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Effective use of cow dung manure for healthy plant growth

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Abstract
Gardens and animals have always had a close relationship. Through the centuries, gardeners have known the value that animal manure adds to the soil and health of plants. The most important significance of cow dung and cow manure is to maintain the organic microbial and mineral micronutrient richness of soil. Cattle manure contains an average of 1.04 percent Nitrogen, 0.15 percent Potassium and 0.78 percent phosphorus and 32 other micronutrients. The Nitrogen release is low and spread over time. Manure applications result in increases in pH, water holding capacity, hydraulic conductivity and infiltration rates. The soil conditioning ability of cow manure due to the amount of quality organic matter, that no fertilizer can match, is reason enough to use it. The soil amending properties of this great natural fertilizer are unbelievable. The present paper is an honest attempt to study the value of cow dung manure as a medicine for plants.

Keywords: cow dung, manure and variety, plants

1. Introduction

Cow dung or cow manure has been used for ages in Indian agriculture to nourish the soil and help in plant growth. Cow manure is packed with high levels of minerals and nutrients and is one of the best natural fertilizers to use in organic gardening. If you have an organic garden or want to grow your own veggies without the use of chemicals and pesticides, then you must consider using cow dung manure to nourish your soil.

Cow manure fertilizer makes an excellent growing medium for garden plants. When turned into compost and fed to plants and vegetables, cow manure becomes a nutrient-rich fertilizer. It can be mixed into the soil or used as top dressing. Most composting bins or piles are located within easy reach of the garden. Heavy manures, like that of cows, should be mixed with lighter materials, such as straw or hay, in addition to the usual organic substances from vegetable matter, garden debris, etc. Small amounts of lime or ash may also be added.

The use of cattle manure, or cow dung, in the garden is a popular practice in many rural areas. This type of manure is not as rich in nitrogen as many other types; however, the high ammonia levels can burn plants when the fresh manure is directly applied. Composted cow manure, on the other hand, can provide numerous benefits to the garden.

Cow manure contains 3 of the most important nutrients that plants need for their healthy growth. Nitrogen, phosphorus and potassium. While not all cow dung contains the exact same proportion of these minerals, research shows that cow dung has roughly about 3% nitrogen, 2% phosphorus and 1% potassium and the best part is that the beneficial bacteria in cow dung converts these essential nutrients into forms that are easily absorbed by plant roots. These nutrients are slowly infused into the soil allowing the plants to enjoy the benefits over longer periods. In the case of fresh cow manure, the moisture content is also high allowing for a better aeration of roots.

Vegetable Plants suffer from diseases caused by various kinds of pathogens such as bacteria, fungi, viruses, nematodes, and mycoplasma. Among these, fungi are considered as most aggressive pathogens causing qualitative and quantitative damage. Fungal pathogens, namely, Fusarium oxysporum, Rhizoctonia solani, and Sclerotiumrolfsii, are associated with damping off and wilting of Methi and Bhindi (Okra). The plant diseases have significant role in agriculture in terms of reduction of yield and economy. One of the most widely used strategies to control plant diseases is the use of chemical agents. However, overuse and abuse of these chemical agents resulted in certain hazardous effects. These chemicals suffer from drawbacks such as high cost, toxicity to non-target organisms, residual problem, and development of resistance in pathogens. This situation triggered interest in searching alternates for disease control. Natural products, in particular from plants, can be the potential candidates which can be used against phyto pathogenic fungi. The use of these agents is risk-free when compared to synthetic chemicals. In ancient Ayurveda cow urine has been greatly mentioned for its pharmacological importance. Okra contains nutrients that may confer a number of health advantages, including a decreased risk of several serious medical problems. Methi is one of the oldest medicinal herbs; ongoing research in India and abroad is currently uncovering new possibilities for its potential role in the treatment of diabetes and high cholesterol levels associated with coronary heart disease, both of which plague many industrial societies. Cow urine is one of the ingredients of "Panchagavya" (urine, dung, milk, curd, and ghee) which is capable of treating many diseases as it has several medicinal properties and it is the best remedy to cure fungal and bacterial diseases. It has an excellent germicidal power, antibiotics and antimicrobial activity. Therefore, cow urine can kill varieties of germs and it also boosts immunity. Cow

urine contains many beneficial elements, that is, chemical properties, potentialities, and constituents which help in removing all the ill effects and imbalances of body caused by infectious agents. Cow urine contains 95% water, 2.5% urea, and the remaining 2.5% a mixture of salts, hormones, enzymes, and minerals. It has been considered that cow urine is very useful in agricultural operations as a bio fertilizer and biopesticide as it can kill number of pesticide and herbicide resistant bacteria, viruses, and fungi. Cow urine in combination with plant extracts is used to prepare disinfectant which is biodegradable and ecofriendly with good antibacterial action. Majority of people in India use cow urine to get rid of various diseases due to its therapeutic values. Cow urine has several biological activities such as antioxidant, antidiabetic, antitumor, antiprotozoal, and molluscicidal.

2. Materials and Methods

Cow manure fertilizer in all forms are a good addition to the vegetable garden. However the nutrient value does differ greatly. If you obtain manure that has been heaped up and permitted to heat up, a lot of its nitrogen may already have dissipated as ammonia. Much of the valuable digestive enzymes will also have been destroyed by the high temperatures at the heap's core.

Table 1: Attributes of the bacterial strains for promoting plant growth

3	Isolates	IAA Production (µg/ml)	Ammonia production	P solubilized		Antagonism to Rhizoctonia
				% P solubilized	pH of broth after 10 days	
PG1	Bacillus safensis	3.45	+ + +	2.98	5.00	+
PG2	B.cereus	3.20	+ +	2.90	5.05	+
PG4	B.cereus	3.02	+ + +	3.43	4.65	+
PG5	B.cereus	3.35	+ + +	3.14	4.59	+
BD2	B.subtitis	3.00	+ + +	3.06	4.81	+
BD3	Lysinibacillus	2.70	+ +	3.35	4.80	-
CPP1	xylanilyticus	1.71	+ +	2.39	4.91	+

All Strains negative for nitrogen fixation, siderophore production ACC deaminase activity

2.1 Effect of Cow dung on Plant Growth

2.1.1 Collection of seeds

The seeds of Trigonellafoenum – graecum (Methi) and A belmoschus esculentus (Bhindi) were purchased from the local market.

2.1.2 Pot Culture Experiment

The pot culture study was conducted to find out the effect of various concentrations of cow dung on growth of Methi and Bhindi plants. The seeds were soaked in water over night and then 5 seeds were sown in different pots filled with sterile garden soil. The garden soil was sterilized in an autoclave at 15 lbs. pressure for half an hour. The pH of the soil was adjusted to 7. Each pot was irrigated twice a day with different concentrations (1%, 2%, 3%, 4%, and 5% (v/v)) of cow urine. In control pots, the seeds were irrigated with tap water instead of cow urine. When the plants grew randomly 3 seedlings from each treatment were uprooted without disturbing the root system and different parameters such as plant height, shoot and root length, number of leaves and branches, and leaf length and breadth were measured after 25 days to observe the plant growth.

2.1.3 Estimation of Protein

10 mg of coomassie brilliant blue G250 was mixed with 10 mL of 88% phosphoric acid and 45 mL of absolute alcohol. Then the mixture was diluted to 100 mL with distilled water. 1 gm of fresh germinated seedlings (test seedlings) was ground in 20 mL of distilled water. It was filtered and filtrate was made up to 20 mL. Then 0.1 mL of filtrated solution was added with 0.9 mL of water to which 2 mL of coomassie blue was added. The absorbance was read at 595 nm. Same procedure was repeated for the seedlings that were treated with water as control.

2.1.4 Estimation of Carbohydrate

2 gm of anthrone was diluted in one liter of sulphuric acid and stored in dark bottle and labeled as anthrone reagent. 5 gm of plant sample was collected from control plant and test plants separately and ground in 2 mL of 80% acetone. The homogenized solution was filtered. 1 mL of filtered solution was added with 5 mL of anthrone reagent. The solution was heated in water bath for 5 minutes. The OD was taken for the above mentioned sample(s) at 600 nm. Standard of glucose was prepared by dissolving 100 mg of glucose in 100 mL water. The concentration of carbohydrate was calculated using the formula:

2.1.5 Estimation of Chlorophyll

Fresh leaves were collected from control plant and test plant separately and 1 gm of leaves was weighed. The leaves were cut into small pieces and homogenized in a mortar and pestle with excess of acetone and then filtered using Whatman No. 1 filter paper. The filtrate was collected and made up to 100 mL with acetone. 5 mL of extract was transferred into 50 mL volumetric flask and diluted to 50 mL with 80% acetone. Absorbance was read at 645 nm and 663 nm using spectrophotometer. The quantity of chlorophyll a, chlorophyll b, and total chlorophyll was calculated using the following formula:

Chlorophyll a (mg/g) = $12.7(A_{663}) – 2.69 (A_{645}) \times V/1000 \times w'$

Chlorophyll b (mg/g) = $22.7(A_{645}) – (4.68 (A_{663}) \times V/1000 \times w'$

Total Chlorophyll (mg/g) = $20.2 (A_{645}) +8.02 (A_{663}) \times V/1000 \times w'$

3. Use of Cow Manure on Plants

Cow manure can be used more directly to fertilize individual plants. A scoop of cow manure inserted into the base of a potting hole for squash or pumpkins, for example, gives them

a nutritional boost for growing. You can also use cow manure spread around the base of established plants, particularly in sandy or nutrient-poor soils. This won't have as immediate an impact as chemical fertilizer, but will provide nutrients over a longer period of time.Use fresh cow manure as fertilizer and you might get a stinky garden and grass popping up in your flower beds. But use composted cow manure and you could have a thriving back yard. Cow manure generally doesn't have as much available nitrogen as commercial chemical fertilizers, but it makes a fine slow-release fertilizer for use on a range of plants -- from rose bushes and flowers to bean plants and squashes.

When you buy cow manure, make sure that you buy manure that is aged, at least 6 months old. It is best to avoid direct application of cow dung on plants.

No matter how old the manure is, I always mix it with my compost or soil and let it sit for a few months before I start using it. When making my own compost, I add a layer of cow dung to the vegetable waste, garden leaves, coco peat mixture. Sometimes, I also add a bag of cow manure to a pot of soil and leave it to sit for a month.

When you compost cow manure, you get several benefits. Harmful ammonia is eliminated, weed seeds in the soil are destroyed and plenty of organic matter is added to the soil. The soil also gets the benefit of aeration and its moisture holding capacity is greatly improved.

3.1 Aged Manures

Cow manure fertilizer in all forms are a good addition to the vegetable garden. However the nutrient value does differ greatly. If you obtain manure that has been heaped up and permitted to heat up, a lot of its nitrogen may already have dissipated as ammonia. Much of the valuable digestive enzymes will also have been destroyed by the high temperatures at the heap's core.

A similar loss of digestive enzymes happens when manure from cattle is dried and bagged. Usually, dried manure comes from feedlots where it has also first been stacked wet and gone through a violent heating process. So if you were going to use bagged dried manure it isn't going to be as rich in nitrogen as fresh manure.

While cow manure and manure from all cattle types do add good nutrients to the vegetable garden they are not abundantly high in any of them. The main value, apart from the nutrients and trace element that they do supply, lies in the other properties of cow manure.

Of all the animal manures commonly available, excluding horse manure, cow manure will supply the best bulk form of organic matter to the garden. The fantastic soil conditioning ability of cow manure due to the amount of quality organic matter, that no processed fertilizer can match, is reason enough to use cow manure fertilizer whenever possible to the garden. The soil amending properties of this really great natural fertilizer has to be used to be properly appreciated.

3.2 Bedding Manures

Bedding manures are available from different animals that are confined either inside or out. Most of the bedding manure from cattle comes from feedlots where sawdust or wood-chips are used mainly for the cattle's comfort.

While these do have valuable amounts of cow manure fertilizer in them the high carbon content of the bedding is going to significantly reduce their value as a nutrient source. This is even more so when the feedlot is outside exposed to the weather rather than being on an indoor feedlot situation.

3.3 Exotic Manures

When animals such as oxen or mules were used to till the soil, they would often fertilize it at the same time. Even the use of human waste, as vile as it may seem, was popular for a time. Although human waste is not used today, the manure of such animals as pigs, steer, cows, horses, rabbits, turkeys, chickens and other poultry are used in a variety of organic gardening practices. Exotic manure can also be used in the garden where available. Exotic manure is also known as zoo manure compost and consists of the manure from herbivore animals in zoos or rehabilitation centers. It may include elephant, rhinos, giraffes, camels, wildcat, ostrich, or zebra manure.

3.4 Fresh Manures

Fresh cow manure usually has a high ammonia content and harmful pathogens like E. coli that can cause diseases in humans. Therefore you must take precautions when handling cow manure, particularly if it is fresh.

If you have fresh cow dung at your disposal, it is best to mix it with the soil and leave it to age for at least 6 months before using it for planting edible crops. And remember, you should never apply fresh cow dung to plants soon after they are planted. The high nitrogen content in the manure will definitely burn the plant tissues. Not only that, fresh cow dung has the tendency to attract pests and you will definitely see an increase in weed growth.

Aged manure on the other hand is much more ideal for adding to your plants. And if your plants are in containers, it is best you use them in moderation.

3.5 Cow Urine as Fertilize

1. Cow Urine – 1 litter
2. Bird's eye chili – 1 handful
3. Bar soap – 50 grams (don't use detergent cakes, use non-detergent cakes)

Preparation – Slice the bar soap and dilute it in 1/2 litter water grind the Bird's eye chili and mix it with bar soap solution and cow urine. Mix well all the ingredients and filter it. You can use it now by adding 10 litter water in this solution. Please be remember that don't use this directly on plants. You should dilute this urine/bird's eye chilli mixture with 10 times of water. Usage of Cow Urine as Fertilizer in Organic Farming methods. We have discussed about organic fertilizers and pesticides here. You can use cow urine as a good organic fertilizer and pesticide. This is best for the cultivation of spinach aka cheera. You can check how to make a good and effective organic fertilizer. It can use as an organic pesticide, we can prevent some attacks by the insects with this. This is using as an effective organic fertilizer in India and other countries. You can use it alone and mix with some other ingredients to get good results. Please be remember that do not apply directly to the plants. You need to dilute it 10% with water and apply to the vegetables means 1 litter cow urine should dilute with 10 litter of water.

Composition of Cows Urine as follows. It contains 95% Water, 2.5% Urea, and 2.5% of Minerals, Hormones, and Salts& Enzymes. We can make natural fertilizers like Panchagavya, Amrit Jal, and Jeevamrutham etc. with Cow Urine. With the help of these natural fertilizers we can improve the growth rate of plants and that will be results in increase in production. All these organic fertilizers are cost effective and ecofriendly. Excess Usage of Chemical fertilizers will spoil the soil structure. This type of natural fertilizers improve the soil structure and it will help us to cultivate healthy veggies.

4. Conclusion

Cow dung consists of three basic elements critical to plant health: nitrogen, phosphorus, and potassium. Nitrogen allows plants to produce the proteins needed to build living tissue for green stems, strong roots, and lots of leaves. Phosphorus helps move energy throughout the plant, especially important in maturing plants. Potassium aids plants in adapting sugars needed in growth and is especially helpful in root crops. Fresh manures from cattle and other ruminant animals, goats and sheep amongst the most common, contain cellulose decomposing bacteria along with active digestive enzymes. These enzymes contribute to faster heating of the manure which accelerates the decomposition of organic materials by the soil microorganisms. The end result of better decomposition of organic material is faster nutrient release to the plant, while cow manure is excellent for growing vegetables it is not recommended to use fresh manure directly on the growing area because they will burn tender plant roots. It should instead be either.

- Applied to an area alone with other organic materials as sheet compost.
- Dug into the garden and allowed to age for at least 30 days.
- Composted in a conventional compost heap.

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