bulbs by freezing microtome and staining them in safranin and Delafield's hæmatoxylin the secondary vascular bundles in all stages of development are found prominently separated from each other laterally by the radially elongated secondary conjunctive tissue; these sections show clear secondary growth with superficial periderm and cork cambium, though in the younger bulb (Fig. 1), the periderm and the cork cambium are both absent. In *Dracœna* stem Strasburger[4] (Fig. 44) also clearly demarcated the secondary conjunctive tissues with radially elongated cells from the rest of the central polygonal cells of the primary ground tissue.

Secondary growth in Monocot. stem with the help of permanent cambium has been observed in stems of local *Curculigo recurvata* (Amaryllidaceæ) and *Sansevieria zeylanica* (Hæmodoraceæ) as recorded by Pfeiffer[2] and Cheadle.[1] Thus, the total number of Monocot. plants, so far investigated, which show secondary growth by permanent cambium, belongs to about 19 genera, *viz.*, *Aloe, Cordyline, Dasylirion, Dracœna, Kniphofia, Nolina, Yucca, Xanthorrhœa* and *Veratrum* (Liliaceæ), *Agave, Furcrœax, Polyanthes* and *Curculigo* (Amaryllidaceæ); *Aristea* and related genera (Iridaceæ); *Testudinaria, Tamus* and *Dioscorea* (Dioscoreaceæ); *Sansevieria* (Hæmodoraceæ); and *Acorus calamus* (Araceæ).

Polyanthes tuberosa L., being a very common garden plant in India, the attention of Indian botanists is drawn to its anatomy.

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[1] Cheadle, Vernon, I., "*Bot. Gaz.*, 1937, **98**, 535–55.
[2] Pfeiffer, H., *Handbuch der Pflanzenanatomie. K. Linsbauer*, **Band IX**; *Das Abnorme Dickenwachstum*, Bremen, 1926.
[3] Randolph, L. F., *Stain Tech.*, 1935, **10**, 95.
[4] Strasburger, E., *Handbook of Practical Botany*, 1924, 8th Edition, Fig. 44, p. 118.

Loss of Water by Evaporation from the Upper Surfaces of Soil Columns Resting on a Water Table

It is well known that, if a layer of soil rests above a water table, moisture ascends upwards in the soil; the height up to which the moisture ascends as well as the rate of ascent depend upon the physical properties of the soil. The fact that the actual rise of moisture is much smaller than what one should expect according to the classical "capillary theory" has been pointed out by several writers.[1]

If the top of the soil column is freely exposed to the atmosphere, evaporation of moisture takes place, the evaporation depending partly upon the saturation deficit and velocity of the air layers immediately above the soil and partly upon the rate of arrival of moisture at the soil surface from the lower layers.

To conduct preliminary experiments on some of the above phenomena with typical Indian soils, a soil evaporimeter with bottom feed was constructed locally. This consists of a metallic cylinder 5″ in diameter containing soil and is kept with its perforated bottom in contact with water in a close fitting reservoir. Fig. 1

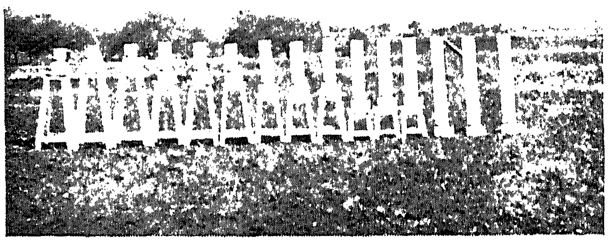

FIG. 1

shows a series of these evaporimeters in triplicate with soil columns 6″, 1 ft., 1½ ft., 2 ft. and 3 ft. respectively in depth. The three instruments corresponding to each of the depths mentioned above, were filled with Poona soil (black-cotton), normal Punjab soil (alluvial) and "bari" (alkali) soil from the Punjab respectively. The packing of soil into the vertical cylinders was done uniformly. The evaporimeters were weighed daily at 8 a.m., replenished with water upto a reference mark on a side tube of glass, and then weighed again. The difference between the weight after adding water of one day and the weight before adding water of the next day gives the actual loss of water by evaporation from the upper surface of the soil column. To ensure uniformity of exposure the series of soil evaporimeters was set up on suitable wooden platforms so that the tops of all the instruments were at the same level above ground.

The time taken by water to rise upto the top of the different soil columns in the different soils (this is indicated by the appearance of wetness at the surface and also verified from the daily evaporation losses) is given in Table I below.

Punjab soils the wetting of the soil at the surface does occur even when the subsoil water level is 3 ft. In "Bari" soil from the Punjab, however, water is unable to ascend beyond 6 inches even after the lapse of several months.

The actual loss of moisture may now be considered. The experiments with five different depths of each of the three soil types were started on the 5th December 1938. The data for the month of December need not be considered as it takes some time for a steady state to be attained. The mean daily evaporation in inches, during January, February and March 1939, as well as the mean daily evaporation in inches from a Piche evaporimeter kept at 4 ft. above ground are given in Table II.

TABLE I

Type of soil	Height of soil column				
	6 in.	1 ft.	$1\frac{1}{2}$ ft.	2 ft.	3 ft.
Poona soil	1 day	2 days	6 days	15 days	Not wet even after 3 months
Punjab soil (normal) ..	$1\frac{1}{2}$ days	3 ,,	5 ,,	10 ,,	21 days
" Bari " (alkali) soil from the Punjab	3 ,,	Not wet even after three months			

TABLE II

Month	Type of soil	Mean daily evaporation in inches from the top of soil columns with depths of					Piche evaporimeter 4 ft. above ground
		6 in.	1 ft.	$1\frac{1}{2}$ ft.	2 ft.	3 ft.	
January 1939	Poona soil	·30	·27	·18	·12	·01	·45
	" Bari " soil from Punjab ..	·05	·02	·02	·01	·01	
	Punjab soil (normal)	·29	·23	·21	·18	·09	
February 1939	Poona soil	·38	·34	·22	·15	·02	·56
	" Bari " soil from Punjab ..	·06	·02	·02	·02	·01	
	Punjab soil (normal)	·37	·26	·22	·18	·09	
March 1939	Poona soil	·48	·41	·23	·16	·02	·71
	" Bari " soil from Punjab ..	·05	·03	·03	·02	·01	
	Punjab soil (normal)	·43	·30	·21	·17	·08	

It is thus seen that in the case of Poona soil actual wetting at the soil surface does not take place even after the lapse of three months when the subsoil water level is more than 2 ft. below the surface. In the case of the normal

From Table II the following general conclusions may be drawn:—

(1)) The amount of water lost by evaporation decreases as the water table recedes below the surface; when the water table is 3 ft. below the surface the loss of water is considerably smaller than when the water table is only 6" below the surface.

(2) Comparing the three soil types amongst themselves it is seen that the loss of water from "Bari" soil (alkali soil containing a large percentage of salts) is strikingly smaller than that from either the normal Punjab soil or the Poona soil for all the depths of the water table considered in these experiments.

(3) Comparing the alluvial soil from the Punjab and the black cotton soil of Poona it seems that the amount of water lost from both of these soils is of the same order of magnitude, with this difference, however, that when the depth of the water table is greater than 1½ ft., evaporation from the alluvial soil of Punjab (which is more porous) is somewhat more than from the black cotton soil of Poona (which has a larger clay-fraction and is less porous).

The experimental results will be discussed at greater length in a later publication.

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[1] Keen, B. A., "The Physical Properties of the Soil," *The Rothamsted Monographs on Agricultural Science*, Chapter III, 1931.

Studies on the British *Aleurodidae*

THE British species of *Aleurodidae* have not received the due share at the hands of the entomologists in the past. Their comparative morphology and bionomics were not thoroughly studied and unfortunately their systematics were also left in the same unsatisfactory state. Even until recently the position of some of the British species was as undefined as before, since their descriptions could not afford positive diagnostic characters.

The original specific differentiations of the species under reference were based primarily on their food plants and such variable characters as the colour and shape of the body, the number of hairs on pupæ, or the relative proportion of the antennal segments. The subsequent workers, in most cases, reconciled with the original views without even doubting the possibility of variations in such characters or realising the significance of biological necessity for the extension of alternative food plants and their consequent influence on any of these characters.

The present investigations, therefore, were taken up at the Rothamsted Experimental Station, with the object of studying the available species, with regard to their systematics, food plants and habits, etc.

Since the differentiating features of the nature stated above were found to be of least specific value for classification purposes, attempts were made to establish more reliable differences on the basis of certain constant characters. As the vasiform orifice is quite specific to this family and is a constant organ in all the stages after the egg, and the gentilia has also yielded results of considerable interest in the taxonomy of other insects and is often used in determining species and genera, therefore, a thorough comparative study was made of both these characters along with others, and specific differences of significance were noted.

Of the nineteen species recorded in Britain, fifteen were studied during these investigations. Besides, two new species, namely, *Aleuroplatus kewensis* and *Trialeurodes williamsi* were described[1] from ferns in hot houses at Kew Gardens.

Four pairs of the species previously considered as different, namely, (1) *A. carpini* and *A. rubicola*, (2) *A. loniceræ* and *A. rubi*, (3) *A. proletella* and *A. brassicæ*, (4) *A. quercus* and *A. avellanæ*, have now been shown morphologically identical in all their stages, which are also described. Their identity has also been established by cross inoculations, as well as, by life-history studies. Moreover, a new genus *Asterobemisia* is proposed for the species in Set (1) and that under (4) is shifted to genus *Pealius* according to the characters of the pupa, and a new description is given for the adult of *P. quercus*,[2] because the previous one did not agree with this species.

Further, some significant differences are also shown for *S. phillyreæ* and *S. immaculata*, and certain differential characters have been pointed out for *T. sonchi* and *T. vaporariorum*. The immature and adult stages of *S. phillyreæ* are also described and some stages of *T. ericæ* and *D. chittendeni* are described for the first time.

Seasonal colour variations were also studied in the pupæ and adults of *A. loniceræ*, both in nature as well as in the laboratory, and at the same time some new alternative food plants were recorded in several species. It is therefore suggested that, such variable characters may not be regarded as conclusive when following any work of systematic nature in *Aleurodidæ*.

Parasites and parasitism were also studied in some species of British white-flies. Transfers of parasites from one species to the other, proved successful when those from *S. phillyreæ* and *T. vaporariorum* were bred on *A. proletella*.

Relative oviposition and the rate of development under coloured screens was studied in *A. proletella* and *T. vaporariorum* under laboratory conditions.

The results of all the above investigations are being compiled and will be published very shortly.

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[1] Trehan, K. N., *Proc. R. Ent. Soc. Lond.*, (B), 1938, **7**, 182.

[2] The genus proposed by the present author.