Cow dung: Nutrient reservoir for livelihood security

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Cow dung is an undigested residue of consumed food material being excreted by bovine animals and which is easily available bioresource on our planet. It also contains higher microbial diversity and different elements like nitrogen, phosphorus, potassium, calcium, magnesium, sulphur along with trace amount of iron, zinc, copper and manganese. However, indigenous Indian cow also contain higher nutrient concentration than the cross-breed cow (Randhawa and Kullar, 2011).

In India, 69.9 % population resides in rural areas, where cow is major cattle and generates 9 to 15 kg dung per day (Brown, 2003). People in some villages cow dung used for cooking purpose by direct burning. It is also used in plastering of walls and floor in rural houses for providing insulation during winter and summer. Cow dung also used as a by-product in agriculture *viz.*, manure, bio fertiliser, biopesticides, pest repellent and source of energy.

Therefore in India, Cow is not only just milk producing animal but also truly considered as Gomata and Kamdhenu (Jarald *et al.* 2008). The review intends to highlight the possible applications of cow dung particularly in the area ranging from energy, agriculture and medicine.

Source of Energy: Dependence of mankind on non-renewable source of energy such as coal, oil and gases are increasing worldwide. In India, the main source of energy is coal, which accounts for 44 % of total energy consumption. Because of the limited availability of coal, easily available, economical as well as environment friendly renewable source of energy is required.

Production of biogas or gobar gas cow dung is the major source in India. Cow dung generated from 3 to 5 cattle per day can run a simple 8 to 10 m^3 biogas plant which is able to produce 1.5 to 2 m^3 biogas per day which is sufficient for the family 6 to 8 persons (Werner *et al.* 1989). On the other hand, farmer also gains 13.87 metric tons of organic fertiliser per year from the biogas plant.

Agriculture management: Human population is increasing worldwide giving rise to intensive farming system that ultimately results in reduced soil fertility (Bedada *et al.* 2014). Use of chemical fertilizers is decreases the nutritional deficiencies and increases crop yield. Many disadvantages of widespread use of chemical fertilizers include increase in soil acidity, mineral imbalance and soil degradation.

In composting, microorganisms decompose organic substrate aerobically into carbon dioxide, minerals and stabilised organic matter. Compost is added into the soil to improve nutrients and water holding capacity (Vakili *et al.* 2015) in the soil. Thus, cow dung may not only act as a substitute for chemical fertilizers because it supplements organic matter and acts as a conditioner for soil.

It not only improves the different properties of soil but also acts as a source of microorganisms without any negative effect on environment.

Bioremediation of environment pollutants: Agriculture run-off, heavy metals, pesticides, biomedical waste and industrial waste these toxic chemicals find their way into the human body, plant tissue and animals through absorption (Adams *et al.* 2014). Conventional methods such as dredging, incineration, use of sorbent materials and dispersion are not only economical but also environmentally unsustainable. Different methods which are used in removing of toxic substances are bioaugmentation, biostimulation, mycoremediation, phytoremediation, biosparging, bioventing and composting.

Amongst these, bioremediation is the most common method used for removal of toxic substances. It involves the use of microorganisms with diverse metabolic capabilities to rapidly degrade hazardous organic pollutants to environmentally safe level. Cow dung contains diverse group of microorganisms such as Acinetobacter, Bacillus, Pseudomonas, Serratia and Alcaligenes spp. which makes them suitable for microbial degradation of pollutants. Cow dung and its microorganisms have been tapped for the remediation of heavy metals like chromium, strontium and arsenic. Using cow

dung for bioremediation is a simple and eco-friendly method as it does not produce any harmful by products.

Source of microbial enzyme: Microbial enzymes have got immense application because microbes can easily cultivated and their enzyme can catalyse wide variety of hydrolytic and synthetic reactions (Illavarasi, 2014). Microbial diversity of cow dung makes it a potential source of microbial enzyme and Bacillus species from cow dung is capable of producing cellulose, carboxymethyl cellulose and cellulase. In case of poor enzyme production, genetically improved strains can be constructed for enhanced enzyme production. Not only as a microbial source but cow dung may also serve as good substrate for enzyme production.

Human health management: Microbial products or their derivatives can kill or inhibit the growth of susceptible pathogenic microbes (Willey *et al.* 2008). Cow dung possesses antiseptic and prophylactic or disease preventive properties and it destroys the microorganism that causes disease and putrefaction. Medicinal properties of five products collectively known as panchgavya obtained from cow namely milk, ghee, curd, dung and urine are supported by their use in the preparation of various herbal medicines (Jarald *et al.* 2008). Panchgavya therapy utilises these five products singly or in combination with herbal or mineral drugs for the treatment of many diseases like flu, allergies, colds, cough, asthma, renal disorders, gastrointestinal tract disorders, acidity, ulcer, wound healing, heart diseases, skin infections, chickenpox and several other bacterial and viral infections. Immunostimulatory, immunomodulatory and anti-inflammatory effects of panchagavya are also being mentioned in Ayurveda (Dhama *et al.* 2013).

Conclusion: Cow dung host a wide variety of microorganisms varying in individual properties. Exploitation of cow dung microflora can contribute significant in sustainable agriculture and energy requirements.

It is one of the bioresources which is available on large scale and still not fully utilised. The understanding of the mechanisms enabling cow dung microbes to degrade hydrocarbons can promote bioremediation of environmental pollutants.

The application of cow dung microflora with considerable antimicrobial potential can result in the promotion of human health.

In this way, cow dung may be considered as an easily available bioresource that holds a great potential for sustainable development in the future.

References:

Adams, G.O., Tawari-Fufeyin, P. and Ehinomen, I., 2014, Laboratory scale bioremediation of soils from automobile mechanic workshops using cow dung. J. Appl. Environ. Microbiol., 2:128–134.

Bedada, W., Karltun, E., Lemenih, M. and Tolera, M., 2014, Long-term addition of compost and NP fertilizer increases crop yield and improves soil quality in experiments on smallholder farms. *Agric. Ecosyst. Environ.,* 195:193–201.

Brown ,R. C., 2003, Biorenewable resources—engineering new products from agriculture. *Lowa state press, London.*

Dhama, K., Chakraborty, S. and Tiwari, R., 2013, Panchgavya therapy (Cowpathy) in safeguarding health of animals and humans—*a review. Res Opin Anim Vet Sci*., 3:170–178.

Illavarasi, S., 2014, Isolation and identification of cellulase producing bacteria from cow dung. SIRJ-MBT 1.

Jarald, E., Edwin, S., Tiwari, V., Garg, R. and Toppo, E., 2008, Antioxidant and antimicrobial activities of cow urine. *Global J. Pharmacol.,* 2:20–22.

Randhawa, G. K. and Kullar, J. S., 2011, Bioremediation of pharmaceuticals, pesticides, and petrochemicals with gomeya/cow dung. *ISRN Pharmacol*. doi:10.5402/2011/362459.

Vakili, M., Zwain, H.M., Rafatullah, M., Gholami, Z. and Mohammadpour, R., 2015, Potentiality of palm oil biomass with cow dung for compost production. *KSCE J Civil Eng.*, 19:1994–1999.

Werner, U., Stöhr, U. and Hees, N., 1989, Biogas plants in animal husbandry. *Deutsches Zentrum für Entwicklungstechnologien-GATE.*

Willey, M. J., Sherwood, M.L. and Woolverton, J.C., 2008, Prescott, Harley, and Klein's Microbiology. *The McGraw-Hill Higher Education, New York*