Panchagavya as soil conditioner : Ancient traditional Knowledge for sustainable agriculture

Abstract

Panchagavya is an ancient traditional agricultural knowledge in Indian farming, where farmers were used in crops from decades, It is completely cow based products combination of five ingredients majorly Cow's dung, urine, milk, ghee and curd, instead of these other ingredients like jaggery, coconut water, ripped bananas were also used to boosting its role. In agriculture, Panchagavya acts as a soil health improver by providing nutrients to plants that it has the abundant quantity of growth promoting hormones, macro and micro nutrients, helpful microorganism that are mutually cooperated with the plant roots and soil in Rhizosphere zone that may helpful in conversion of organic form of nutrients to inorganic form where plants can easily uptake them and results better plants immune system and effective control of various diseases in plants.

Key words: Panchagavya, Cow, dung, soil health, growth

Introduction

Presently Global country's mainly India facing major problem of reducing soil fertility in agriculture lands that is mainly due to the continuous use of synthetic chemicals and its compounds without using organic amendments, this may leads to loss of organic fertility in soil, causing effect to the beneficial microbial biota in root rhizosphere, plant species and adoption of disease causing insects and pests to the chemicals. Continuous use of insecticides, pesticides and fertilizers in large quantities to the soil and plants for higher bumper production purpose may lead to the soil and environmental pollution. Hence, in order to reduce harmfulness to soil and beneficial microorganisms in agriculture we need to follow traditional agriculture (I.e., eco-friendly, integrated, organic and sustainability agriculture) along with modern technical agriculture. In present days humans are aware towards the organic related products and its importance to health. Hence, demand for organically grown agricultural products have been increasing. In India from ancient times farmers are using organic amendments and its dilutions in agriculture that results low cost of cultivation in agriculture, still in some remote areas they are following the ancient traditional knowledges. There are different traditional knowledges developed by the ancient farmers for healthy production of organic products in agriculture, among them 'Panchagavya' is one. In India, Vedas like Vriskshayurveda from ancient wisdom discuss about the panchagavya a traditional agriculture ingredient used for the boost up of plant biological efficiency, disease resistance in plants body.

Panchagavya is an organic method of preparation, as its words are derived from the ancient sanskrit of which 'Panch' denotes five and 'Gavya' meaning the cow related products (i.e., Milk, Ghee, Curd, Urine and Dung) and all these combinely called the panchagavya. These

panchagavya is an ancient traditional knowledge that uses in Indian agriculture, medicinal purposes (Sadhale, 1996, Sugha, 2005). Products of panchagavya are cheap and readily available to the farmers in rural areas. Among panchagavya ingredients, Cow urine has a lot of medicinal, disease control ability (Pathak and Kumar 2003), immune booster and germs control in plants and human beings as well (Chauhan et al. 2001). Cow urine contains the water of about (95%), urea (2.5%) and other combination of hormones, minerals, enzymes and salt of about (2.5%). Some research studies find out that cow urine has a small proportion of bio-fertilizers and pest controlling agents (Dhama et al. 2005). Cow dung the second most important ingredient for panchagavya used from ancient times in agriculture have been discussed by the some of the Indian historians like Kautilya (321-296 BC), Varahamihira (505-587 AD), Surapala in 1000 AD and Someshwara deva in 1126 AD (Nene YL,1999) . Cow dung has more than 22 beneficial microorganisms (Bacteria, Fungi, actinomycetes and other beneficial organism), It consists the water content of (82%), Solid content (18%) and among in solid matter it have N(0.5%), P(0.2%), K(0.5%), Silica(1.5%), ca + mg (0.4%), ash (2.4%), minerals (0.1%) and organic matter of about 14.6% (Mathivanan et al. 2006). Third most important thing in panchagavya is cow's milk, in ancient agricultural practices it is used as an organic liquid formulation mixed with other organic ingredients for better sticking and spreading purposes. It also helps in inhibiting saprophytic bacteria and other viruses. Cow's milk have various sources like protein, fat, carbohydrates, ca, H, amino acid, lactobacillus bacterium and lactic acid. These sources may helpful for better boosting the growth and replicating of useful bacterium in panchagavya (Nene YL,1999). Fourth most important thing is the cow's ghee, in ancient agriculture it is used for maintaining the healthy seedlings (Kautilya 321-296 BC and Someshwara Deve 1126 AD). It contains Vit A, Vit B, glycosides, ca and fat which is helpful for the better recovered from cut infections (Nene YL, 1999). Curd the fifth most important ingredient in panchagavya, it has lactobacillus microbes, which may helpful in fermentation process, It is used as an organic pesticides in ancient, modern agriculture. Rice blast, wheat rust were effectively controlled by spraying fermented butter milk. It is mixed with other organic pesticides for better controlling diseases in plants. Instead of above 5 cow based products other ingredients like bananas, jaggery and coconut water were also used. These combinations may help in doing better work in the field crops and boosting up soil Microbial biota.

Panchagavya preparation

1. Collect fresh cow dung @ 7kg and add Ghee @ 1 kg to it, mix it well and remain undisturbed for 2 days.

2. Then add Cow urine @ 3 lit + Water @ 10 lit to it and stir it well in clock wise direction on morning and evening with wooden stick for one week.

3. Then add either Jaggery or sugarcane juice @ 3 lit to the above preparation.

4. Then add Cow milk@ 2 lit + Curd @ 2 lit to the above preparation and stir it well.

5. Add Coconut water@ 3 lit + Yeast @ 100 gram + Well ripen bananas @ dozen (12) to the preparation and mix it well

6. Then preparation should be incubated for 2 weeks.

7. After 2 week's panchagavya is getting ready for use

8. Filter the panchagavya preparation with double layer muslin cloth and stored in bottle.

Fig 1: Raw materials for Panchagavya preparation

Source : blog.ucbmsh.org

Panchagavya application dosage.

Panchagavya should be applied @ 3 % (3 lit in 100 lit of water) for spraying purpose in most of the field crops. In irrigation system (drip or open channel) apply 48 - 50 lit panchagavya for ha land. For seed treatment treat dip the seeds in 3 % panchagavya solution for 30 minutes. Most recommended spraying time for various crops is pre flowering and pod development stage. Panchagavya should be applied at 15 days interval at flowering, pod/ fruit formation stage and 10 days interval at pod/ fruit maturity stage.

Table 1: Chemical composition

Sr.no	**Physical properties**		**Chemical properties**	
1	PH	5.45	Total N (ppm)	229

2	EC(dSm^2)	10.22	Total P (ppm)	209
3			Total K (ppm)	232
4			IAA (ppm)	8.5
5			G.A (ppm)	3.5
6			Ca (ppm)	25
7			Na	90

Source: TNAU portal

Table 2: Microbial population in panchagavya

sr.no	**Microbes**	**Population/ml panchagavya**
1	Bacteria	1880000/ml
2	Fungi	38800/ml
3	Lactobacillus	2260000/ml
4	anaerobes	10000/ml
5	Acid formers	360/ml
6	Methanogens	250/ml

Source: TNAU Portal

Panchagavya role in agriculture

In organic agriculture, Panchagavya plays a crucial role in controlling disease, boosting up plant growth, flowering, germination and better canopy development. It also plays massive role in compost decomposition, improves better nutrients status in soil by promoting better mineralization process and helpful in sufficient production of beneficial microorganisms in root rhizosphere that can helpful in supply of beneficial macro and micro nutrients to plants. **Panchagavya role in following aspects**

a) Seed germination and plant growth

Panchagavya mixture have several required nutrient like macro (N,P,K,Ca,Mg,S) and other micro-nutrients that are very essential for the plant growth, These panchagavya also have the plant required enzymes, carbohydrates, amino acids, vitamins, antibiotics, growth regulators/hormones like(Auxins, Gibberellins, Cytokines etc.,), Metabolites (Chauhan JS et al.,2009) also has Azotobacter, Phosphobacteria plant growth promoting microbes. Major ingredient of panchagavya is cow urine that which may helpful for the sufficient availability of plant required macro, micro nutrients and other fatty acids, alcohols, antibiotics and alkanes. Hence, due to the availability of sufficient quantity of growth promoters, microbes and other growth boosters it may helpful for the better germination of seeds (Ratnoo and Bhatnagar, 1993; Saritha et al. 2013) and also helpful for better plant growth.

b) Plant protection

Panchagavya shown good results in controlling insects and pests, when applied it to crops as a spray, it acts as a pest repellent (Swaminathan C et al., 2007). It helps in improving biological resistance against pests and diseases (Nileema and Sreenivasa , 2011). Panchagavya shows good results in controlling pests in horticultural crops, according to some researches it shows good results in controlling panama wilt disease in banana (Kaushik and Gautam, 1994). It also helps in controlling tomato wilt successfully, improving resistance capacity of plants to diseases and helps in obtaining better tomato yield. When applying panchagavya to vegetable crops helps in controlling Solanum malanogens Linn and other diseases and pest incidence in crops. When applied to the soil combined with agnihotra helps in reducing the population of cutworms and boost up the yield of potato

c) Seed storage

In some remote parts of India Panchagavya also used as a seed storage purpose by external dressing application to pots. Cow urine one of the main ingredient of panchagavya have been mixed with red soil may helpful for better control of C. chinensis L. and its adults. It is also used to control mung bean beetles, reduces the incidence of O. bennigseni, when sprayed in 7 days interval

d) Soil fertility improvement

Panchagavya an organic formulation that when applied to the field through water channel or directly to the soil may boost up the soil health by maintaining sufficient quantity of organic matter content in soil and helpful for the better growth and replicating various microorganisms that are beneficial to soil and crops. It helps in improving nitrogen status in soil by benefiting nitrogen fixation bacteria (Amalraj et al., 2013). Panchagavya also helpful in improving physical properties of soil by maintaining macro, micro pores which are very necessary for soil air, water storage and also maintain aggregate stability. It also helpful in improving chemical properties of soil like Maintaining neutral soil pH (6.82), improving nutrient status of soil by boosting better mineralization process that may helpful for good availability of nutrients to plants. As in panchagavya there are availability of microorganisms that are beneficial to plants and when these microorganisms reached to soil it may adopt well to the soil sufficient conditions in root rhizosphere and boost up the plant growth, helps in getting better yield to farmer and also safe to the soil and its environment (Beaulah. 2001, Pathak and Ram,2013).

Table 3: Panchagavya application time for different crops.

sr no.	**Crops**	**Panchagavya application time**
1	Rice	10,15,30,50 DAT(Days after transplanting
2	Wheat	15 Days interval
3	Maize	15 Days interval
4	Chickpea	15 Days interval
5	Red gram	15 Days interval
6	Black gram	15,25,40 DAS
7	Green gram	15,25,30,40,50 DAS
8	Groundnut	25, 30 DAS
9	Sunflower	30, 45, 60 DAS
10	Castor	30,45 DAS

11	Bhendi	30,45,60,70 DAS
12	Tomato	Seed treatment, nursery preparation, 40 Days after transplanting
13	Onion	45, 60 Days after transplanting
14	Moringa	Flowering and pod formation stage
15	Rose	Pruning, budding time
16	Jasmine	Budding, setting stage

Source: TNAU Agritech Portal

Advantages

Panchagavya plays major role in maintaining genetic biodiversity, helps as a growth promoter, root growth enhancer, Increasing water holding capacity, increase photosynthetic activity in plants by better formation of plant canopy, increase availability of nutrients to plants, helps in obtaining good yield attributes and reduces the cost of cultivation for farmers and also plays role in disease controlling, insect repellent and also preciously helpful in controlling environmental, soil pollution by reduced use of chemical compounds.

Pagar et al., 2015 observed that panchagavya positively impact plant height and enhance the tiller numbers in wheat; which implicate the significant positive agronomic parameter impact of panchagavya. Moreover panchagavya is proved to improve the macro and micronutrient status of soiland influence the soil microbial growth more as compared to other organic manures like FYM and vermicompost (Jain et al 2014). Plant growth promoting bacteria like rhizobium, azospirillum and azotobactor was recorded during soil application of panchagavya (Patel 2018). Microbial biomass and consequently nutrient mineralisation after the amendment of panchagavya has been observed by many studies (Rana et al.2015). Panchagayva application enhances physiological functions and biological yield via conditioning soil to release maximum nitrogen, phosphorus, potassium (Choudary et al. 2017; Prajapati et al. 2022)

Conclusion

Panchagavya is an India's old traditional agriculture formulation prepared from cow based products. Usage of these formulation is neglected by using inorganic components, but presently there is increasing interest towards organic products. In organic farming Panchagavya plays a crucial role for maintaining better nutrients status in soil for plant growth and maintain plant health and plays key role in disease control. Hence farmers need to look towards old agricultural practices were, lot of hidden traditional agriculture knowledges is there which are safe to soil, living creatures and nature.

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