Vegetational history and palaeoenvironment of Hirpur Locality-I, Lower Karewa, Kashmir

H. P. Gupta & Chhaya Sharma


The present palynostratigraphical studies carried out on the exposed sediments of Hirpur Locality-I, lying under the earlier worked out Hirpur Locality-III, has revealed continued dominance of arboreal elements in the sequence depicting comparative preponderance of spruce and oak, although showing abrupt change in their values. The palynodata thus obtained has been interpreted to reconstruct the palaeovegetation pattern and to deduce the possible climatic fluctuation witnessed during the course of sedimentation of the 40 m thick lithocolumn. The pollen diagram has been divided into four pollen assemblage zones.

Key-words—Palynostratigraphy, Palaeoenvironment, Palaeovegetation, Lower Karewa (India).

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THE present investigations carried out on the exposed sediments from Hirpur Locality-I (33°42'N-75°41'E) cover the downward extension of earlier worked out Hirpur Locality-III (Gupta et al., 1984a, 1984b) of Lower Karewa in Kashmir Valley. Apparently, the lithofacies in Hirpur Locality-I is very similar to Hirpur Locality-III. The sediments in Hirpur Locality-I consist of laminated as well as lignitic mud with distinct overlying and underlying beds of sand. The former was found palynologically barren whereas, later yielded pollen in appreciable frequency. The techniques employed for the present analysis of soil samples are the same as already discussed in an earlier communication (Gupta et al., 1984a).

POLLEN DIAGRAM AND COMPOSITION

The pollen analysis of nine samples from different horizons of a 40 m thick lithocolumn from Hirpur Locality-I has revealed the predominance of *Picea* and *Quercus*, together with other broad-leaved arboreal elements, which is divisible into four pollen assemblage zones, viz., HLI-I, HLI-II, HLI-III and HLI-IV in ascending order. These zones are primarily aimed to interpret palynological data so as to throw light on the palaeovegetation and if possible to decipher the corresponding climatic changes during the period of sedimentation.

Zone HLI-I—The early phase of this zone is recognized by exceedingly high values of *Quercus*, followed by *Picea, Abies, Salix, Acacia, Ericaceae* and low frequency of *Abies*. The scarce non-arborescent vegetation is represented by poor values of *Poaceae, Asteraceae, Cyperaceae* and *Peperomia*. AP/NAP ratio has demonstrated over dominance of arborescent vegetation.

हिरपुर के वन-प्रदेश में अधिक जन्म की हिरपुर सरिष्णश्चति-प्रथम का वनस्पतीकीय दृश्यम तथा पुराकालवर्ण

हिरपुर सरिष्णश्चति-प्रथम में अनावरण अवसाद के वनस्पतीकीय अवसाद में इस अनुक्रम में वृक्षीय अवसाद की अधिकतम प्रमुखता यक्त होती है। तुलनात्मक तौर पर इन अवसादों में गैर एवं ओक की बाह्यता है होतीक इसकी मात्रा में मानो यादृच्छिक दिखती है इसलिए इसके भी अवसाद में अनावारण मापक देखा गया है। अन्यथा परमाणुकालीन अवसाद के अवसाद पर पूर्वस्थापित अवसाद तथा इस 40 मीटर मौसम वातावरण के अवसाद के समय अवसाद अवसाद की भी व्यक्ति की गई है। परमाणु-विज्ञान चार परमाणु समूह महत्त्व में विभाजित किया गया है।
The later phase of this zone is marked by steep fall in the values of Quercus and Picea coupled with the appearance of Carpinus and Berberidaceae, and disappearance of Salix and Ericaceae. However, Alnus remains static in its values. Arcicolpites birpurensis (Gupta et al., MS) and Rosaceae also appear in this phase showing fairly high values—maintaining 17 per cent each. The values for Poaceae markedly improve to reach its maximum whereas, other non-arboreals such as Asteraceae, Cyperaceae and Liliaceae are locally present. Primulaceae in low frequencies and Typha in moderately high values appear in this phase. Potamogeton maintains almost same low values. The emergence of ferns exhibit low percentage. AP/NAP ratio shows considerable depression in the overall arboreal vegetation as compared to the early phase.

Zone HIJ II—This zone is identified by the preponderance of Picea pollen throughout, indicating the existence of spruce forest. The broad-leaved element Quercus which was once most dominant declines to moderate values and remains confined only to the middle of the zone. Other associates of Picea forest namely Juniperus, Larix, Betula, Carpinus and Ulmus are sporadic in this zone. Corylus remains confined to this zone only with fluctuating values. Alnus continues its high values till the beginning of this zone and then dwindles down in the middle and disappears in the upper half of the zone. However, Carya too, is restricted to this zone in good frequencies right from the base of the zone showing an upward trend in its values. Juglans appears about in the middle of the zone accompanied with Carya up to upper half of the zone, the later with comparatively high values. Amongst the shrubby taxa, Berberidaceae and Rosaceae are recorded throughout the zone in low and high values respectively, but both disappear at the top of the zone. Arcicolpites birpurensis (Type-1 pollen) in pollen diagram is represented in considerably high values throughout the zone.

The non-arboreal vegetation is depicted distinctly in low frequency. Even Poaceae is poor throughout the zone except for considerable improvement in its values at the top of the zone. The other herbaceous taxa such as Chenio/Ams, Primulaceae and Onagraceae show fairly high values but are chiefly confined to the lower half of the zone. The aquatics are represented by good frequencies of Potamogeton throughout the zone except for its intermittent fluctuations. Typha is encountered in moderate values but slightly below the top of the zone. Ferns are locally present except their enhanced values at the middle of the zone. AP/NAP ratio indicates dominance of arboreous vegetation except that it is slightly reduced in the upper half of the zone.

Zone HIJ III—This is a markedly short-spanned zone as compared to the preceding two zones, i.e., HIJ I and HIJ II and is demonstrated by an abrupt fall in the values of Picea which has reduced to merely a fraction. The downfall of Picea is witnessed by the dominance of Larix and Quercus in almost equally high values, followed by Abies, Betula and Carpinus. Alnus and Juglans remain as before whereas, Carya is unrepresented and Engelhardtia emerges in low values in this zone. Berberidaceae continues with almost the same values. Arcicolpites birpurensis is surprisingly absent in this zone when compared to its tremendous increase to about 30 per cent of the total values in zone II.
The ground cover is further reduced as compared to what has been witnessed in the previous zone, and is represented by low values of Poaceae, Chenopods, Primulaceae and Cyperaceae. Aquatics and ferns remain totally unrepresented in this zone. The AP'NAP ratio again demonstrates the overall continued dominance of arboreal vegetation.

Zone HL-IV—This zone is demarcated by the re-emergence of Picea, showing exceptionally high values of Picea forest along with Juglans and less frequent other broad-leaved arboreal elements namely Betula, Abies and Salix showing much reduced values. However, Juglans shows fairly high values. No shrubby element is witnessed in these Picea woods. Arcicolorites birpurensis, though reappears in this zone, is in much reduced values. Herbaceous vegetation too is poorly represented as compared to the preceding zone with scanty values of only Poaceae and Primulaceae. Aquatic elements are totally absent in this zone too, except for Typha which is represented in low frequencies. Non-arboreals remain distinctly scanty in contrast to the arboreal taxa present in this zone.

**DISCUSSION**

The palynostratigraphical studies of the sediments from the Hirpur Locality-I demonstrate the existence of a thick Picea forest. Nevertheless, Picea forest did not remain predominant throughout the pollen sequence but it experienced two major depressions, one at the later phase of zone-I and another showing its very low frequencies during zone-III of the pollen diagram. The fluctuations in Picea, associated with the replacement or corresponding fluctuations in the broad-leaved elements especially Quercus has lead to the formulation of four pollen zones through which the palaeovegetation pattern is demarcated and the data obtained is interpreted to throw light on the palaeoclimatic changes in time and space in this region of inner Himalaya.

The well-marked preponderance of Quercus followed by Picea along with associated two taxa, Abies and Betula, is suggestive of temperate and humid climate at the beginning of zone-I. Later on, at the close of this zone, both Quercus as well as Picea registered significant depression besides the disappearance of Abies and Betula indicating amelioration in the temperature or change over to the warm temperate climate.

Similarly in Zone HL-II the restoration of Picea, an element of continued dominance, followed by Arcicolorites birpurensis and Rosaceae in good frequencies along with insignificant or sporadic presence of other taxa is indicative of the type of vegetation sustained under cool temperate and humid climate.

Zone HL-III has witnessed a catastrophic degradation of woods where Picea reduced to its ever minimum frequencies on one hand but associated with the appearance of Larix as a dominant element restricted to this zone only which is indicative of a cool temperate and still more humid climate comparable to the present sub-alpine zone in the north-west Himalaya.

Zone HL-IV again reflects a change in the vegetation pattern where Picea restores to its maximum dominant position indicating the advent of cool temperate but dry climate.

However, it may be pointed out that the occurrence of Arcicolorites birpurensis in high values throughout the zones HL-I and HL-II in the pollen diagram has led to the inference that the sediments of Hirpur Locality-I are in continuance with the underlying sediments of Hirpur Locality-III (Gupta et al., 1984a, 1984b)

**CONCLUSIONS**

Pollen analytical investigation of the sediments has led to the following conclusions:

1. Based on the changes witnessed in the palaeovegetation, the pollen diagram has been divided into four pollen assemblage zones, viz., HL-I, HL-II, HL-III and HL-IV in chronological order.
2. Arboreal vegetation remains dominant throughout the pollen diagram as compared to the non-arboreal vegetation.
3. Climatic fluctuations inferred from the worked out palaeovegetational data of different zones are summarized as under:

<table>
<thead>
<tr>
<th>Zone</th>
<th>Climate</th>
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<tbody>
<tr>
<td>HL-I</td>
<td>Temperate and humid climate in the beginning and warm temperate at the top.</td>
</tr>
<tr>
<td>HL-II</td>
<td>Cool temperate and humid climate.</td>
</tr>
<tr>
<td>HL-III</td>
<td>Cool temperate and still more humid climate.</td>
</tr>
<tr>
<td>HL-IV</td>
<td>Cool temperate but dry climate.</td>
</tr>
</tbody>
</table>

4. The occurrence of Arcicolorites birpurensis Gupta, Sharma & Yadav (MS) in Hirpur Locality-I demonstrates its downward extension in Hirpur Locality-III.

**REFERENCES**
