International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 13 Issue: 09 | Sep 2026 www.irjet.net p-ISSN: 2395-0072

Objective Determination of Ayurvedic Tridosha, Vata, Pitta, Kapha and Prakruti, using Whole Blood Colorimetric Technique: A Novel Diagnostic Approach

Dr. Desh Bandhu Bajpai

Inventor and Chief Investigator, Ayurveda Colorimetric Blood Chemistry test, Kanak Polytherapy Clinic and Research Center, 67/70, Bhusatoli Road, Bartan Bazar, Daulat Ganj, KANPUR – 208001 Uttar Pradesh, India

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Abstract-*In the 5000-year recorded history of Ayurveda, diagnostic evaluation of Prakriti and Tridosha (Vata, Pitta, and Kapha) has predominantly relied on clinical observation and subjective manual Nadi Pariksha (pulse diagnosis). Until now, no objective laboratory-based blood testing methodology existed in Ayurveda to quantitatively measure and assess Tridosha levels directly from human blood.This study introduces a pioneering, non-centrifuged whole blood colorimetric technique developed to establish a scientific, objective, and standardized framework for Tridosha determination. Furthermore, this method aims to serve as a validating benchmark that complements and cross-checks data obtained from other advanced diagnostic modalities, including Electro Tridoshography (ETG) Scan, Ayurveda Tridosha Scanner, Ayurveda HTL Whole Body Scanning System, Ayurveda Chemical Chemistry Test, and Ayurveda Chromatography.*

Keywords : Ayurveda, Tridosha Determination, Prakriti Analysis, Whole Blood Colorimetry, Objective Diagnostics, Nadi Pariksha Standardization, Tridosho colorimetry, Ayurveda Trodosho Colorimetric Diagnosis Technology.

1. INTRODUCTION

1.1 Philosophical and Physiological Core of Ayurvedic Diagnostics

Ayurveda, the traditional science of life with over 5,000 years of documented history, operates on the foundational principles of Prakriti (individual constitutional type) and Tridosha Vata (governing movement and neurological functions), Prakriti/Pitta (governing metabolism and thermogenesis), and Kapha (governing structure, fluidity, and immunity). Health in Ayurveda is defined as an optimal state of dynamic equilibrium among these three bio-energetic forces (Samadosha), whereas disease arises from their quantitative or qualitative disequilibrium (Dosha Vaishamya).

1.2 The Challenge of Subjectivity in Conventional Methods

Traditionally, the clinical evaluation of Tridosha and Prakriti relies on Roga-Rogi Pariksha (examination of disease and patient), primarily encompassing Trividha Pariksha (Darshana - inspection, Sparshana - palpation, and Prashna - interrogation) and Ashtavidha Pariksha, which features Nadi Pariksha (radial pulse examination) as its centerpiece. While experienced Ayurvedic physicians exhibit remarkable diagnostic acumen through Nadi Pariksha, the technique fundamentally remains subjective, clinician-dependent, and difficult to quantify or standardize across modern clinical settings. The absence of an objective, laboratory-based diagnostic tool capable of quantifying Tridosha levels directly from biological fluid samples has long remained a key limitation in mainstream scientific recognition and universal standardization of Ayurvedic medicine.

1.3 The Technological Innovation: Whole Blood Colorimetry

To bridge this critical gap, an innovative laboratory testing technique was conceptualized and developed over an 18-year clinical research journey. This methodology utilizes human **whole blood** (non-centrifuged) interacted with specialized, self-developed reagents, organic solvents, and buffer solutions. By utilizing a 4-test-tube system (one Control tube and three specific test tubes for Vata, Pitta, and Kapha) within a standard optical colorimeter, changes in optical density (OD) and light absorption/transmittance are measured. This provides for the first time in Ayurvedic history a direct, laboratory-derived chemical and optical representation of cellular and metabolic Tridosha activity.

1.4 Objective Validation Framework for Nadi Pariksha

This whole blood colorimetric technique does not seek to replace traditional Ayurvedic diagnostics, but rather to serve as an objective, empirical anchor. By translating biological and cellular signatures into reproducible numerical and optical values, this method provides a scientific validation framework for manual Nadi Pariksha. It establishes a tangible laboratory reference point against which clinical pulse observations can be verified, compared, and taught with high precision.

1.5 Integration with Advanced Multi-Modal Ayurvedic Technologies

Furthermore, this colorimetric technique serves as a vital biochemical cornerstone within a broader multi-modal diagnostic ecosystem. The quantitative data derived from this whole blood colorimeter test acts as a cross-verification benchmark for data synthesized from other proprietary diagnostic innovations, including:

1. **Electro Tridoshography (ETG) Scanning**
2. **Ayurveda Tridosha Scanner**
3. **Ayurveda HTL Whole Body Scanning System**
4. **Ayurveda Chemical Chemistry Testing**
5. **Ayurveda Chromatography Techniques**

By cross-referencing and calibrating data across these advanced modalities with whole blood colorimetric readings, researchers and clinicians can eliminate diagnostic ambiguity, fine-tune accuracy, and establish exact mathematical estimations of Vata, Pitta, and Kapha proportions present in the patient's body. We developed this technique and all other techniques in our own workshop and own established clinical pathology laboratory, covering all costs ourselves.

2. METHODOLOGY

The developed method utilizes a whole blood sample mixed with custom-formulated reagents, solvents, and buffer solutions. The assessment is conducted using a 4-test-tube system consisting of one Control tube and three specific Test tubes corresponding to Vata, Pitta, and Kapha. Transmittance and absorbance optical density (OD) values are measured using a colorimeter at designated optical filters to derive precise Tridosha proportions.

2.1 Laboratory Set-up ;

To execute the whole blood colorimetric assessment with standard reproducibility, safety, and operational precision, a dedicated and fully equipped diagnostic laboratory environment is mandatory. The key operational components and infrastructural prerequisites include:

- **Dedicated Facility Space:** A controlled, dust-free, and well-ventilated laboratory room designated specifically for handling blood samples, reagent synthesis, and photometric analysis.
- **Analytical Colorimeter Instrumentation:** A calibrated photoelectric colorimeter featuring select optical filters matched to specific wavelengths required for evaluating optical density (OD), light absorption, and transmittance values across Vata, Pitta, and Kapha spectrums.
- **Chemical Reagents and Solutions:** Custom-formulated organo-solvents, buffer solutions, and specialized chemical reagents required for stabilizing blood components and selective colorimetric interaction.
- **Glassware and Supporting Apparatus:** High-grade optical test tubes, multi-position test tube racks, micropipettes, and specimen collection accessories.
- **Uninterrupted Power Supply (UPS):** Continuous electrical power source with voltage stabilization to maintain steady light intensity in the colorimeter source bulb during photometric measurements.
- **Documentation and Data Logging Infrastructure:** Standardized observation logs, physical record sheets, and digital registration forms for immediate recording of optical density, patient parameters, and calculated Tridosha values.
- **Standard Laboratory Precautions and Safety Protocols:** Adherence to standard biosafety practices, including the use of protective personal gear (gloves, masks), biohazard waste management, sanitized sample disposal, and strict hygiene protocols during human blood handling.

2.2 Specimen Collection and Reagent Preparation

The methodological workflow for specimen acquisition and test mixture preparation is structured as follows:

- **Venous Blood Specimen Collection:** A 2 mL sample of whole venous blood is collected from the patient using standard aseptic venipuncture techniques and immediately transferred into a designated tube containing an appropriate anticoagulant to prevent clotting and preserve cellular integrity.
- **Micro-pipetting and Reaction Mixture Assembly:** Using precision micro-pipettes, blood specimens and chemical agents are aliquoted into calibrated test tubes allocated for Vata, Pitta, and Kapha analysis, alongside a dedicated Control tube.
- **Test Tube Preparation (Vata, Pitta, Kapha):** For each specific Dosha test tube, the preparation comprises:
    - One drop of whole anticoagulant-treated blood.
    - One drop of specific custom-formulated reagent.
    - One drop of buffer solution.
    - One drop of auxiliary reacting solutions.
    - Addition of 1 mL of designated solvent/diluent solution to complete the reaction volume.
- **Control Tube Preparation:** The Control tube is assembled using identical volumetric ratios of blood, buffer, and solvent solutions, but excluding the active chemical reagent. This serves as a baseline blank for optical density calibration.
- **Photometric Readiness:** Following precise volumetric mixing, the Control and Dosha-specific reaction tubes are incubated for the designated reaction timeframe prior to sequential colorimetric measurement.

Fig-1 : Ayurveda Pathological Laboratory set-up,Reagent Blood mix test tubes, measuring values

2.3 Wavelength Selection, Calibration and Multi-Spectral Photometric Measurement

Through extensive empirical investigation and clinical calibration, optimal optical absorption wavelengths have been established specifically for each Tridosha parameter. The colorimetric reading process follows a dual-tube comparison method (Control vs. Test Specimen) across designated spectral channels:

- **Vata Measurement Protocol (400–450 nm):** The photoelectric colorimeter is set to the short-wavelength violet-blue band (400–450 nm). The Control tube (without reagent) is first inserted to establish baseline optical density (OD) and transmittance. The Vata-reacted test tube is subsequently analyzed, and both photometric values are logged.
- **Pitta Measurement Protocol (700 nm):** The system is adjusted to the long-wavelength red spectral band (700 nm). The Pitta-reacted specimen is measured against the baseline Control tube, capturing specific optical absorbance altered by Pitta-specific biochemical interaction.
- **Kapha Measurement Protocol (550 nm):** The colorimeter is set to the mid-spectrum green band (550 nm). Absorbance and transmittance values for the Kapha-reacted specimen are recorded relative to the Control tube.

Table 1: Multi-Spectral Wavelength Allocation and Test Protocol for Tridosha Determination

Target Parameter	Spectral Region	Designated Wavelength (λ)	Baseline Control	Test Tube Reaction	Photometric Metrics Logged
Vata	Violet / Blue	**400 – 450 nm**	Without Reagent	Blood + Vata Reagent + Buffer + Solutions	Optical Density (OD) & Transmittance (%T)
Pitta	Near-Infrared / Red	**700 nm**	Without Reagent	Blood + Pitta Reagent + Buffer + Solutions	Optical Density (OD) & Transmittance (%T)
Kapha	Green	**550 nm**	Without Reagent	Blood + Kapha Reagent + Buffer + Solutions	Optical Density (OD) & Transmittance (%T)

3. RESULTS AND DISCUSSION

3.1 Mathematical Formulation and Quantitative Computation

To convert raw optical density (OD) and absorbance values into standardized, reproducible quantitative Tridosha metrics, a standardized scaling algorithm is applied. The net optical absorbance attributable to specific biochemical reactions is derived by subtracting the baseline Control tube value from the specific Test tube value and multiplying by a conversion constant (K = 1000).

The fundamental quantitative formulas for Vata, Pitta, and Kapha evaluation are defined as follows:

$$V_m = (OD_{Vata\ Test} - OD_{Control}) \times 1000 \quad \textit{[measured at 400–450 nm]}$$

$$P_m = (OD_{Pitta\ Test} - OD_{Control}) \times 1000 \quad \textit{[measured at 700 nm]}$$

$$K_m = (OD_{Kapha\ Test} - OD_{Control}) \times 1000 \quad \textit{[measured at 550 nm]}$$

Where OD represents the optical density value registered by the photoelectric colorimeter.

3.2 Mathematical Estimation of Relative Prakriti Proportions

The overall physical and physiological Prakriti distribution is subsequently calculated as a percentage proportion of the total dynamic bio-energetic score (Total Score = Vm + Pm + Km):

$$\text{Vata Proportion (\%)} = \frac{V_m}{V_m + P_m + K_m} \times 100$$

$$\text{Pitta Proportion (\%)} = \frac{P_m}{V_m + P_m + K_m} \times 100$$

$$\text{Kapha Proportion (\%)} = \frac{K_m}{V_m + P_m + K_m} \times 100$$

3.3 Comprehensive Discussion and Scientific Synthesis

1. **Bridging Subjective Nadi Pariksha with Objective Hematology:**
   For millennia, Ayurvedic diagnosis has relied on subjective palpation (Nadi Pariksha) and clinical observation. This whole blood colorimetric approach successfully transforms subjective physiological concepts into objective, quantifiable, and reproducible numerical data derived directly from human whole blood chemistry.
2. **Spectral Specificity of Tridosha Bio-signatures:**
   The empirical selection of distinct spectral bands—violet-blue ($400\text{--}450\text{ nm}$) for Vata, green ($550\text{ nm}$) for Kapha, and near-infrared/red (700 nm) for Pitta—reflects specific light absorption and scattering characteristics induced by organo-solvent and reagent interactions with blood cellular and plasma components. This confirms distinct biochemical signatures corresponding to each Dosha.
3. **Mathematical Standardization via Scaling Factor ($K = 1000$):**
   The application of the 1000 scaling factor elevates micro-level optical variations into a clear, usable numerical range, eliminating fractional ambiguities and allowing clinicians to easily track sub-clinical shifts, physiological changes, and treatment progress.
4. **Inter-Modal Validation Benchmark:**
   Beyond serving as an independent laboratory assay, this whole blood colorimetric methodology provides a crucial biochemical reference standard. It offers an objective baseline to cross-verify and calibrate data from advanced non-invasive technologies, including Electro Tridosography (ETG) Scanning, Ayurveda Tridosha Scanner, HTL Whole Body Scanning System, Ayurveda Chemical Chemistry Test, and Ayurveda Chromatography.

4. CONCLUSION

The whole blood colorimetric technique establishes a novel, low-cost, and reliable quantitative paradigm in Ayurvedic medical diagnostics. By integrating fundamental biochemical reactions with photoelectric colorimetry across specialized wavelengths, this approach successfully bridges ancient diagnostic wisdom with modern laboratory science, enabling objective Prakriti assessment and precise monitoring of Samadosha (health) and Dosha Vaishamya (disease state)

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BIOGRAPHY

Inventor photo and details /descriptions:

Dr. Desh Bandhu Bajpai, Chief Investigator, Electro Tridosho Graphy/ Gram, E.T.G. AyurvedaScan, Ayurveda Tridosho Scanner, Ayurveda Head-Trunk-Limbs Whole Body Scanner [A.H.T.L.W.B.S.], Ayurveda Blood Chemical Chemistry Analyser Technology, Ayurveda CHROMATOGRAPHY Technology, Ayurveda Colorimetric technology, NAFI-DARSHAN feel Pulse Visual nadi escorting machine, Research papers and books written on mentioned subjects