917.
- Economic Survey of Delhi, Planning Department, Delhi Government (2014). <http://www.delhi.gov.in/wps/wcm/connect/221f388048d8ee99a947f97a2b587979/ESD+2014-15+-+Ch-19.pdf?MOD=AJPERES&lmod=519617529&CACHEID=221f388048d8ee99a947f97,a2b587979>. (accessed 30/4/17)
- Fadel, Q.J. and Al-Mashhedy, L.A.M., 2017. Biosynthesis of Silver Nanoparticles Using Peel Extract of *Raphanus sativus* L. *BioTechnology: An Indian Journal*, 13(1).
- FAO. (2011) *Global Food Losses and Food Waste: Extent, Causes and Prevention*. Swedish Institute for Food and Biotechnology (SIK) Gothenburg, Sweden. <http://www.fao.org/docrep/014/mb060e/mb060e00.pdf>. (Accessed 30/4/17).
- Goodarzi, M., Safaei, M.R., Vafai, K., Ahmadi, G., Dahari, M., Kazi, S.N. and Jomhari, N., 2014. Investigation of nanofluid mixed convection in a shallow cavity using a two-phase mixture model. *International Journal of Thermal Sciences*, 75, pp.204-220.
- Javaria, S. (2012). *Fruits and Vegetable Waste Management*. Food Science and Technology. <http://fst11.blogspot.in/2012/08/fruits-and-vegetable-waste-management.html>. (Accessed 3/5/2017).
- Machado, S., Grosso, J.P., Nouws, H.P.A., Albergaria, J.T. and Delerue-Matos, C., 2014. Utilization of food industry wastes for the production of zero-valent iron nanoparticles. *Science of the Total Environment*, 496, pp.233-240.

Many, J.N., Radhika, B. and Ganesan, T., 2014. Synthesis Of Silver Nanoparticle Using Fresh Tomato Pomace Extract. *International Journal of Nanomaterials and Biostructures*, 4(1), pp.12-15.

NIAM. 2011 *Handling of Agricultural wastes in APMCs*. Research report National Institute of Agricultural Marketing, a government of India organization, Jaipur, India. https://ccsniam.gov.in/images/research/2013_agri_waste_mgmt_by_dr_saswati_bose.pdf.

(Accessed 30/4/17).

Parveen, N., Mahato, N., Ansari, M.O. and Cho, M.H., 2016. Enhanced electrochemical behavior and hydrophobicity of crystalline polyaniline@ graphene nanocomposite synthesized at elevated temperature. *Composites Part B: Engineering*, 87, pp.281-290.

Schauermann, S., Nilius, N., Shaikhutdinov, S. and Freund, H.J., 2012. Nanoparticles for heterogeneous catalysis: new mechanistic insights. *Accounts of chemical research*, 46(8), pp.1673-1681.

Shahwan, T., Sirriah, S.A., Nairat, M., Boyacı, E., Eroğlu, A.E., Scott, T.B. and Hallam, K.R., 2011. Green synthesis of iron nanoparticles and their application as a Fenton-like catalyst for the degradation of aqueous cationic and anionic dyes. *Chemical Engineering Journal*, 172(1), pp.258-266.

Surendra, T.V., Roopan, S.M., Al-Dhabi, N.A., Arasu, M.V., Sarkar, G. and Suthindhiran, K., 2016. Vegetable Peel Waste for the Production of ZnO Nanoparticles and its Toxicological Efficiency, Antifungal, Hemolytic, and Antibacterial Activities. *Nanoscale research letters*, 11(1), p.546.

Tamileswari R. , M.Haniff Nisha² , S.Jesurani³ , S.Kanagesan⁴ , M.Hashim⁵ , S.Catherine P.Alexander. Synthesis Of Silver Nanoparticles Using The Vegetable Extract Of Raphanus Sativus (Radish) And Assessment Of Their Antibacterial Activity. *International Journal of Advanced Technology in Engineering and Science*, 3, pp 207-212.

Tan, K.A., Morad, N. and Ooi, J.Q., 2016. Phytoremediation of Methylene Blue and Methyl Orange Using Eichhornia crassipes. *International Journal of Environmental Science and Development*, 7(10), p.724.