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Panchagavya is a bio-fertilizer in organic farming

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Abstract
Panchagavya is an organic product produced by using the use of five specific through-products of cow like cow dung, cow urine, cow milk, cow ghee, cow curd and other substances. It has the capability to play the function of promoting boom and supplying immunity in plant machine thereby confers resistance against pest and sicknesses. Panchagavya includes several vitamins i.e. macronutrients like N, P, okay and micronutrients which might be required for the growth and development of vegetation and additionally consists of various amino acids, vitamins, increase regulators like Auxins, Gibberellins and also useful microorganisms like pseudomonas, azatobacter and phosphor bacteria etc.

Keywords: panchagavya, cow dung, cow urine, cow milk

Introduction

Panchagavya is an organic formulation, which in Sanskrit means the blend of five products obtained from cow milk, ghee, curd, dung and urine (all these products are individually called as "Gavya" and collectively named as panchagavya). Panchagavya has got reference in the scripts of Vedas (devine scripts of Indian wisdom) and Vrikshayurveda (Natarajan, 2002). In India, use of panchagavya in organic farming is gaining popularity in recent years especially in states like Tamil Nadu and Kerala.

Panchagavya is a special preparation made from five by-products of cow along with certain other ingredients, has the potential to play the role of promoting growth and providingimmunity in plant system. Panchagavya plays a major role in organic farming.Ingredients used for preparation of panchagavya.

Mix thoroughly the fresh cow dung (7kg + Cow ghee (1kg)
↓
Incubation for 2 days
↓
Add cow urine (3:1) + 10 litre of water
↓
Stir properly (morning and evening, daily for 1 weak)
↓
Add sugarcane juice (3 litre) or jiggery mixed in water at 1:6 ratio
+
Cow milk (2 litre)
+
Cow curd (2 litre)
+
Coconut water (3 litre)
+
Yeast (100 g) and 12-ripe banana
↓
Stir properly (morning and evening, daily for 3 weaks)
↓
Panchagavya is ready to use

All the above items can be added to a wide mouthed mud pot or concrete tank or plastic bucket as per the above order. The container should be kept open under shade. The content is to be stirred twice a day both in morning and evening. Sugarcane juice and coconut water are reported to accelerate fermentation. Toddy also accelerates fermentation and helps in minimizing the bad odor. To prepare toddy two liters of tender coconut water has to be kept in a sealed airtight plastic bottle for a week. However, 100 g of yeast powder can be made use of in case of non-availability of toddy.

Chemical and Biological Properties of Panchagavya

Panchagavya contains several nutrients i.e. macronutrients like nitrogen, phosphorus, potassium and micronutrients which are required for the growth and development of plants and also contains various amino acids, vitamins, growth regulators like Auxins, Gibberellins and also beneficial microorganisms like pseudomonas, azatobacter and phosphor bacteriaetc. Effective Micro Organisms (EMO) in panchagavya are the mixed culture of naturallyoccurring, beneficial microbes' mostly lactic acid bacteria (Lactobacillus), yeast (Saccharomyces), photosynthetic bacteria (Rhodopsuedomonas) and certain fungi (Aspergillus) (Xu 2001; Swaminathan *et al*. 2007). Presence of macro (N. P, K and Ca) and micro (Zn, Fe, Cu, and Mn) nutrients besides total reducing sugars (glucose) in panchagavya have been detected. Chemolithotrops and autotropic nitrifies (ammonites and nitrifies) present in panchagavyawhich colonize in the leaves increased the ammonia uptake and enhance the total N supply (Papen *et al*. 2002). The pH of panchagavya is low due to fermentation and presence of Lactobacillusbacteria which is effective in killing of plant pathogens (Manthivanan *et al*. 2006). Yadav & lourduraj (2005) observed bio fertilizers such as Azospirillum, Azotobactor, Phosphobacteriaand

Pseudomonas in Panchagavya. Parmalat *et al*. (2006) detected growthregulatory substances such as Indole Acetic Acid (IAA), Gibberlic Acid (GA3), Cytokinin andessential plant nutrients in it.

Beneficial Effects of Panchagavya

Panchagavya is a component of crop production and it plays a crucial role in each and everycomponent of crop management like integrated soil fertility management, integrated pestmanagement, and integrated disease management.

Use of Cattle dung and Panchagavya in diseases control

1. It increases immunity power in plants thereby confers resistance against pest and diseases
2. various beneficial metabolites produced by microorganisms such as organic acids,hydrogen peroxide and antibiotics, which are effective against various pathogenicmicroorganisms

Cow dung is being used for different purposes from the ancient time and has asignificant role in crop growth because of the content in humid compounds and fertilizing bio elements available in it. Composted cow dung is rich in total nitrogen (0.74%) including some hormones and favor's plant growth (Dhama *et al*. 2005).

Boomiraj *et al*. (2004) reported that panchagavya was effective against leaf hopper (Amrascabiguttula) and white fly (Bemisiatabacci) in bhendi. Similar results were observed by Mudigora *et al*. (2009) in cabbage and sorghum. Cowdung is very effective manure for reducing the bacterial and fungal pathogenic diseases. It showed positive response insuppression of mycelial growth of plant pathogenic fungi like Fusarium solani, F. oxysporumand Sclerotiniasclerotiorum (Basak & Lee 2002). Similarly, as per Mary *et al*. (1986) cow dung extract spray was also reported to be effective for the control of bacterial blight diseaseof rice and was as effective as penicillin, paushamycin and streptomycin.

Pammel (1889) found that cowdung as organic manure increase vigour of plant andreduce the disease incidence of root rots in cotton caused by Phymatotrichumomnivorum. Similarinvestigations were conducted by Abawi & Widmer (2000); Akhtar & Malik (2000) and Gamiliel *et al*. (2000) reported that organic manure reduce disease incidence caused by awide range of plant pathogens including bacteria, fungi and nematode species. Therefore, application of cow dung in proper and sustainable way can enhance not only productivity ofyield but also minimizing the chances of disease.

Effect of panchagavya on soil fertility and productivity

1. Panchagavya improves fertility status in soils by increasing macronutrients, micronutrients and beneficial microorganisms thus increase soil health.
2. It improves water holding capacity of soils because it acts as organic manure.
3. It encourages growth and reproduction of beneficial soil microorganisms
4. Increases nutrient uptake in plants and enhances plant growth.

Beaulah (2001) [12] opined that the beneficial microorganisms from panchagavya and theirestablishment in the soil improved the sustainability of agriculture as the microorganisms presenting the rhizosphere environment around the roots influence the plant growth and crop yield. It may be due to presence of plant growth promoting substance in cattle dung and otherrnutrients which provide substrate for growth of microbes. Panchagavya enhances the growthand vigor of crops, inducing resistance to pests and diseases and improving the keepinequality of vegetables and fruits (Natarajan 2002). Panchagavya spray was also reported as effective on all the crops than therecommended nutrients and growth regulators (RFS) in terms of higher growth andproductivity (Somasundaram 2007). Panchagavya can be effective organic growth-promoterfor small and marginal farmers. The B: C ratio of panchagavya was higher as compared to other organic insecticides as cattle dung and cattle urine are cheap sources which are available in the house hold of farmers.

Use of Panchagavya as growth promoter

In jasmine, spraying two rounds of panchagavya, one before the flower initiation andanother during bud setting phase ensured continuous flowering. In annual mooring sprayingdoubled the stick yield besides giving resistance to pests and diseases (Vivekananda 1999) The current trends in organic practices showed improved yields in crops of rained areas inIndia, especially during drought years (Singh *et al*. 2001; Ramesh *et al*. 2005) [5]. Studies haveshown increased yields where the farmer has used organic practices (Singh *et al*. 2001; Ramesh *et al*. 2005) [5] in crops like chilli (Subhashini *et al*. 2001), moringa (Beaulah 2001) [12], green gram (Somasundaram *et al*. 2003) and french bean (Selvaraj 2003). It can be concludedthat Panchagavya as an organic growth-promoter for small and marginal vegetable growers (Boomathi 2006). The cost-benefit to farmers was greatest when Panchagavya was used as agrowth promoter and proved as the cheapest, while AmritPani, and Bokashi were the costliestalternative input (Francis & Smith 2006).

Effect of panchagavya in different cropsPaaddy

- Increases tillering
- Absence of chaffy grains
- Grain weight is increases by 20%
- Improved cooking quality
- Harvest is advanced by 15 days

Reduced percentage of broken rice during milling

Effect of Panchagavya on plants

Leaf

Plants sprayed with Panchagavya invariably produce bigger leaves and develop denser canopy. The photosynthetic system is activated for enhanced biological efficiency, enabling synthesis of maximum metabolites and photosynthetic.

Stem

The trunk produces side shoots, which are sturdy and capable of carrying maximum fruits to maturity. Branching is comparatively high.

Roots

The rooting is profuse and dense. Further they remain fresh

for a long time. The roots spread and grow into deeper layers were also observed. All such roots help maximum intake of nutrients and water.

Yield

There will be yield depression under normal circumstances, when the land is converted to organic farming from inorganic systems of culture. The key feature of Panchagavya is its efficacy to restore the yield level of all crops when the land is converted from inorganic cultural system to organic culture from the very first year. The harvest is advanced by 15 days in all the crops.It not only enhances the shelf life of vegetables, fruits and grains, but also improves the taste. By reducing or replacing costly chemical inputs, Panchagavya ensures higher profit and liberates the organic farmers from loan.

Advantages of Panchagavya

- It improves soil health and fertility
- It is used against pest and diseases
- It increases yield and quality of produce
- No chemicals are used
- Eco-friendly approach
- Cost required for preparation is less
- No special techniques is required
- It gives multiple uses
- Reduces cost of cultivation by reducing chemicals like fertilizers, pesticides,
- Fungicides, growth regulators etc
- Farmer friendly method

Organoleptic characters of Pancagavya

Table 1

Parameters	Odour	Touch	Taste	Colour
Ghee	Pleasant	Oily	Slightly sweet	yellow
Urine	Bad	Watery	Bitter	Straw yellow
Curd	Pleasant	Faint oily	Sour & astringent	White
Dung	Bad	Sticky	-	Brown
Milk	Pleasant	Viscous than water	Sweet and faint alkaline	Yellowish white

Dosage of Panchagavya recommended for field application

Spray system: 3% solution is effective. 3 liters of Panchagavyamixed with every 100 liters of water is suitable for all crops.

Flow system: The solution of Panchagavya can be mixed with irrigation water at 48-52 liters per hectare either through drip irrigation or flow irrigation.

Seed/seedling treatment: 3% solution of Panchagavya can be used to soak the seeds or dip the seedlings before planting. Soaking the seeds or dipping the seedlings for 30 minutes is feasible.

Conclusion

The increasing concern for environmental safety and global demand for pesticide residue free food has evoked keen interest in crop production using eco-friendly products which are easily biodegradable and do not leave any harmful toxic residues besides conserving nature. So it is necessary to use natural products like Panchagavya to produce chemical residue free food crops and hence Panchagavya can play a major role in organic farming.

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