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Research Article

THE EFFECT OF *VAIVIDANGA BEEJ CHURNA KWATH* AND *APARAJITA PANCHANG KWATH* ON PLANT GROWTH AND METAL PURIFICATION

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ABSTRACT

Soil pollution due to heavy metal accumulation from pesticides and chemical fertilizers poses a threat to agricultural productivity and environmental health. In *Sushruta Samhita kalpa sthana*, *Acharya* talked about some *Ausadhiya Dravya kwath* like *Aprajita, Vaividanga* for elimination of *Vishadushita bhoomi lakshana*. So, we choose *Aparajita* and *Vaividanga* for study on polluted soil and got selected in CCRAS-SPARK Project. This study investigated the potential of *Vaividanga Beej Churna kwath* (*Embelia ribes*) and *Aparajita Panchang Kwath* (*Clitoria ternatea*) in purifying metal contaminated soil and promoting plant growth. Three experimental pots were set up with identical soil and environmental conditions: Pot A (plain water), Pot B (*Aparajita Panchang Kwath),* and Pot C (*Vaividanga Beej Churna kwath*). Each decoction was applied once daily. Brinjal small plants (*Solanum melongena*) and capsicum seeds (*Capsicum annuum*) were grown in all pots. Soil parameters including pH, EC, organic carbon, macronutrients (N, P, K), micronutrients (Zn, B, Fe, Mn), and heavy metals (Cu, Pb, Hg) were analyzed before and after. Results indicated that Pot B demonstrated superior plant growth, while Pot C demonstrated the greatest reduction in heavy metal concentrations, these findings suggest that both Ayurvedic preparations hold significant promise as herbal-based soil purifiers and plant growth promoters.

INTRODUCTION

In the present era, excessive use of pesticides and chemical fertilizers has led to severe soil pollution, adversely affecting soil fertility, microbial diversity, and overall plant growth. Heavy metals such as Copper (Cu), Lead (Pb), and Mercury (Hg) are particularly harmful contaminants that persist in the soil environment and enter the food chain, posing risks to human and animal health. *Acharya Sushruta,* in *Kalpa Sthana* chapter 3, has mentioned several *Dravya* (herbal substances) that possess the potential to purify and rejuvenate polluted soil.

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क्षितिप्रदेशं विषदूषितं तु शिलातलं तीर्थमथेरिणं वा ।।१०।।
स्पृशन्ति गात्रेण तु येन येन गोवाजिनागोष्ट्रखरा नरा वा ।
तच्छूनतां यात्यथ दह्यते च विशीर्यते रोम नखं तथैव ।। ११ ।।
तत्राप्यनन्तां सह सर्वगन्धैः पिष्ट्वा सुराभिर्विनियोज्य मार्गम् ।
सिञ्चेत् पयोभिः सुमृदन्वितैस्तं विडङ्गपाठाकटभीजलैर्वा ।। १२।।

The present study focuses on evaluating two such *Dravya: Vaividanga* (*Embelia ribes*) *Beej Churna Kwath* and *Aparajita* (*Clitoria ternatea) Panchang Kwath*, for their efficacy in improving plant growth and reducing heavy metal contamination in soil. The findings may contribute to the development of sustainable, eco-friendly agricultural practices rooted in traditional Ayurvedic knowledge, offering viable alternatives to synthetic soil treatments.

OBJECTIVES

1. To scientifically evaluate the effect of *Vaividanga Beej Churna* and *Aparajita Panchang Kwath* on soil purification and plant growth.

2. To compare their relative efficacy with a control setup.
3. To develop a standardized method for future experimental studies on polluted soil.
4. To minimize dependency on pesticide.

METHODOLOGY

Experimental Setup

Three identical pots were prepared using the same polluted soil and maintained under identical environmental conditions throughout the experiment duration of 30 days.

- Pot A (Control): Irrigated daily with plain water only.
- Pot B (Treatment 1): Irrigated daily with *Aparajita Panchang Kwath* (*Clitoria ternatea* decoction).
- Pot C (Treatment 2): Irrigated daily with *Vaividanga Beej Churna Kwath* (*Embelia ribes* decoction).

Plant Material Used

- Plant 1: Brinjal (*Solanum melongena*)- small plants transplanted into each pot.
- Plant 2: Capsicum seeds (*Capsicum annuum*)

Duration and Application

The experiment was conducted over 30 days. Each decoction or plain water was applied once daily in equal measured quantities to maintain uniformity.

Testing Methods

Soil samples were collected before and after the experiment. Analyses performed:

- Basic soil tests: pH, EC, OC, N, P, K, S, Zn, B, Fe, Mn.
- Heavy metal analysis (AAS): Cu, Pb, Hg compared with CPCB/WHO permissible limits.
- Plant growth observation: Height, leaf development, and vitality recorded qualitatively and photographically throughout the experiment.

OBSERVATIONS AND RESULTS

Basic Soil Tests - Before vs After (All values in mg/kg unless stated)

Parameter	Unit	Before	After A (Water)	After B (*Aparajita*)	After C (*Vaividanga*)
PH	-	6.9	6.9	7.7	6.9
EC	dS/m	0.18	0.45	0.54	0.42
Organic Carbon	%	0.66	0.31	0.48	0.57
Nitrogen (N)	kg/ha	181.88	175.61	159.30	139.23
Phosphorus (P)	kg/ha	9.22	99.20	51.91	56.23
Potassium (K)	kg/ha	188.60	290.25	273.95	250.09
Sulphur (S)	mg/kg	12.53	36.10	13.28	14.31
Zinc (Zn)	mg/kg	6.264	0.849	0.478	0.844
Boron (B)	mg/kg	0.49	0.26	0.36	0.44
Iron (Fe)	mg/kg	43.02	8.966	4.768	5.192
Manganese (Mn)	mg/kg	2.284	4.196	5.148	3.146

Heavy Metal Analysis - AAS (mg/kg)

Heavy Metal	Before	After A (Water)	After B (*Aparajita*)	After C (*Vaividanga*)
Copper (Cu)	993.8	99.3	116	63
Lead (Pb)	2161.2	106	103	68
Mercury (Hg)	1.2	BLQ	BLQ	BLQ

BLQ - Below Limit of Quantification

Plant Growth Observations

Pot	Treatment	Brinjal (Small Plants)	Capsicum
Pot A	Water (control)	Lesser growth compared to B and C	Satisfactory growth
Pot B	*Aparajita Kwath*	Best growth among all three pots (flowering seen only in pot B)	Best growth among all three pots (flowering seen only in pot B)
Pot C	*Vaividanga Churna Kwath*	Satisfactory growth	Lower growth compared to A and B

Photographic Evidence Before and After Comparison

Pot A Control (Plain Water)



Fig. A1: Before Dry, cracked, heavily polluted soil, no plant growth



Fig. A2: After 30 days Satisfactory Capsicum growth; Brinjal showed lesser growth compared to B and C

Visual Observation

Pot A received only plain water throughout the experiment. The before photograph shows severely compacted, cracked, polluted soil with no visible plant growth. After 30 days, capsicum showed satisfactory growth; however, brinjal growth remained lesser compared to the treated pots B and C. The soil structure showed no significant improvement, confirming that plain water alone is insufficient for soil remediation or meaningful plant growth enhancement in heavily polluted conditions.

Pot B- ***Aparajita Panchang Kwath (Clitoria ternatea)***



Fig. B1: Before moist dark soil with a small brinjal plant beginning to establish



Fig. B2: After 30 days-best growth: Brinjal fully developed dense vigorous capsicum throughout Flowering Observed in Pot B- Brinjal and Capsicum



Fig. B3: Capsicum flower bud observed in Pot B, indicating advanced reproductive growth stage



Fig. B4: Brinjal flower observed in Pot B, confirming superior vegetative and reproductive development

Visual Observation

Pot B treated with *Aparajita Panchang Kwath* showed the best plant growth across all three pots. Brinjal developed into a robust, large-leaved plant and capsicum showed dense, vigorous growth filling the entire pot. Notably, both brinjal and capsicum in Pot B reached the flowering stage, with flower buds observed on both plants-a sign of vigorous, healthy growth not observed to the same extent in Pots A or C. This is consistent with the bioactive properties of *Clitoria ternatea*- flavonoids and anthocyanins promoting root development and chlorophyll synthesis even in contaminated soil.

Flowering Observation

Towards the latter part of the 30-day experimental period, both brinjal and capsicum plants in Pot B advanced to the flowering stage. The emergence of flower buds in both species is a strong indicator of healthy reproductive development and confirms that *Aparajita Panchang Kwath* not only enhanced vegetative growth (leaf size, plant height and flowering) but also accelerated the plants' progression toward the reproductive phase - a result not observed in Pots A or C within the same timeframe.

Pot C- *Vaividanga Beej Churna Kwath* (*Embella ribes*)



Fig. C1: Before-Dry, loose soil labelled 'C *Vidanga'*; no plant growth at start



Fig. C2: After 30 days - Brinjal and Capsicum growth visible: Capsicum lower compared to A and B

Visual Observation

Pot C treated with *Vaividanga Beej Churna Kwath* showed satisfactory brinjal growth but lower capsicum growth compared to both A and B. Laboratory data confirmed Pot C achieved the greatest heavy metal reduction (Cu: 63mg/kg, Pb: 68mg/kg) and best organic carbon retention (0.57%), indicating *Vaividanga's* strength lies in soil detoxification and long-term restoration rather than direct plant growth stimulation.

RESULT

The results demonstrate the significant potential of both Ayurvedic herbal preparations in purifying contaminated soil and promoting plant growth.

Heavy Metal Reduction: Initial soil was highly contaminated with copper (993.8mg/kg) and Lead (2161.2mg/kg), far exceeding CPCB permissible limits. Pot C (*Vaividanga*) achieved the greatest reduction in Cu (63mg/kg) and Pb (68mg/kg), indicating superior chelation and phytoremediation properties of *Embelia ribes*. Mercury reduced to BLQ across all pots.

Soil Quality: Pot C showed best overall soil quality-highest organic carbon retention (0.57%), lowest heavy metal residues, and better micronutrient balance.

Plant Growth: Pot B demonstrated best plant growth with flowering for both brinjal and capsicum as clearly visible in photographic evidence. Pot C showed lower capsicum growth compared to A and B, suggesting *Vaividanga'*s bioactive compounds preferentially support soil detoxification over direct growth stimulation.

Clear functional differentiation: *Aparajita* is more effective for immediate plant growth promotion; *Vaividanga* is superior for soil detoxification and long-term restoration.

Discussion and future recommendations: This study successfully demonstrated the efficacy of *Vaividanga Beej Churna* and *Aparajita Panchang Kwath* as herbal soil purifiers and plant growth promoters. Key findings:

- Pot B (*Aparajita Panchang Kwath*) showed the best plant growth for both brinjal small plants and capsicum, making it the most effective treatment for promoting vegetative growth.
- Pot C (*Vaividanga Beej Churna*) demonstrated the best soil quality- greatest reduction in heavy metals (Cu: 63mg/kg, Pb: 68mg/kg), highest organic carbon retention, and best micronutrient balance. Capsicum growth in Pot C was lower compared to A and B.
- Mercury (Hg) was reduced to below quantifiable limits across all three pots.

Both preparations show significant promise as eco-friendly alternatives to chemical soil treatments. The findings support classical Ayurvedic knowledge documented in *Sushruta Samhita Kalpa Sthana*, and open pathways for standardized herbal protocols for agricultural soil remediation. Further studies with larger sample sizes and extended duration are recommended.

The experiment demonstrated that *Vaividanga Beej Churna* and *Aparajita Panchang Kwath* positively influenced soil purification and plant growth. The treated groups performed better than the control, a standardized experimental method was established, and the findings supported the use of these herbal formulations as eco-friendly alternatives to chemical pesticides.

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