The discussion indicates that the plant microfossils suggest a Paleocene—Eocene age for the beds examined. The Kuar Bet Beds of Patcham Group are considered so far as Bathonian-Lower Callovian in age.

Mega-fossil genus Onychiopsis is considered as a typical post Jurassic fern and the youngest of the Gondwana form. Earlier Indian records of the genus are from Jabalpur Series, Sehora, Umia Series, Kutch and from Kathiwar. Genus Sphenopteris has a wider geological range and occurs in pre Cretaceous as well as in the post Jurassic horizons. It may be noted that the Onychiopsis psilotoides recorded from the Umia beds is also associated with Sphenopteris.

The plant megafossil evidences, thus, indicate an age not older than Lower Cretaceous for the lower beds of Kuar Bet.

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**CHANGES IN THE DYNAMICS OF PHOSPHATE EQUILIBRIA ON STORING SOIL SAMPLES**

The complexity of phosphate equilibria in soils is due to the many different phosphate forms and reactions that occur in soils. The heterogenous phosphate equilibria in soil is constantly disturbed both in presence and absence of growing plant by combinations of physical, chemical and biochemical changes in the soil fabric. The changes in the equilibria between different phosphate fractions on storing soil samples under air-dry conditions are brought out in this note.

The soil samples used in this investigation were collected from a field experiment with rice (IR-8 variety) conducted at the Agricultural College and Research Institute, Coimbatore. The field soil belongs to the medium black soils group, sandy clay in texture and calcareous with a pH of 8-1. Surface soil samples (0-16 cm) from 36 control plots of the above-mentioned field experiment were used for the determination of available P by a modified Olsen's method (Velayutham and Jain, 1971) and phosphate fractionation by Chang and Jackson method with modification as suggested by Peterson and Corey (1966), during May, 1970 and December, 1971 after storing the soil samples for about 18 months at room temperature. On both occasions phosphate fractionation was also done on the soil samples after extraction with 0.5 M sodium bicarbonate of pH 8-2 for the determination of available P.

The average (N = 36) available P extracted using 0.5 M sodium bicarbonate of pH 8-2 during May, 1970 was 11.2 Kg/ha. After storing for 18 months the average available P by the same extractant reduced to 5.0 Kg/ha. Substantial reduction in phosphate solubility in neutral and weak acid solutions after ordinary air-drying of Swedish soil samples was shown by Ghosh and Wilander (1968). They also indicated that waterlogged and poorly aerated soils (as was the case of paddy soil used in this investigation) are subject to much stronger P solubility depression than dry and well-aerated soils.

The available P extracted is the net result of differential contribution of phosphate fractions which are in dynamic equilibrium with one another. Therefore it is to be expected that the reduction in available P on storage would have shifted the equilibria between the different P fractions. The four inorganic P fractions have changed on storage under air-dry condition in their values as given in Table I. It is seen that marginal reductions in Al-P and Fe-P, a compensating increase in Ca-P
and significant reduction in reductant soluble P have taken place during storage. That the dynamics is towards a change in R-P to other inactive fractions not measured in the fractionation procedure is also reflected in the values of the four fractions estimated after extracting the soil samples for available P during May, 1970 and December, 1971 as given also in Table I. Compared to the other fractions the reduction in R-P (26 ppm) in the available P-extracted samples is much more significant than that in other fractions. It is also seen that at both times the distribution of P fractions during extraction with the reagent has been such that net effect has been an increase in the unidentified forms to an extent of 7/8th of the difference between sum of P fractions before and after extractions, leaving the remaining 1/8th as the available P in the extract. Reorientation of adsorbed phosphate ions, dehydration of the products formed, phosphate occlusion and phosphatolysis of clays almost continue indefinitely at a very slow rate shifting always in the process the dynamic equilibrium between the different phosphate fractions.

The shift in the phosphate fractions equilibria into more inactive and unavailable forms of P as obtained in the present investigation is an undesirable effect, since such forms under normal field conditions may not contribute to the available P pool as measured either by plant or by quick soil test methods. Since the soil samples were stored under air-dry conditions, it is possible that a similar shift in phosphate equilibria, though of different magnitude is likely to happen in field soils more under dry-farming regions than in irrigated areas and those areas having assured rainfall.

Since mere storage of soil samples under air-dry conditions reduces the available P in such soils, it becomes imperative that such determinations either for routine fertilizer recommendations to the farmers by the soil-testing laboratories or for soil fertility investigations under field experiments, be done on the samples as soon as they are ready for the purpose.

<table>
<thead>
<tr>
<th>Period</th>
<th>Al-P</th>
<th>Fe-P</th>
<th>R-P</th>
<th>Ca-P</th>
<th>Sum of P fractions</th>
<th>Total P</th>
<th>Available P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before extraction with 0.5 M NaHCO₃ of pH 8.2</td>
<td>May 1970</td>
<td>35-0</td>
<td>69-0</td>
<td>188-0</td>
<td>238-0</td>
<td>520-0</td>
<td>1108-0</td>
</tr>
<tr>
<td>After extraction with above reagent</td>
<td>Dec. 1971</td>
<td>21-8</td>
<td>57-0</td>
<td>68-2</td>
<td>264-0</td>
<td>301-0</td>
<td>do.</td>
</tr>
</tbody>
</table>

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Division of Soil Science and J. M. Jain.
Agricultural Chemistry, M. Velayutham.
Indian Agricultural Research R. Hasan.
Institute,
New Delhi-12, February 28, 1972.


**CYTOLOGICAL STUDIES ON THE SIX SPECIES OF CHRYSomELIDAE (INSECTA: COLEOPTERA)**

Out of 26,000 species recorded under the family Chrysomelidae about 127 species are known cytotologically.$^{1-8}$

The present study deals with six species belonging to four subfamilies, namely, Eumolpinae, Galerucinae, Cassidinae and Clytrinae collected from the plants *Azadirachta indica*, A. Juss., *Cucurbita pepo*, Dc., *Cocculus hirsutus*, Diels and *Cajanus indicus*, Spreng. respectively at Pondicherry in December, 1971. Testes from living specimens were collected; both squash and section preparations (10-12 microns) were made and stained in crystal violet and Feulgen's stain.

The diploid and haploid numbers of species with their chromosome formulae are given in Table I.

Chrysomelidae is highly polymorphous and many taxonomists believe that a number of subfamilies under it should be raised to family status (Virkki). Ten subfamilies were described by Smith,$^{1,2}$ one by Virkki and a further addition of Clytrinae has been made in the present study. The phylogenetic development seems complicated cytologically (Crowson$^9$).