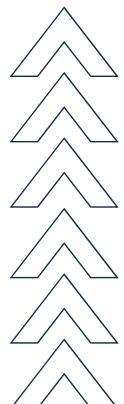
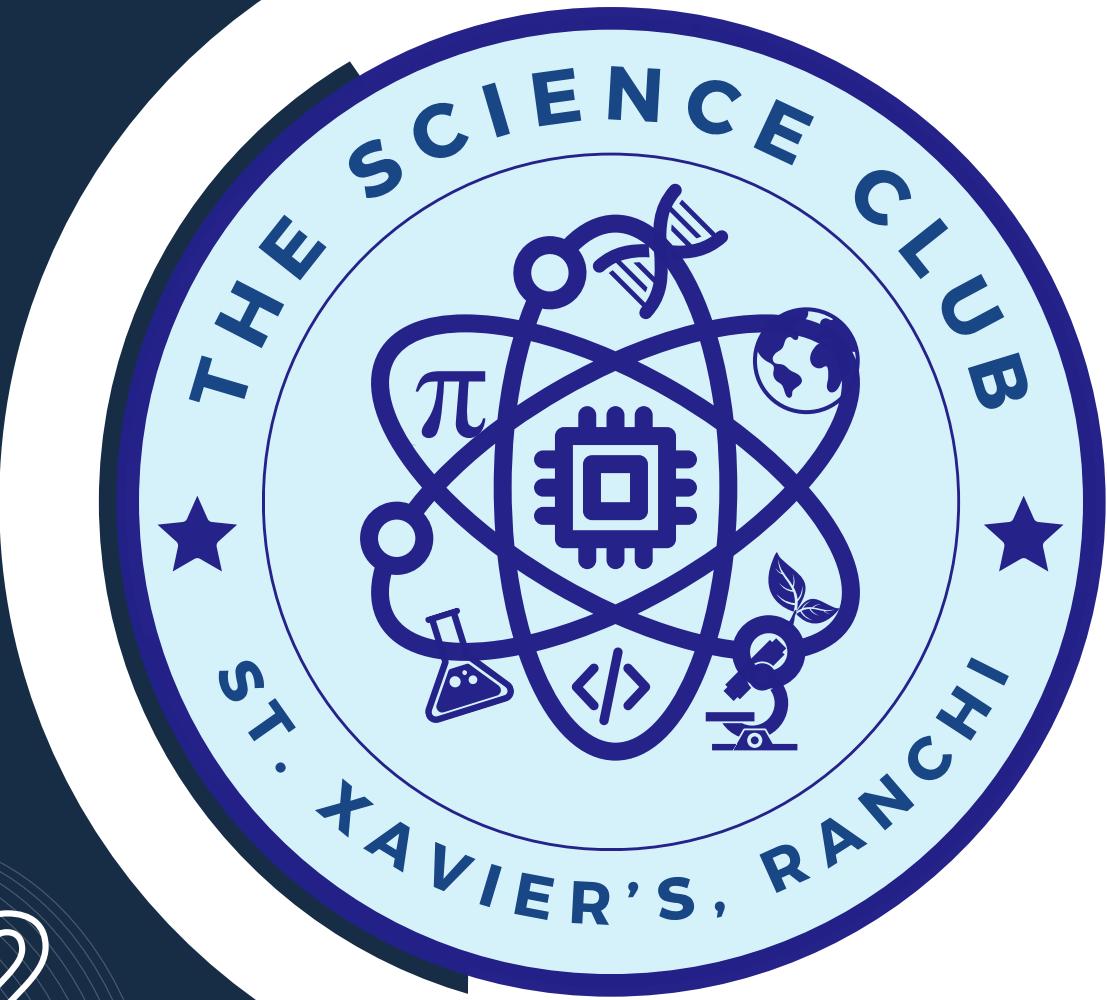




December
2025



2025-2026

THE SCIENCE CLUB St. Xavier's College, Ranchi



PRESIDENT : VISHNU NATH PANDEY
SECRETARY: HARSH SINGH

Submitted To
The Science Club , for Research Rumble: Event 3

Valorization of Agro-Waste via Natural Dye Extraction from Native Weeds of Jharkhand: An In Silico Assessment for Textile Applications

By Synthesis Scholars
[Manabi Chatterjee, department of biotechnology, semester 3; Asmita Kumari, department of biotechnology, sem 2; Kaniz Tasheer, department of biotechnology, semester 3]

Abstract
The accumulation of agro-waste from non-edible, non-fodder, and invasive weeds in Jharkhand presents a significant environmental challenge. These plant species constitute a renewable source of phytochemicals with potential utility in sustainable textile dying. This study investigates ten native weed species for their phytochemical composition and evaluates their suitability as eco-friendly textile colorants. An in silico workflow was employed to assess pigment-fabric interactions, dye stability, and toxicity, thereby providing predictive insights into their practical applicability. Five environmentally benign extraction methodologies were analyzed for efficiency, economic feasibility, and ecological sustainability. Molecular docking, toxicity prediction, colorimetric simulation, and wash-fastness analyses were performed to predict dye-fiber affinity, pigment stability, and human and environmental safety. The findings establish a framework for sustainable waste valorization and provide guidance for the development of green dyeing processes in the textile industry.

Introduction
Textile coloration using synthetic dyes contributes substantially to environmental pollution through effluent discharge, chemical hazards, and high water consumption. In Jharkhand, a substantial fraction of agricultural biomass consists of invasive and non-utilized weed species. These plants are rich in bioactive pigments such as flavonoids, anthocyanins, carotenoids, tannins, and betalains, which have historically been employed as natural dyes. The valorization of these weeds aligns with principles of circular economy by converting biomass waste into high-value products.

Recent computational approaches facilitate the in silico assessment of dye-fiber interactions, pigment stability, and toxicity, enabling predictive evaluation without extensive laboratory experimentation. This study leverages such computational techniques to identify suitable weed-derived pigments, evaluate their compatibility with multiple textile substrates, and simulate eco-friendly extraction processes.

DATE: 15th December, 2025

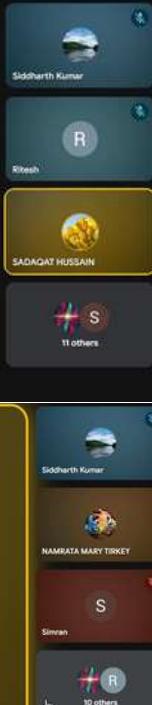
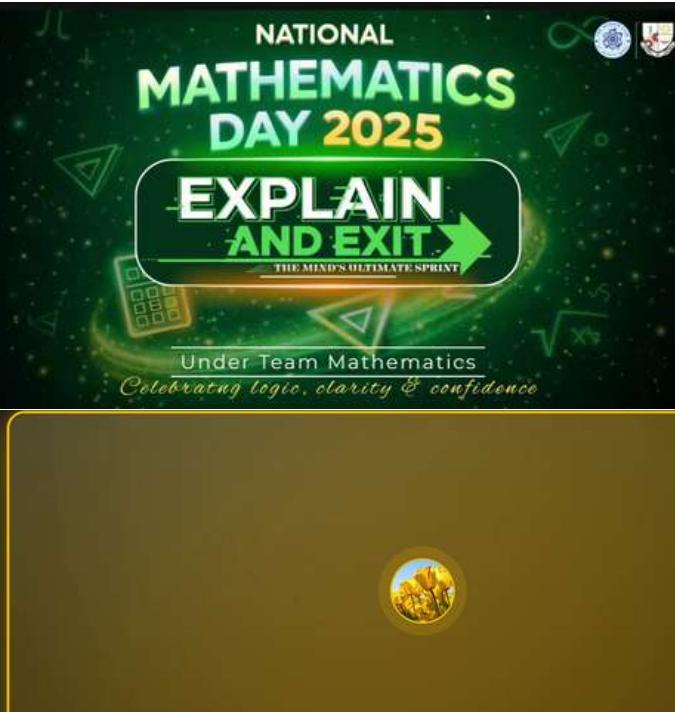
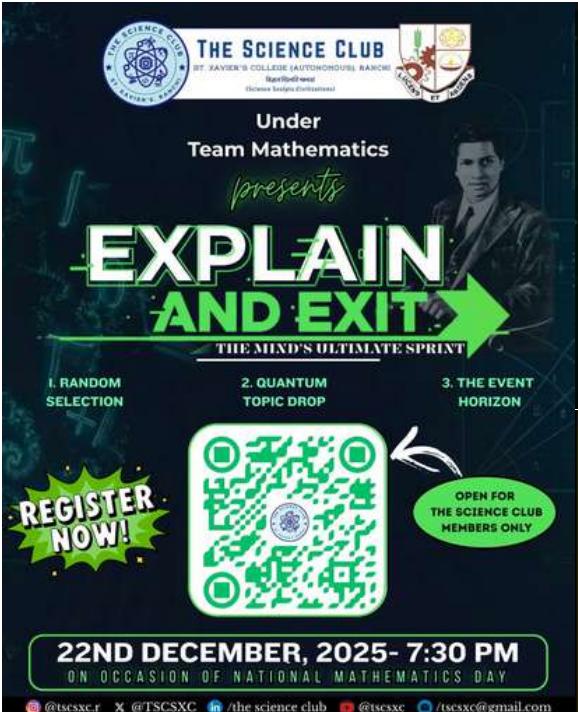
PLACE: Online

The Science Club of St. Xavier's College, Ranchi, successfully conducted Research Rumble - Review Paper Submission on 10th December 2025 via an online platform. The event aimed to promote research aptitude, critical thinking and effective scientific communication among participants.

Around 35 members actively participated by presenting research-based ideas, engaging in discussions and responding to analytical questions. The session witnessed enthusiastic involvement and showcased participants' confidence and depth of understanding.

Overall, the event served as a valuable learning experience and contributed meaningfully in fostering a strong research culture within the Club.

TSCSXC/2025-2026



DATE: 22nd December, 2025

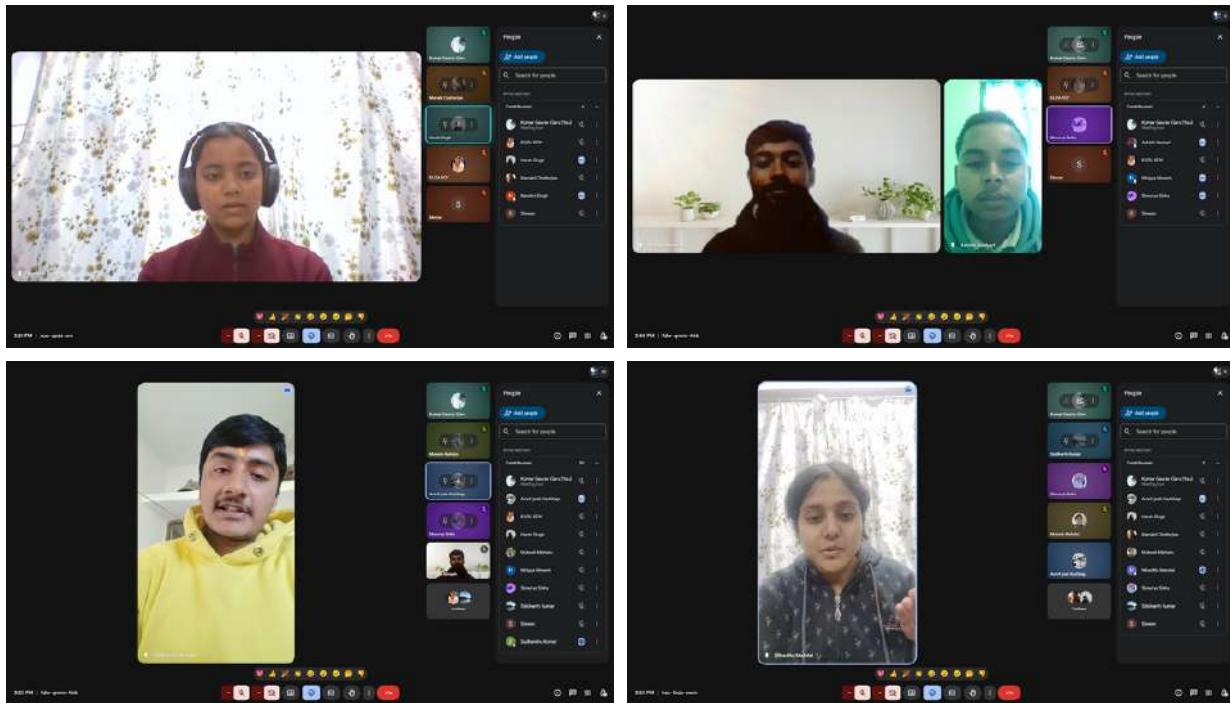
PLACE: Google Meet

The Science Club successfully conducted the mathematics based event “Explain and Exit – The Mind’s Ultimate Sprint” under Team Mathematics on 22nd December 2025 at 7:30 PM via Google Meet, on the occasion of National Mathematics Day.

The event aimed to test participants’ conceptual clarity, analytical ability, and communication skills through random selection, quantum topic drops, and the event horizon round.

The event was smoothly organized, with active engagement throughout, making it an intellectually stimulating and enriching experience for the Science Club members.

TSCSXC/2025-2026



 DATE: 27th December, 2025

 PLACE: Google Meet

The Science Club, St. Xavier's College, Ranchi, invited applications for Team Head positions on the Board of Governors.

This opportunity was open to dedicated, motivated, and responsible members who are eager to take up leadership roles and actively contribute to the academic, technical, and organizational development of the club.

Selected team heads will play a key role in planning events, coordinating members, and strengthening their respective disciplines within the club.

Positions are available across various science and technical teams, offering members a platform to showcase leadership and initiative.

TSCSXC/2025-2026

3



DATE: 29th December, 2025

PLACE: Google Meet

The Science Club of St. Xavier's College, Ranchi, under the Tech Team, successfully conducted a Canva Masterclass Session 1, on 29th December at 7:30 PM via Google Meet, led by esteemed alumnus Mr. Shubham Nag.

The session proved to be highly informative and engaging, offering valuable insights into content creation, presentation design, poster making, and effective use of digital media tools. Members actively participated throughout the workshop and gained practical knowledge on enhancing visual communication skills using Canva.

The event contributed meaningfully to skill development and was well received by all participating Science Club members.

TSCSX/2025-2026

BOARD OF GOVERNORS

2025-2026



DR. SWARAT CHAUDHURI - CLUB MENTOR

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PARUL	STATISTICS TEAM HEAD
KHUSHI KUMARI	ZOOLOGY TEAM HEAD

I affirm that all the information I have provided is accurate and truthful. I have not supplied any incorrect detail intentionally. Both my club and I are prepared to accept any disciplinary measures if any discrepancy and inaccuracy are discovered during the verification process.

Harsh Singh
Secretary
The Science Club
St. Xavier's College, Ranchi

TSCSXC/2025-2026