

Review Article

<http://dx.doi.org/10.20546/ijcmas.2017.602.205>

## Cow Urine: A Boon for Sustainable Agriculture

Sunita Choudhary<sup>1</sup>, Manish Kushwaha<sup>4</sup>, Seema<sup>2\*</sup>, Preeti Singh<sup>2</sup>,  
R. Sodani<sup>3</sup> and Sunil Kumar<sup>1</sup>

<sup>1</sup>Department of Agronomy, Banaras Hindu University, Varanasi– 221 005, Uttar Pradesh, India

<sup>2</sup>Soil Science and Agricultural Chemistry, Banaras Hindu University, Varanasi– 221 005,  
Uttar Pradesh, India

<sup>3</sup>Plant Physiology, Banaras Hindu University, Varanasi– 221 005, Uttar Pradesh, India

<sup>4</sup>Forage Research and Management Centre, NDRI, Karanali, Haryana – 132001, India

\*Corresponding author

### ABSTRACT

#### Keywords

Chemical fertilizer,  
Cow urine,  
Nutrients, Soil  
management,  
Sustainability.

#### Article Info

Accepted:  
25 January 2017  
Available Online:  
10 February 2017

The indiscriminate use of agrochemicals since green revaluations resulted in adverse effect on the soil fertility, crop productivity, quality of produce and more specifically on the environmental system. The current scenario under such situations firmly emphasizes the need to adopt eco-friendly agricultural practices for food production by considering the sustainability of soil and environment. The use of cow urine can be considered as a low cost agricultural practice for farmers and had been extensively used in traditional agriculture in India for medicinal and agricultural purposes since *Vedic* period. Among different organic sources cow urine is good source of nitrogen besides it contains sulphur, phosphate, potassium, sodium, manganese, carbolic acid, iron, silicon, chlorine, salt, enzyme and hormones. It strengthens the fact that cow's urine is not a toxic effluent as 95% of its content being water, 2.5% urea and the remaining 2.5% a mixture of minerals, salts, hormones and enzymes. It is also considered as a natural disinfectant and pest repellent and forms the main component of *Panchagavya*, an organic crop booster prepared and sprayed by Indian farmers. As products of ecological sanitation, urine is therefore in many ways suited for use as fertilizer as they contain essential nutrients needed for plant growth. Favourable effect of cow urine application has been reported in enhancing the productivity of different crops *viz.* maize, mustard and rice etc.

### Introduction

India is primarily agrarian, and this sector provides livelihood to a major part of the population. To feed the 1.3 billion population of the country, increasing tremendously approximately at 1.2% every year, the food grain production need to be increased correspondingly, towards attaining this goal, there is requirement of higher doses of fertilizers, which require non-renewable

energy. In the same time, declining factor productivity owing to imbalanced and indiscriminate use of fertilizers in most productive zone of the country i.e. Indo Gengatic Plains, food grain production in India reached to the plateau. Thus, the importance of organic sources of nutrients was recognized in current scenario in order to get higher yield without disturbing soil health

(Arif *et al.*, 2012a). In this context, integrated use of chemical and organic source of nutrients in crop production is becoming very crucial for assurance of food security on sustainable basis, which in turn not only improve the soil fertility for sustained crop productivity but also to reduce the cost of inorganic fertilizers. Different kind of organic materials such as FYM, animal manures, crop residues, composts, cow urine etc. have been used in crops but the amount and availability of nutrients in organic material vary widely, which makes interpretation of the value of nutrient supplied.

Livestock wealth is deemed as the oldest wealth resource for mankind. Cow represents the *Vedic* values of selfness service, strength, dignity and non-violence. The “Cow” occupies the highest place of honour in Indian civilization. The five products of cow (urine, dung, ghee, milk and curd) are used in different organic systems. Many farmers are reviewing age old practices of applying cow dung, cow urine, and their products in the form of manures and pesticides. The average size of land holding in India has declined to 1.32 ha in 2000-01 from 2.30 ha in 1970-71. If this trend continues the average size of land holding would be about 0.68 ha in 2020 and would be further reduced to 0.32 ha in 2030 (Anonymous, 2011). Majority of farmers in India are small farmers and about 70% of the population engaged in agriculture. Thus, with small holdings and small scale farming, there is no other better alternative than involving cattle in farming system.

The use of cow urine is known for a long time in India. Cow urine has been described as a liquid with innumerable therapeutic values, capable of curing several incurable diseases in human beings and plants. It has been considered that cow urine is very useful in agricultural operations as a bio fertilizer and bio pesticide (Dharma *et al.*, 2005). It is rich

source of macro, micronutrients and has disinfectant and prophylactic properties thus purify the atmosphere and improve soil fertility (Pathak and Ram, 2013). Cow urine therefore, could be an effective tool to address multi nutrient deficiencies in most of soils in the country. It is believed to provide nutrients to plants at low cost; therefore, it is considered an alternative for plant nutrition, metabolic activation and pest and disease control (PESAGRO-RIO, 2002). It is unfortunate that with the advent of fertilizers, slowly Indian farmers have forgotten use of cow products in agriculture and thus facing the current crises. Now it is high time that the farming community and scientific fraternity realize the importance of cow for assuring sustainability in farming and try to bring the glory of cow again with our culture and agriculture.

### **Effect of cow urine on different aspects**

#### **Growth parameters**

Application of cow urine accelerates the different aspects of growth in several crops .e. maize, rice, mustard, lettuce (Devakumar *et al.*, 2014; Pradhan *et al.*, 2016; Oliveira *et al.*, 2009; Qibtiyah *et al.*, 2015, respectively). Seed priming with P, Zn, human and cow urine can potentially improve crop growth and yield of maize on low-fertility acid soils of northeast India (Kumar, 2014). Cow urine at 5 and 10 % concentration significantly improved all vegetative parameters of gladiolus *viz.*- earlier 50 % emergence of corms, increased emergence of plants, plant height, number of leaf, length and width of leaves (Tamaraker *et al.*, 2016). Urine sources (human, cattle and got urine) had significantly taller maize plants as compared to control (Nwite *et al.*, 2015). Increase in cow urine concentrations increased the performance of all phenotypic characters of methi and bhindi such as plant height, shoot and root length,

number of leaf, leaf length and breadth were increased with increased concentration of urine as compared to control (Jandaik *et al.*, 2015). Application to soil at 20 ml/plant of cow urine solution at the concentration of 0.86% provided 10% increase in fresh matter of lettuce cv. Romana, in comparison to the control (Gadelha *et al.*, 2003). Among the 6 ratios of water to urine (10:1, 8:1, 6:1, 4:1, 2:1, and 1:1), higher plant height (279.42 cm) was observed with 6:1 ratio (Ayalew, 2015).

### **Yield and yield attributes**

The yield and yield characters get affected significantly in crops exposed to cow urine *viz.*- maize, rice, mustard, gladiolus, broccoli etc. (Devakumar *et al.*, 2014 and Veerasha *et al.*, 2014; Qibtiyah *et al.*, 2015, Tamaraker *et al.*, 2016 and Sharma *et al.*, 2016, respectively). PSB + cow urine application recorded higher values of grain yield and biological yield than PSB + *Azospirillum* (Abraham and Lal, 2004). Application of cow urine up to 900 l/ha as basal dose markedly improved yield attributes as well as seed and stover yield of mustard (Pradhan *et al.*, 2016). There was significantly higher maize grain yield was found in different urine sources (human, cattle and goat urine) of urine treated pots as compared to control (Nwite *et al.*, 2015). Application of N at 125 kg/ha and 100 kg/ha by urine recorded highest biological yield (53.71 t/ha) and curd yield (20.08 t/ha) of cauliflower, respectively (Khanal *et al.*, 2010). Highest total fresh amaranth biomass was obtained from cattle urine fortified organic fertilizer (Adeoluwa *et al.*, 2009). Urine-biochar treatment led to a pumpkin yield of 82.6 t/ha, which was 85% increase compared with the biochar-only treatment (Schmidt *et al.*, 2015). Six foliar sprays of 55% cattle urine solution resulted highest fruit weight, volume, number of fruit, fruit yield kg/plant and yield tons/ha of mango compared to control (Damodhar *et al.*, 2010).

Maximum fruit weight, length and volume of mango fruits was recorded in 30% cattle urine foliar sprays at pea stage + marble stage + egg stage (Jadhav, 2007). Water to urine mix of 8-6:1 among the ratios of 10:1, 8:1, 6:1, 4:1, 2:1, and 1:1 has a great blow to maximize productivity of maize grain yield up to 104.94 q/ha (Ayalew, 2015). Application of recommended dose of nitrogen through human urine in three split doses plus gypsum recorded higher yield for ashgourd, french bean, pole bean and pumpkin, and it was at par with recommended dose of nitrogen through cattle urine in three splits plus gypsum and recommended dose of fertilizers (Yogeeshappa *et al.*, 2016).

### **Plant nutrient content**

Protein content and chlorophyll content of methi and bhindi were increased with increased concentration of urine as compared to control (Jandaik *et al.*, 2015). Urine increased the N concentration of grass and increased the potassium concentration of grass and clover (Ledgard *et al.*, 1982).

### **Soil physical and chemical properties**

Significantly high soil organic carbon (0.58%), available nitrogen (272.4 kg/ha), phosphorus (23.5 kg/ha) and potassium (199.9 kg/ha) were obtained with the application of FYM 12.5 t/ha+cattle urine at 34300 l/ha as compared to control (Veerasha *et al.*, 2014). Higher total nitrogen, available phosphorus, Ca, Mg, organic carbon, pH, exchangeable K and Na were obtained under human and cattle urine treatments as compared to control (Nwite *et al.*, 2015). High dose of LCM (Liquid Cow Manure) application resulted in increased pH and EC values, nutrients and DOC (Dissolved Organic Carbon) content of amended soils (Aguilera *et al.*, 2010). Nitrogen at 150 kg/ha by urine through foliar application gave the highest soil pH (6.1),

organic matter (5.43%), phosphorus (147 kg/ha) and the nitrogen (0.31%) which was significantly higher than N0 whereas N at 50 kg/ha gave the highest potassium (242 kg/ha) which was significantly higher than the lowest 187 kg/ha from N0 (Sharma *et al.*, 2016).

### **Soil microbial population**

Significantly higher soil microbial population *viz.*, bacteria ( $47.0 \times 10^5$  cfu/g), fungi ( $34.6 \times 10^4$  cfu/g) and actinomycetes ( $40.0 \times 10^3$  cfu/g) were obtained with the application of FYM 12.5 t/ha+cattle urine at 34300 l/ha as compared to control (Veerasha *et al.*, 2014). Compost tea (cow dung+cow urine+water) containing high amounts of microbes was found to have complemented the activity of the native microbes and favoured decomposition of organic matter at a faster rate resulting in better transformation of nutrients and their availability to crops (Pathak and Ram, 2002). Urine caused an increase in soil respiration of >50% and the average increase were greater for cow's urine ( $30.8 \text{ mg CO}_2/\text{m}^2/\text{min}$ ) than for artificial urine ( $20.1 \text{ mg CO}_2/\text{m}^2/\text{min}$ ) (Lovell and Jarvis, 1996). Incorporation of increasing dose of LCM (liquid cow manure) resulted in increased respiration activity, C-CO<sub>2</sub> evolution and soil enzymatic activities of amended soils (Aguilera *et al.*, 2010).

### **Post-harvest parameters**

Cow urine at 5 and 10 % concentration significantly improved all post harvest parameters of gladiolus *viz.*- percent opened flower in vase, diameter of basal floret, shelf life and vase life of cut spikes as compared to control (Tamaraker *et al.*, 2016). Maximum reduction in strychnine and brucine contents was found when the seeds of *Nux vomica* (Kupeelu) were purified by keeping them in cow's urine for seven days followed by

boiling in cow's milk for 3 hrs, out of these three methods (by using cow's urine and cow's milk as media alone and together ) (Mitra *et al.*, 2012).

In conclusion, increasing prices of chemical fertilizer and non-efficient role in long term to sustainable production, there is a need of application of organic source of nutrients including cowdung for enhancing maximum productivity in sustainable way with better soil health. It is an effective tool to improve physico-chemical and biological properties of the soil with higher yield of plants in sustained basis without deleting the fertility of soil. Let's hope the use of cow urine could open the door of sustainable agricultural production because as known it is eco-friendly, economically viable, and easily available at abundance.

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**How to cite this article:**

Sunita Choudhary, Manish Kushwaha, Seema, Preeti Singh, Sodani, R. and Sunil Kumar. 2017. Cow Urine: A Boon for Sustainable Agriculture. *Int.J.Curr.Microbiol.App.Sci.* 6(2): 1824-1829. doi: <http://dx.doi.org/10.20546/ijcmas.2017.602.205>