ANTIMICROBIAL PROPERTIES OF PANCHGAVYA IN CURING PLANT DISEASE

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ABSTRACT

Panchgavya, the age-old organic preparation from cow-based products-milk, ghee, curd, dung and urine-has again found exciting scientific inputs in sustainable agriculture. Panchgavya, as recorded in *Vedaas* and *Vrikshayurveda* promotes ecological balance, etc., crop resistance and act as a good substitute for chemical fertilizer and pesticides. This review discusses its multiple benefits, ranging from plant growth promotion to tolerance to disease and finally yield. The efficacy of Panchgavya is tremendous in the management of plant diseases like early blight in tomato, sheath blight in rice, southern sun hemp mosaic virus and stem gall disease (bacterial) in coriander. The biological and chemical properties enable improved photosynthesis, more denseness of roots and better drought resistance which is crucial for sustainable farming. The other clues in the review include a helper of microbes for suppressing the pathogen and its role in controlling post-harvest diseases. Panchgavya as An eco-friendly-low-cost-input promoting soil health, enhancing quality of crops and reducing dependency on synthetic inputs – the findings are focused on these aspects. This all-encompassing review highlights that it potentially opens new avenues of its use in organic agriculture as well as bio pesticides thereby promoting a sustainable and resilient agricultural future.

Keyword: Panchgavya, Efficacy, Ecological balance, Sustainable farming

Introduction

In Sanskrit, panchgavya, an organic composition, refers to a combination of five products made from cow's milk, ghee, curd, dung, and urine (all of which are separately known as "Gavya" and referred to as panchgavya together. Panchgavya has got reference in the scripts of Vedas (devine scripts of Indian wisdom) and Vrikshayurveda. Both formulations support ecological balance and crop resilience while providing farmers with workable substitutes for chemical inputs, embodying the ideals of sustainable farming. The quality of fruits and vegetables is influenced by panchagavya. It can be applied as a seed treatment, foliar spray, or soil application in conjunction with irrigation **(natrajan,2002)** . By boosting macronutrients, micronutrients, and beneficial microbes, panchagavya enhances soil fertility and promotes soil health Beaulah (2001). Panchagavya is a sustainable agricultural strategy used by farmers in South India. As an alternative to chemicals, the use of chemical pesticides and fertilizers in agricultural fields has resulted in environmental damage. Additionally, Panchgavya is being pursued to enhance crop health and establishmen (Kumar S et al., 2019). An organic substance called panchgavya can help plants grow and become more resilient. Panchgavya helps in dealing with different types of plant disease, some of them are discussed below.

What is panchgavya?

Panchgavya is a blend of five cow-derived items that are widely employed in traditional medicine. These include ghee, milk, curd, urine, and manure from cows. The importance of the special blend of the cow's five products is being rediscovered by scientists. A single organic ingredient called panchgavya has the ability to improve immunity and encourage growth. It plays a big part in boosting total output and offering resistance to pests and illnesses. It was discovered that Panchgavya possessed the qualities of both biopesticides and fertilizers Vivekanandan, P. (1999). When making Panchgavya, the stock solution is stirred clockwise and anticlockwise, creating a depression that makes a cosmic ray link possible. Unbalanced physical, chemical, and biological processes as well as physiological

elements are eliminated when cosmic energy is let to flow through a living system. This energy harmonizes the fundamental components of growth, revitalizing the process Sundaraman,(2001).

Ingridients and procedure of making panchgavya

Take 7kg cow dung and 1kg ghee (mix thoroughly)

⇩

Incubation for 2 days

⇩

Combine 10 litre cow urine and 10 litre water

⇩

stir properly (for 1 week)

⇩

now , add sugarcane juice (3 litre) + cow milk (2 litre) + jiggery (3kg) + cow curd (2litre) + coconut water(3 litre) + 12 ripped banana

⇩

stir for 30 days under controlled environmental conditions

⇩

Panchgavya is ready to use

Table: 1 Physico-chemical properties of Panchgavya

Chemical composition	
pH	5.45
EC dSm2	10.22
Total N (ppm)	229
Total P (ppm)	209
Total K (ppm)	232
Sodium	90
Calcium	25
IAA (ppm)	8.5
GA (ppm)	3.5

Effects of Panchgavya on plants

Leaf: Bigger leaves and a denser canopy are always produced by plants treated with Panchagavya. Maximum metabolite and photosynthetic synthesis are made possible by the activation of the photosynthetic system for improved biological efficiency.

Stem: Sturdy side branches that can bear the most fruits to maturity are produced by the trunk. The level of branching is relatively high.

Roots: The rooting is dense and abundant. They also stay fresh for a very long period. It was also noted that the roots grew and expanded into deeper strata. These roots all aid in maximizing nutrient and water uptake.

Yield: Under normal conditions, when land is switched from inorganic cultural systems to organic farming, there will be a yield decline. When the land is transformed from an inorganic cultural system to an organic one from the first year, Panchagavya's main advantage is its ability to recover the yield level of all crops. For every crop, the harvest is 15 days earlier. It improves the flavor of fruits, vegetables, and cereals in addition to extending their shelf life. Through the reduction or replacement of expensive chemical inputs, Panchagavya guarantees increased profit and releases organic farmers from debt.

Drought Hardiness: Water evaporation is decreased as a result of the formation of a thin, oily coating on the leaves and stems. The plants' wide and deep roots enable them to endure protracted dry spells. Both of the aforementioned elements help to guarantee drought resistance and a 30% reduction in the amount of water needed for irrigation.

Different Diseases controlled with application of Panchgavya

Early blight in tomato:

One of the most lucrative and extensively cultivated plants in the Solanaceae family is the tomato (*Lycopersicon esculentum* Mill, n = 12) in the entire world . Leaf blight is one of the fungal infection caused by *Alternaria* species is among the most devastating sickness in the world that causes losses both prior to and following tomato harvest **(Gondal et al., 2012).** Mostly on the lower leaves, early blight symptoms manifest as tiny, round, light brown necrotic patches with or without a yellow halo. A target board effect results from the enlargement of some areas with distinctive concentric rings. Veins were also seen to have confined a few asymmetrical areas. This pathogen also causes symptoms such as fruit drop, blossom blight, stem, and seedling **(Agrios, 2005)**. The field tests were carried out in Sikkim's farmers' fields throughout the 2019 and 2020 kharif seasons. Out of 12 treatments, including chemical check and untreated control, studies on integrated disease management using organic inputs were carried out in South Sikkim in 2019 and 2020.Treatment{Susceptible Variety + Soil treatment with *Trichoderma harzianum* @1:25(1kg *Trichoderma* +25 Kg of FYM) + cow dung slurry 10% + nimbicidine 0.3% + Panchagavya 10% + Cow Urine 10%} was the most successful in achieving the lowest disease severity, highest yield, highest percentage of illness reduction, and highest percentage of yield gain. Panchgavya was the most successful in terms of the lowest degree of disease, the highest percentage of disease reduction, the highest yield, and the highest percentage of yield growth after treatment in controlling early blight of tomato.

Sheath blight in rice

More over half of the world's population depends on rice (*Oryzae sativa L.)* as their primary food source. Diseases and pest-related losses are among the main limitations in the production of rice. Sheath blight of Rice diseases result in significant losses particularly in regions with high yields. *Rhizoctonia solani* which causes rice sheath blight is both soil and water borne and management of the disease is difficult **(Kagale et al., 2004).** One of the prevalent and damaging diseases affecting rice in India is sheath blight. Panchgavya and four plant leaf extracts were evaluated against R. solani at a 10% concentration in an in vitro setting. Table 1 displays the mycelial growth

and sclerotial development observations that were made **(Ashlesh and Paul, 2014)**. The microorganisms (fungi, bacteria, and actinomycetes) that are found in panchgavya may be the cause of the release of antimicrobial chemicals **(Swaminathan et al., 2007)** . Regarding the solvents—cold water, hot water, and acetone—no discernible pattern in the effectiveness of medicinal plant leaf extracts was found. Different antifungal chemicals present in different solvents may be the cause of the variance in efficacy. It is not required that every extract or solvent contain every antifungal component, and the amount may differ based on the kind of extraction solvent and solvent type. While dealing with sheath blight it is noticed that there was reduced mycelial development and no sclerotia formation in this investigation. This may be because there is less active mycelial growth, which ultimately prevents mycelial strands from aggregating to create-sclerotia.

Table: 2 Panchgavya and various plant leaf extracts have an inhibitory impact on *Rhizoctonia solani* mycelial growth in vitro (at 10% concentration)

Plant species	Cold water		Hot water		Acetone	
	Mycelial Growth (mm)	%decrease over contol	Mycelial growth (mm)	%decrease Over control	Mycelial growth (mm)	%decrease over control
T1-Neem (*Azadirachta indica*)	36.2	59.77	52.47	41.7	46.86	47.92
T2-Garlic (*Allium sativum)*	17.53	80.51	22.33	75.18	37.13	58.74
T3-Datura (*Datura stramonium*)	53.8	40.22	48.67	45.92	32.4	63.99
T4-Lemon grass (*Cymbopogan flexousus*)	90.0	0.o	72.07	19.92	84.87	5.70
T5-Panchgavya	73.27	18.59	62.66	30.36	58.40	35.11
Control	90.0	-	90.0	-	90.0	-
SE(m)+	2.6312		1.9808		2.6464	
CD(5%)	8.1078		6.1035		8.1545	

Sounthern Sunnhemp Mosaic Virus (SSMV)

Sunnhemp mare raised in several states as green manure and fibre crop. A virus is causing mosaic disease in the plant which results in puckering and curling of the plants. The virus was named as Sounthern sunn hemp mosaic disease (SSMV). The virus is serologically related to TMV and RNA virus. In the present work an attempt was made to find out the effect of Panchgavya on Sounthern Sunhemp Mosaic Virus (SSMV) **(narjani , 1963)** . In plants infected by SSMV, foliar treatment of panchagavya yields superior results. This study was conducted to determine how panchagavya affected a plant afflicted with a virus. After ten days, the SSMV-inoculated control and panchagavya-treated plants displayed mosaic symptoms. Plants treated with panchagavya grew more rapidly than control plants treated with water. Plants treated with panchagavya had longer shoots and roots than the control group. Similarly, plants treated with panchagavya and SSMV infected grew more than plants treated with water and SSMV inoculated. Compared to control plants, the total number of nodules

and leaves rose in panchagavya-treated plants. Additionally, biomass trended higher in plants treated with panchagavya than in control. Presence of lesser virus concentration in panchagavya + SSMV treated sunnhemp and on assay host cluster showed that spraying with panchagavya improves plant health and act as immunity booster **Prabhu, M.J.,(2004).** Treatment of Panchagavya Better development and higher levels of pigments and carbohydrates were observed in sunnhemp plants. It might be because panchagavya contains growth-regulating chemicals like IAA, GA, and *cytokinin,* vital plant nutrients, beneficial microbes, and biofertilizers like *Acetobacter*, *Azosprillum,* and *Phosphobacterium.*

Stem gall disease of coriander

India is largest producer, consumer and exporter of coriander in the world. *Protomyces macrosporus* is the cause of stem gall disease. Unger is a significant illness in all regions of Madhya Pradesh, Bihar, Uttar Pradesh, and the surrounding district of Rajasthan that grow coriander. Galls on stems are one way the disease shows up. Fruits, petioles, branches, and leaves reduce yield by 15% to 20% **(Pandey and Dange, 1998)**. Seed treatment and soil drenching with Panchagavya (cow urine+ cow dung+ curd + milk+ghee) @ 30% concentration. Fungicides at 30% concentration are found to be significant with control and comparable to panchagavya, cow urine, and cow dung slurry. The yield of coriander increased significantly with organic treatment compared to control and was comparable to that with fungicides. An analysis of recent developments in organic farming revealed higher crop yields in India's rain-fed regions, particularly in years of drought **(Singh et al. 2001)** . **Natrajan (2002)** stated that panchagavya improves the quality of vegetables and fruits during storage and increases crop growth and productivity, as well as resistance to pests and diseases. More over direct application of cow dung on the infected plants may cause the death of plant due to having high toxicity. Panchagavya is the richest source of all liquid manures in nutrition and essential microbial population.

Chadha et al (2012) were found to have a noteworthy impact when used as a foliar spray to prevent cauliflower stalk rot. Since cow dung slurry contains a variety of both digested and undigested plant components, it is simple to shield plants from pathogens by forming poisonous barriers. Furthermore, when applied to plants, the compounds and gases that are found in cow urine may evaporate, reducing the urine's inhibitory action compared to cow dung **(Basak and Lee 2005)**. The current experiment offers a new technology for controlling plant pathogens and increasing crop productivity that is affordable and safe for the health of plants, soil, and people. Fungicides were found to be effective in managing stem gall disease, but they are harmful to the environment and soil structure.

Post harvest disease control

Panchgavya has been utilized to treat fungal developments both before and after harvest. Using the poisoned food technique, **Sharma and Sharma (2016)** examined the antifungal activity of Panchagavya against three fungal pathogens*: Sclerotium rolfsii, Rhizoctonia solani*, and *Fusarium oxysporium*. Numerous kinds of fungal infections affecting nursery plants are linked to these fungus pathogens. In comparison to the control, the fungal development in the poisoned plates has decreased with the Panchagavya therapy.

The antifungal properties of Panchgavya against the fungus pathogens *R. solani, S. rolfstt, S. sclerotiorum, F. solam,* and *Phytophthora colocasiae* were documented by **Sugha (2005)**. In vitro experiments using these pathogens showed that when mycelial bits were immersed for longer than six hours, Pathanggavya reduced mycelial growth by 90–100%. In controlling post-harvest disease of horticulture crop the results showed that neem seed formulations have the potential to be created as biofungicides, but more research is required to determine which active compounds play a significant role in fungal overgrowth. Additionally, it is non-toxic and environmentally safe.

Pumpkin (cucurbita moschata)

The genus Cucurbita and family Cucurbitaceae include the pumpkin (*Cucurbita moschata*).

Pumpkin is also referred to as "Sitaphal," "Kashiphal," or "kaddu" in India. Pumpkins are orange because they contain a lot of orange pigments. In addition to being a good source of vitamins, minerals, and particularly high levels of caretenoid pigments, pumpkin is rather high in energy and carbs. It might undoubtedly help improve people's nutritional status, particularly for those who are more susceptible to vitamin A deficiency. The length of the vines in various hybrids varies greatly. Variety TMPU-1827 has a longer vine at 90 days following seeding. Increased photosynthetic and other metabolic processes, which result in a rise in several plant metabolites necessary for cell division and cell elongation, and a greater amount of panchagavya, which is determined to be appropriate for pumpkin, may be the cause of longer vine length. The findings in okra are consistent with the fact that plants sprayed with panchagavya always develop denser canopies and larger leaves. The number of fruits produced by each hybrid plant varies greatly. Variety TMPU-1827 had the highest amount of pumpkin fruits per plant. The inclusion of auxin and kinetin in Panchagavya, which when applied as a foliar spray, favored the plants to produce more fruits per plant, may be the cause of the higher quantity of fruits per plant. **Nileema et al. (2010)** reported similar results. The number of days till the first harvest varies greatly amongst hybrids. Variety TMPU-1827 had the earliest days to harvest (52.437). Increased metabolic activity in the days preceding up to the first harvest may cause nutrients to be actively translocated to develop fruits, causing them to mature earlier. **Anjanappa et al. (2012)** reported similar results. Based on the findings of the experiment on disease of pumpkins it is concluded that hybrid TMPU-1827 is superior with interaction of 6% Panchagavya spray with respect to vine length, days to first harvest, and number of fruits per plant.

Conclusion

Growing environmental safety concerns and the need for food free of pesticide residues worldwide have sparked a strong interest in growing crops with eco-friendly products that are easily biodegradable and leave no hazardous residues behind in addition to protecting the environment. Hence, Panchgavya can be a key component of organic farming since it is essential to use natural items like it to create food crops free of chemical residues. It also helps in improving fertility status of soil by increasing number of macronutrients and micronutrients . Use of Panchgavya reduces the cost of management by saving money which was used earlier in expensive fertilizers. It is one of the farmer friendly method which do not require special techniques .Overall, it is noticed that Panchgavya is one of the best organic method to deal with different plant diseases without harming environment and soil fertility. Thus, it is a sustainable method of farming and helps in maintain the economic balance.

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