

Harappan Civilization Shrank

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Why in News?

Recently, A study, used pollen analysis from Deoria Tal to reconstruct vegetation and hydro-climate variability. Findings link the shrinking of the Harappan Civilization to abrupt climate change.

Key Findings

- **Conducted by** - The Birbal Sahni Institute of Palaeosciences (BSIP), supported by the Department of Science and Technology (DST).
- **Timeline** - Weak Indian Summer Monsoon (ISM) between 5100-4000 cal yr BP.

Cal yr BP – Calibrated calendar years before the present; The present is 1950; to find the approximate historical year (BCE), subtract 1,950 from historical year. 4250 cal yr BP is around 2300 BCE.

- **Evidence** - Oak/Pine pollen ratio showed abrupt increase around 4250 cal yr BP, matching sedimentological records of dry climate at 4200 cal yr BP.
- **Impact** - Collapse of reliable seasonal flooding along Indus and Ghaggar-Hakra rivers, hence migration started eastwards to Ganga plains.
- **Cause** - Cool-dry climate, weak ISM due to southward shift of ITCZ, decreasing Northern Hemisphere summer insolation.

Methodology

- **Sediment Core** - Scientists studied sediment cores from Deoria Tal in the Garhwal Himalaya.
- **Dating** - They dated samples using radiocarbon analysis of *Trapa seed cases*, calibrated with OxCal software.

- **Tools** - Pollen and spores have been used as established tools for reconstructing past vegetation dynamics and contemporary climate change.
- **Collaboration** - The study involved collaboration between universities in India and the USA, using pollen and spores as indicators of past vegetation and climate.

Historical Climate Patterns

- **Roman Warm Period (2500-1450 years ago)** - The Indian Summer Monsoon was strong, leading to high agricultural productivity and what is called the *“Golden Age of India.”*
- **Medieval Climate Anomaly (1050-650 years ago)** - The monsoon remained strong due to a northward Intertropical Convergence Zone (ITCZ) shift, solar activity, and ENSO influence, resulting in wetter conditions.
- **Little Ice Age (650-100 years ago; CE 1350-1850)** - The monsoon weakened because of intensified Asian westerly jets, positive North Atlantic Oscillation, ENSO warm phase, and a southward ITCZ shift.
- **4.2 ka event** - It was a major cooling phase during the Holocene period.
- It provides a natural case study to understand how the Indian Summer Monsoon was influenced by El Niño, ITCZ shifts, Indian Ocean Dipole, and summer insolation in low-latitude regions.

Significance

- **Historical** - Explains Harappan decline through climate stress.
- **Scientific** - Demonstrates pollen as tool for reconstructing past monsoon variability.

Reference

[PIB | Harappan Civilization](#)