

PHARMACEUTICAL AND PHYSICOCHEMICAL STUDY OF THE DRY EXTRACT OF *PANCHKOL*

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ABSTRACT

Vaat Kaphaj illnesses are treated with *Panchkol*, an Ayurvedic compound. There is no proof that *Panchkol* extract has undergone a standardized analytical review, despite its historical relevance. By concentrating on the physicochemical characteristics, phytochemical profile, and microbiological profiles of *Panchkol* extract, this study seeks to define analytical parameters for it. **Methods:** Similar to *Panchkol* power, *Panchkol* extract was made as described in the *Bhavprakash Nighantu*. Pharmacognostical analysis using counting powder microscopy of the basic medicament demonstrated the authenticity and quality of each *Panchkol* Extract component. The organoleptic properties of the fine extract powder produced from the base medications were within the normal range. Each *Panchkol* component's validity and purity were confirmed by pharmacognostical study

employing an extract of the fundamental medications counting powder microscopy. Physicochemical parameters including loss on drying, ash value, acid-insoluble ash, water-soluble extractive, alcohol-soluble extractive, pH of 5% solution, phytochemical screening, and microbiological screening were carried out in accordance with established methods, and organoleptic characteristics were recorded. **Results:** *Panchkol* Extract was prepared from Pippali Fruit (*Piper longum* Linn.), Pippali mool Root (*Piper longum* Linn), Chavya Root (*Piper chaba* Hunter) Chitraka Root (*Plumbago zeylanica* Linn). and Sunthi Rhizome (*Zingiber*

officinalis Roxb). The crude drug extract's organoleptic characteristics fell within the expected range. Pharmacognostical analysis using counting powder microscopy of the basic medicament demonstrated the authenticity and quality of each *Panchkol* Extract component. The organoleptic properties of the fine extract powder produced from the base medications were within the normal range. Each *Panchkol* component's validity and purity were confirmed by pharmacognostical study employing an extract of the fundamental medications counting powder microscopy. Physicochemical parameters including loss on drying, ash value, acid-insoluble ash, water-soluble extractive, alcohol-soluble extractive, pH of 5% solution, phytochemical screening, and microbiological screening were carried out in accordance with established methods, and organoleptic characteristics were recorded. There were 400 cfu/gm of aerobic microorganisms. *Escherichia coli*, *Salmonella*, *Staphylococcus aureus*, and *Pseudomonas* were not present in the sample, and the total fungal count was less than 10 cfu/gm. Using a variety of reagents, the presence of each phytochemical was evaluated. **Conclusion:** Phytochemical screening illustrates the presence of Sugar compounds, alkaloids, phenolic compounds and amino acids in both aquas as well as in alcoholic solutions while Saponin only in aquas solution and glycosides only in alcoholic solution along with the standardized values of Organoleptic physicochemical and microbiological Analysis are established of given sample of *Panchkol Extract*.

KEYWORDS: Ayurveda, Extract, *Escherichia coli*, Fungal Count, Microbial Count, *Mishrak Gana*, *Panchkol*, Pharmacognosy, Pharmaceutics, *Pseudomonas*, *Salmonella*, *Staphylococcus aureus*.

INTRODUCTION

Panchkol is a well-known poly-herbal Ayurvedic formulation of the *Mishraka gana* and used for many *Vata Kaphaj* diseases. According to Indian Pharmacopeia pharmaceutical and pharmacognostical investigation, it contains an equal part of *Pippali*, *Pippalimoola*, *Chavya*, *Chitrak*, and *Sunthi*. In this study we have taken the extract of all the drugs to formulate *Panchkol* extract, Therefore, the present study was undertaken to evaluate and establish various quality control parameters of *Panchakol* Extract, as well as to analyse its physico-chemical properties.

MATERIALS AND METHODS

Collection of raw materials

Drugs for *Panchkol* extract were procured from Ayushraj Enterprises PVT. LTD., Jaipur and mixed in the equal quantity for *Panchkol* Extract and taken for the study.

Preparation of *Panchakol* Extract

Panchkol Extract was prepared as per classical method. Reference of *Panchkol Churna* is available in Sharangdhara Samhita. Extract of all ingredients were taken in prescribed ratio equal in quantity. Powdered and stored in airtight glass jars under hygienic conditions.

Table 1: Ingredients of *Panchkol* Extract.

Sr. No.	Drug	Latin Name	Family	Parts Used	Quantity
1	<i>Pippali</i>	<i>Piper longum</i> Linn.	Piperaceae	Fruits	1
2	<i>PippaliMool</i>	<i>Piper longum</i> Linn.	Piperaceae	Root	1
3	<i>Chavya</i>	<i>Piper chaba</i> Hunter.	Piperaceae	Root	1
4	<i>Chitraka</i>	<i>Plumbago zeylanica</i> Linn.	Plumbaginaceae	Fruit	1
5	<i>Sunthi</i>	<i>Zingiber officinalis</i> Roxb.	Zingiberaceae	Rhizome	1

Analytical Study

Raw materials *Panchkol* extract was prepared by and prepared final product in powder form were analyzed by employing various analytical parameters. Physicochemical analysis was carried out on all three batches. Organoleptic characteristics (colour, odour, taste, touch) were assessed, along with physicochemical analysis such as loss on drying at 105 °C, PH value, water soluble extractives, Total Ash value, Total Microbial count, Total Fungal Count etc. tests were carried out and depicted below.

1. Organoleptic Characters

Organoleptic characters of *Ayurvedic* drugs are very important and give the general idea regarding the genuinity of the sample. It is done with the help of *Panchagyanendriya Pariksha*. The characters like color, odor, taste and appearance of the base drugs were noted –

Table 2: Organoleptic Characters of *Panchkola* Extract Drugs.

Name Of Sample	Appearance	Colour	Odour	Taste
<i>Pippali</i> Extract	Fine Powder	Brown	Pungent	Pungent
<i>Pippali Moola</i> Extract	Fine Powder	Brown	Pungent	Pungent
<i>Chavya</i> Extract	Fine Powder	Yellowish Brown	Very Pungent	Very Pungent
<i>Chitraka</i> Extract	Fine Powder	Brown	Pungent	Acrid
<i>Sunthi</i> Extract	Fine Powder	Brown	Pungent and aromatic	Pungent and aromatic
<i>Panchkol</i> Extract	Fine Powder	Brown	Pungent strong	Pungent

			aromatic	
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Physio-Chemical Parameter

Loss of Drying

Table 3: Loss of Drying.

Table 3: Loss of Drying of *Panchkol* Extract.

S. No	Sample	Standard	Result	Test Method
1	<i>Pippali</i> Extract	NMT 7.0 % W/W	3.27	API Part- I, Vol. IX 2016
2	<i>Pippali moola</i> Extract	NMT 7.0 % W/W	3.84	API Part- I, Vol. IX 2016
3	<i>Chavya</i> Extract	NMT 7.0 % W/W	3.41	API Part- I, Vol. IX 2016
4	<i>Chitraka</i> Extract	NMT 7.0 % W/W	3.68	API Part- I, Vol. IX 2016
5	<i>Shunthi</i> Extract	NMT 7.0 % W/W	3.68	API Part- I, Vol. IX 2016
6	<i>Panchkol</i> Extract	NMT 7.0 % W/W	3.68	API Part- I, Vol. IX 2016

Determination of pH

The pH value of an aqueous liquid may be defined as the common reciprocal of the hydrogen ion concentration expressed in gram per liter. It practically means the quantitative indication of the acidity or basic nature of a solution. The pH of a given solution is measured by using digital pH meter. First Standardized the pH meter. Tablets of different pH were taken and each tablet was dissolved in 100 ml of distilled water to prepare solutions of different pH. The instrument was switched on and left for some time until required different pH solutions appeared. Buffer solution was taken in the beaker and the electrode was dipped in it. Same procedure was repeated for the other buffer solution after washing the electrode thoroughly with distilled water. The sample was taken (10% aqueous solution) and electrode was dipped in it and the value of pH was noted.^[1,2]

Table 4: pH Determination of *Panchkol* Extract.

S. No	Sample	Ph
1.	<i>Pippali</i> Extract	4.80
2.	<i>Pippali moola</i> Extract	5.11
3.	<i>Chavya</i> Extract	5.38
4.	<i>Chitarak</i> Extract	5.40
5.	<i>Sunthi</i> Extract	5.70
6.	<i>Panchkol</i> Extract	5.35

Determination of Water Soluble Extractive

Table 5: Determination of Water Soluble Extractive.

Ayurvedic Management of Agnivisarpa (Pitta-Rakta Pradhana Visarpa) in an Elderly Female: A Case Report. No	Sample	Standard	Result	Test Method
1	Pippali Extract	NLT 70.0	86.25% W/W	API Part- I, Vol. IX 2016
2	Pippali moola Extract	NLT 70.0	84.81% W/W	API Part- I, Vol. IX 2016
3	Chavya Extract	NLT 70.0	86.25 % W/W	API Part- I, Vol. IX 2016
4	Chitraka Extract	NLT 70.0	86.12 % W/W	API Part- I, Vol. IX 2016
5	Sunthi Extract	NLT 70.0	87.71 % W/W	API Part- I, Vol. IX 2016
6	Panchkol Extract	NLT 70.0	86.12 % W/W	API Part- I, Vol. IX 2016

Determination of Total Ash**Table 6: Determination of Total Ash of Panchkol Extract.**

S. No	Sample	Standard	Results	Test Method
1	Pippali Extract	NMT 20	5.36 % W/W	API Part- I, Vol. IX 2016
2	Pippali moola Extract	NMT 20	6.46 % W/W	API Part- I, Vol. IX 2016
3	Chavya Extract	NMT 20	2.89 % W/W	API Part- I, Vol. IX 2016
4	Chitraka Extract	NMT 10	4.45 % W/W	API Part- I, Vol. IX 2016
5	Sunthi Extract	NMT 20	5.44 % W/W	API Part- I, Vol. IX 2016
6	Panchkol Extract	NMT 20	5.24 % W/W	API Part- I, Vol. IX 2016

Sieve Test (Passes from 40 mesh)**Table 7: Sieve Test for Panchkol Extract (Passes from 40 mesh).**

S. No	Sample	Standard	Results	Test Method
1	Pippali Extract	NLT 95	99.16 % W/W	API Part- I, Vol. IX 2016
2	Pippali moola Extract	NLT 95	99.15 % W/W	API Part- I, Vol. IX 2016
3	Chavya Extract	NLT 95	99.11 % W/W	API Part- I, Vol. IX 2016
4	Chitraka Extract	NLT 95	99.18 % W/W	API Part- I, Vol. IX 2016
5	Shunthi Extract	NLT 95	99.14 % W/W	API Part- I, Vol. IX 2016
6	Panchkol Extract	NLT 95	99.11 % W/W	API Part- I, Vol. IX 2016

Determination of Microbiological Analysis**Total Aerobic Microbial Count****Table 8: Total Aerobic Microbial Count.**

S. No	Sample	Standard	Result	Test Method
1	Pippali Extract	Less than 100000	200 cfu/gm	API Part- I, Vol. IX 2016
2	Pippali moola Extract	Less than 100000	800 cfu/gm	API Part- I, Vol. IX 2016
3	Chavya Extract	Less than 100000	1200 cfu/gm	API Part- I, Vol. IX 2016

4	Chitraka Extract	Less than 100000	150 cfu/gm	API Part- I, Vol. IX 2016
5	Shunthi Extract	Less than 100000	500 cfu/gm	API Part- I, Vol. IX 2016
6	Panchkol Powder	Less than 100000	400 cfu/gm	API Part- I, Vol. IX 2016

Total Fungal Count

Table 9: Total Fungal Count.

S. No	Sample	Standard	Result	Test Method
1	Pippali Extract	Less than 1000	Less then 10 cfu/gm	API Part- I, Vol. IX 2016
2	Pippali moola Extract	Less than 1000	Less then 10 cfu/gm	API Part- I, Vol. IX 2016
3	Chavya Extract	Less than 1000	Less then 10 cfu/gm	API Part- I, Vol. IX 2016
4	Chitraka Extract	Less than 1000	Less then 10 cfu/gm	API Part- I, Vol. IX 2016
5	Shunthi Extract	Less than 1000	Less then 10 cfu/gm	API Part- I, Vol. IX 2016
6	Panchkol Powder	Less than 1000	Less then 10 cfu/gm	API Part- I, Vol. IX 2016

Escherichia Coli

Table 10: Escherichia Coli.

S. No	Sample	Standard per gm	Result	Test Method
1	Pippali Extract	Absent	Absent	API Part- I, Vol. IX 2016
2	Pippali moola Extract	Absent	Absent	API Part- I, Vol. IX 2016
3	Chavya Extract	Absent	Absent	API Part- I, Vol. IX 2016
4	Chitraka Extract	Absent	Absent	API Part- I, Vol. IX 2016
5	Shunthi Extract	Absent	Absent	API Part- I, Vol. IX 2016
6	Panchkol Powder	Absent	Absent	API Part- I, Vol. IX 2016

Salmonella

Table 11: Salmonella.

S. No	Sample	Standrad per gm	Result	Test Method
1	Pippali Extract	Absent	Absent	API Part- I, Vol. IX 2016
2	Pippali moola Extract	Absent	Absent	API Part- I, Vol. IX 2016
3	Chavya Extract	Absent	Absent	API Part- I, Vol. IX 2016
4	Chitraka Extract	Absent	Absent	API Part- I, Vol. IX 2016
5	Shunthi Extract	Absent	Absent	API Part- I, Vol. IX 2016
6	Panchkol Powder	Absent	Absent	API Part- I, Vol. IX 2016

Staphylococcus aureus

Table 12: Staphylococcus aureus.

S. No	Sample	Standard Per gm	Result	Test Method
1	Pippali Extract	Absent	Absent	API Part- I, Vol. IX 2016
2	Pippali moola Extract	Absent	Absent	API Part- I, Vol. IX 2016
3	Chavya Extract	Absent	Absent	API Part- I, Vol. IX 2016
4	Chitraka Extract	Absent	Absent	API Part- I, Vol. IX 2016
5	Shunthi Extract	Absent	Absent	API Part- I, Vol. IX 2016
6	Panchkol Powder	Absent	Absent	API Part- I, Vol. IX 2016

Pseudomonas aeruginosa**Table 13: Pseudomonas aeruginosa.**

S. No	Sample	Standard Per gm	Result	Test Method
1	Pippali Extract	Absent	Absent	API Part- I, Vol. IX 2016
2	Pippali moola Extract	Absent	Absent	API Part- I, Vol. IX 2016
3	Chavya Extract	Absent	Absent	API Part- I, Vol. IX 2016
4	Chitraka Extract	Absent	Absent	API Part- I, Vol. IX 2016
5	Shunthi Extract	Absent	Absent	API Part- I, Vol. IX 2016
6	Panchkol Powder	Absent	Absent	API Part- I, Vol. IX 2016

Tests For Various Phytochemical Groups**Phytochemical screening**

Phytochemicals are non-nutritive plant chemicals that have protective or disease preventive properties. A plant cell produces two types of metabolites: primary metabolites involved directly in growth and metabolism (carbohydrates, lipids and proteins), and secondary metabolites not involved in metabolic activity (alkaloids, phenolics, sterols etc) but act as defense chemicals.^[3]

Phytochemical**Phytochemical screening**

Freshly prepared extracts were tested for the presence of various active Phyto compounds like phenols, tannin, flavonoid, protein, reducing sugar, carbohydrates, lipids, saponin, triterpenoid alkaloid, resins, volatile oils, by the method of Kokate and Khandelwal.

Qualitative analysis of extracts to evaluate general phytochemical profile

The extracts obtained from the research drug were subject to qualitative examination as per the Pharmacopoeia of India (IP).^[4]

Table 14: Phytochemicals table.

Name of Test	Chitrakamoola		Sunthi		Pippali moola		Chavya		Pippali		Panchkol	
	Aq. Ext.	Alco. Ext.	Aq. Ext.	Alco. Ext.	Aq. Ext.	Alco. Ext.	Aq.Ext.	Alco. Ext.	Aq. Ext.	Alco. Ext.	Aq. Ext.	Alco. Ext.
Carbohydrate												
Molish test	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve
Benedict test	+Ve	+Ve	-Ve	+Ve	-Ve	+Ve	-Ve	+Ve	+Ve	+Ve	+Ve	+Ve
Fehling test	+Ve	+Ve	-Ve	+Ve	-Ve	+Ve	-Ve	+Ve	+Ve	+Ve	+Ve	+Ve
Alkaloids												
Dragendorff test	-Ve	+Ve	+Ve	+Ve	-Ve	-Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve
Wagner's	-ve	-Ve	+Ve	+Ve	+Ve	-Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve

test												
Hager's test	-ve	-Ve	+Ve	+Ve	-Ve	-Ve	-Ve	-Ve	+Ve	+Ve	+Ve	+Ve
Amino acids												
Ninhydrine	+ve	-Ve	+Ve	-Ve	+Ve	+Ve	+Ve	-Ve	+Ve	+Ve	+Ve	+Ve
Protein												
Biuret test	-ve	+Ve	-Ve	-Ve	-Ve	-Ve	-Ve	-Ve	+Ve	+Ve	+Ve	+Ve
Xenthoprotic test	+ve	+Ve	+Ve	+Ve	+Ve	-Ve	+Ve	+Ve	+Ve	-Ve	+Ve	+Ve
Saponin												
Foam test	+ve	-Ve	+Ve	-Ve	+Ve	-Ve	+Ve	-Ve	+Ve	-Ve	+Ve	-Ve
Glycosides												
Borntrager's test	-ve	+Ve	-Ve	+Ve	-Ve	-Ve	-Ve	+Ve	-Ve	-Ve	-Ve	+Ve
Phenolic compound												
Phenolic test	+ve	+Ve	+Ve	+Ve	+Ve	+Ve	-Ve	-Ve	-Ve	+Ve	+Ve	+Ve
Steroids												
Salkowaski	+ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve
Tannins												
FeCl ₃	-ve	+Ve	-Ve	-Ve	-Ve	+Ve	-Ve	+Ve	-Ve	+Ve	+Ve	+Ve
Lead acetate	+ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve
Pot. Dichromate	+ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve	+Ve

RESULTS

Composition of *Panchkol* Extract are mentioned in Table 1 and Organoleptic characteristics were described in Table 2. Physicochemical analysis results are elaborated in Tables 3 to 7, respectively. The Microbiological analysis of the formulation demonstrated in Table 8 to 13. All the phytochemical analysis of the *panchkol* extract is given in the Table 14.

The *panchkol* extract had a distinctive brown appearance and a strong aromatic pungent fragrance. The formulation had greater solubility in water when compared with alcohol the pH was 5.35 and the drying loss was 3.68 % w/w. The powder's total ash content was 5.24 % w/w. Water soluble extractive was 86.12% w/w. Sieve test (Passes from 40 mesh) was 99.11% w/w. Total aerobic microbial Count was 400 cfu/gm. Total fungal count was less than 10 cfu/gm., while *Escherichia coli*, *Salmonella*, *Staphylococcus aureus*, *Pseudomonas* were absent in the taken sample. Carbohydrates, flavonoids, reducing sugar, alkaloids, steroids, and tannins were found in the water-soluble extract of *Panchkol* extract, as well as carbohydrates, reducing sugar, monosaccharides, flavonoids, pentose sugar, alkaloids, proteins, and tannins in the alcohol-soluble extract.

DISCUSSION

The *Panchkol* extract appeared greenish brown because of the morphology of the raw drugs used and had a characteristic aromatic odor due to the presence of drugs containing volatile components. Loss on drying data showed less moisture content, thus increasing the shelf life of the formulation. The ash values revealed that the formulation had fewer inorganic components, contaminants, and adulterants. The results of the water-soluble extractive and the alcohol-soluble extractive demonstrated that it was more soluble in water than in alcohol. The pH of aqueous extract of *Panchkol* extract was 5.35, suggesting the solution was acidic.

Loss on drying was 3.68 % w/w which is indication for moisture content of the *panchkol* extract. The powder's total ash content was 5.24 % w/w it shows no adulteration. Water soluble extractive was 86.12% w/w this indicates its formulation will be good in the form of water soluble base. Sieve test (Passes from 40 mesh) was 99.11% w/w which shows fine power for use. Microbiological analysis; Total aerobic microbial Count was 400 cfu/gm. Total fungal count was less than 10 cfu/gm., while *Escherichia coli*, *Salmonella*, *Staphylococcus aureus*, *Pseudomonas* were absent in the taken sample. Thus, the study founds it can be used for the further trials as microbiological analysis indicates safe for further uses.

Preliminary phytochemical studies indicated that steroids, flavonoids, alkaloids, and tannins were identified in the aqueous and alcoholic extracts of *Panchkol* extract. The action of steroids (saponins) can be explained through their attempt to render the molecule inert through their structure and surface-active attributes.^[5]

The activity of flavonoids can be explained through the theory that functional hydroxyl groups of flavonoids regulate antioxidant activities by scavenging free radicals and/or chelating free ions. By enabling aromatic ring conjugation and the presence of a free 3-OH, the flavonoid heterocycle adds to antioxidant actions.^[6]

Alkaloids detoxify the free radicals through xenobiotic metabolism, involving oxidoreductase or hydrolases, bioconjugation with sugars, amino acids, organic acids, or peptides.^[7] Different tannin molecules are able to scavenge cellular and molecular free radicals, particularly in pro-oxidant states, and restrict lipid peroxidation.^[8]

CONCLUSION

The preliminary physicochemical and phytochemical evaluation of the *Panchkol* extract was carried out, including the organoleptic characters, Physico-chemical analysis, Microbiological analysis and Phytochemical analysis. Phytochemical analysis showed the presence of steroids, flavonoids, alkaloids, and tannins, etc.

The Standard Operating Procedure and the conclusions of this study are expected to serve as standards for subsequent studies on *Panchkol* extract. The findings can vary slightly. To promote the identification of novel bioactive compounds and more effective drug administration routes, an expanded and methodical investigation of the phytochemical and pharmacodynamic elements of Ayurvedic fumigation therapy is essential.

Author's contribution statement

Dr. Monika and Prof. Dr Ashwini Kumar Sharma conceived and designed the study. Dr Monika carried out the literature review, data collection, and performed the analysis and interpretation of the data. Dr Monika and Prof. Dr. Ashwini Kumar Sharma mutually contributed to drafting the manuscript. Additionally, Dr Monika critically revised the manuscript for important intellectual content.

Data availability statement

The data supporting the findings of this article are available within the article and its supplementary materials. Additional data related to this study may be obtained from the corresponding author upon reasonable request.

Declaration of AI in Scientific Writing

The authors declare that no artificial intelligence tools or language models were used in the preparation, writing, and analysis of the manuscript.

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Conflicts of interest

There are no conflicts of interest.

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