

# FISSION-TRACK DATING OF FOSSIL PALM WOOD FROM SHAHPURA, MANDLA DISTRICT, MADHYA PRADESH

The direct application of any of the radio isotopic dating method on petrified woods has been hampered probably due to the fact that the process of petrification and the occurrence of minerals, which constitute it, are not well understood (Barghoorn, 1977). Recently Rajagopalan *et al.* (1983) have applied the Fission-Track dating method on petrified wood and the estimated age for in situ apatite grains agreed well with other evidences indicating the authigenicity of the apatite mineral in the body of wood during petrification. Srivastava (1985) has also applied the same technique to date petrified dicot-wood from Cretaceous.

The fossil monocot-wood *Palmoxylon siltherensis* Ambwani (1984), described in this note, has been collected from the Deccan Intertrappean beds exposed at the fossiliferous locality of Silther Village near Shahpura in Mandla District, Madhya Pradesh (Bande & Prakash, 1981, 1983). The anatomical studies of this fossil specimen show the following details : the presence of single small metaxylem vessel in the fibrovascular bundle; the fibrovascular bundles can be differentiated into dermal, subdermal and central zones; the fibrovascular bundles are generally compact in the dermal and slightly sparse in subdermal and in central zones; the dorsal sheath is reniform; median sinus concave, auricular sinus is indistinct and the auricular lobes are round; radiating parenchyma are absent, sometimes a narrow ventral sclerenchymatous sheath is present in the fibrovascular bundles and diminutive fibrovascular bundles are also present. The ground tissue is compact.

For age determination of this fossil palm wood by F-T dating method, ten transverse and longitudinal sections were cut and mounted on a glass slide using epoxy resin (CIBA product, Araldite AY 103 & HY 951 in 8: 1 ratio). These sections were ground using Universal Waterproof carborundum papers of mesh sizes 320, 400 and 600 successively. To polish, alumina-powder of grade 1  $\mu\text{m}$  and 0.3  $\mu\text{m}$ , were used and final high grade polishing was carried out using diamond paste (0.25  $\mu\text{m}$ ). The polished thin sections were scanned under Olympus BHS-2 microscope (1000  $\times$  magnification). The thin sections, having in-situ apatite crystals within the worn out/injured space in the ground tissue as well as within the metaxylem and protoxylem vessels had been selected. These apatite grains were etched in 4 % nitric acid at room temperature. On scanning the apatite grains under 1000  $\times$  magnification for fossil fission tracks in ten thin sections, a total of 42 tracks for the 1360 graticules of surface of grains were counted, which gave the fossil track density  $\rho_s$  as  $1.24 \times 10^3$  tracks/cm<sup>2</sup>. The sections were sent for thermal neutron bombardment vide capsule F-39 in CIRUS reactor at BARC, Bombay. These sections were ground and polished again to expose new surface. After re-etching, total track density ( $\rho_T = 1.22 \times 10^4$  t/cm<sup>2</sup>) was obtained (total number of tracks counted = 416 and number of graticules = 1360). The induced track density ( $\rho_i = 1.10 \times 10^4$  t/cm<sup>2</sup>) was obtained by subtracting fossil track density ( $\rho_s$ ) from the measured total track density after neutron irradiation. The thermal neutron dose  $\phi$  ( $8.06 \times 10^{15}$  n/cm<sup>2</sup>) was obtained after counting tracks on Fisher Standard glass and Blue Star microscopic glass slide (Saini *et al.*, 1981).

The F-T age of the sample and  $1\sigma$  statistical error have been calculated as 54.4

$\pm 8.1$  Ma and the uranium concentration in apatite crystals is estimated as 5 ppb using the formulae given elsewhere (Srivastava, 1985).

The Palaeobotanical studies (Lakhanpal, 1970; Prakash, 1960) on Deccan intertrappean flora suggests that it was made up of number of plant communities of different ages occurring in a wide area of Central India. K-Ar age data given by Alexander (1981) also show different ages for different lava flows in the Deccan plateau. The F-T age of the present fossil palm wood indicates the age of the related intertrappean bed at Shahpura, Mandla District as Early Eocene. Determination of F-T age of more fossil woods from different localities of the Deccan intertrappean beds will help in describing the development of flora in chronological sequence.

## References

- ALEXANDER, P. O. (1981). Age and duration of Deccan volcanism K-Ar evidence, in : Subbarao, K. V. & Sukheswala, R. N. (Eds.)—*Deccan Volcanism and Related Basalt Provinces in other parts of the world. Geol. Soc. India*, **3** : 244-258.
- AMBWANI, K. (1984). *Palmoxylon siltherensis* sp. from the Intertrappean beds of Mandla District, Madhya Pradesh. *Palaeobotanist*, **31**(3) : 213-217.
- BANDE, M. B. & PRAKASH, U. (1981). Fossil dicotyledonous woods from the Deccan Intertrappean beds of Mandla District, Madhya Pradesh. *Palaeobotanist*, **16** : 101-108.
- BANDE, M. B. & PRAKASH, U. (1983). Fossil dicotyledonous woods from the Deccan Tertrappean beds near Shahpura, Mandla District, Madhya Pradesh. *Palaeobotanist*, **31**(1) : 13-29.
- BARGHOORN, F. S. (1977). Petrification. *Encyclopedia of Science and Technology*. McGraw Hill p p. 10-49.
- LAKHANPAL, R. N. (1970). Tertiary floras of India and their bearing on the historical geology of the region. *Taxon*, **19**(5) : 675-694.
- PRAKASH, U. (1960). A survey of the Deccan Intertrappean flora of India. *J. Palaeontol.*, **34**(5) : 1027-1040.
- RAJAGOPALAN, G., SRIVASTAVA, A. P. & SAINI, H. S. (1983). An attempt to date petrified wood through in-situ measurements on apatite grains. *Nucl. Tracks: Methods and Applications* (ed. H. S. Virk) : Proc. 3rd National SSNTDs Conference Amritsar : 3-14.
- SAINI, H. S., SRIVASTAVA, A. P. & RAJAGOPALAN, G. (1981). Glass microslide as a thermal neutron fluencemeter. *Curr. Sci.*, **50**(8) : 356-359.
- SRIVASTAVA, A. P. (1985). Fission-Track studies on authigenic sedimentary mineral glauconite and its application to date Lower Vindhyan deposits. *Ph.D. Thesis*. Kurukshetra Univ. Kurukshetra.

A. P. SRIVASTAVA, G. RAJAGOPALAN & K. AMBWANI

*Birbal Sahni Institute of Palaeobotany, 53, University Road, Lucknow 226 007*