can be synthesized by refluxing sulphenyl bromide with zinc dust in dry benzene for six hours.

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A NOTE ON THE INTRAFORMATIONAL RECUMBENT FOLDS IN THE JODHPUR SANDSTONE OF LADNUN, DISTRICT NAGAUR, RAJASTHAN

THIS note records a folded cross bedding (Fig. 1), for the first time, in finely laminated alternatively brick-red and light coloured medium grained quartzose sandstone of Sonia Formation, Jodhpur Group, Marwar Super Group (Shrivastava[7], Paliwal[4], and Pareek and Sinha[5]), which is available for examination in a quarry section near Ladnun (27° 38′ : 74° 23′), district Nagaur, Rajasthan. The structural sedimentary feature is confined to a less than 1 m. thick zone occurring between finely laminated layers, that have a total thickness of 5 to 10 m. increasing SSW wards in the basin. The foreset laminations appear overturned in the upper part, and the shape attained is of a recumbent fold in between upper and lower finely laminated horizontally disposed beds. Fine unfolded horizontal laminations cross-cutting the folded foreset laminations appear in the central part of the zone.

This structure is inferred to have been formed under rapid sedimentation and very strong currents, since these are believed to exert a drag effect on the top of the earlier deposited foreset laminations, when they flow across them, in next stage (cf. Kumar and Tandon[2], and Mc Kee *et al.*[3]). The underlying forcset laminations are thus overturned and attain the shape of intraformational recumbent fold. That such structures originate due to unidirectional pressure and overburden of the succeeding strata (*cf.* Vaidyanandhan[9]), or due to a shear couple provided by two currents flowing in opposite directions facing towards each other (Subramanyan[8]), is refuted by the absence of composition variation in the two zones, and constancy of the palaeocurrent direction (Awasthi *et al.*[1]). Existence of such beds is confirmative of their being deposited under fluviatile conditions (*cf.* Reineck *et al.*[6],

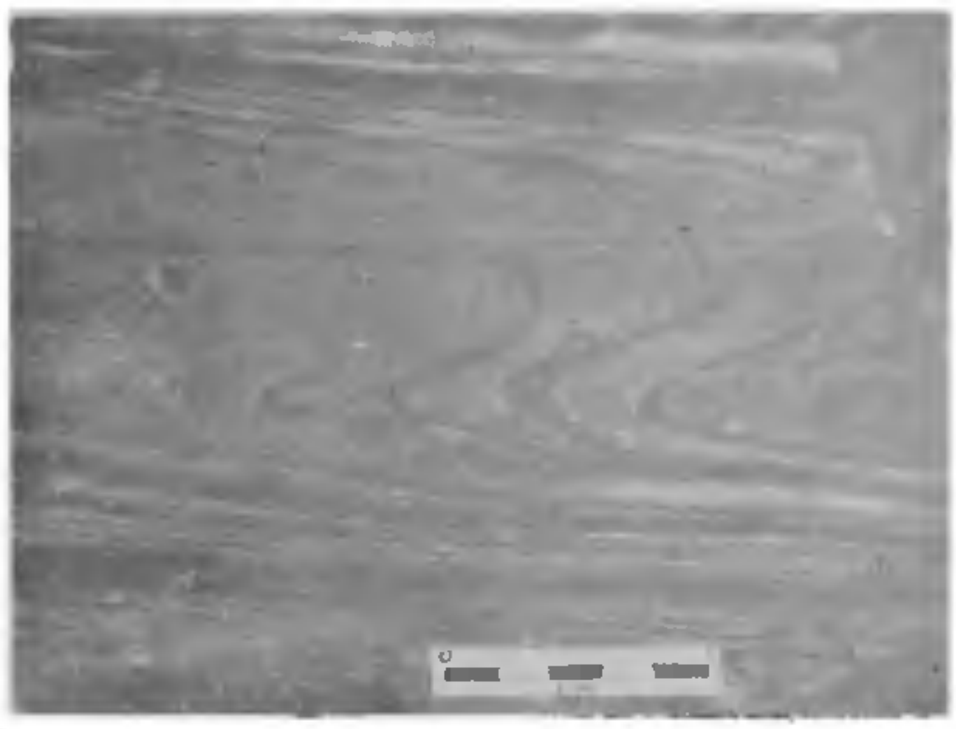

FIG. 1. Intraformational recumbent folds—an unusual type of cross-bedding in the Jodhpur sandstone of Ladnun.

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UTILIZATION OF LIPIDS BY *SPODOPTERA LITURA* (FABRICIUS) ON NINE FOOD PLANTS

IN recent years emphasis is being given to the quantitative aspect of insect nutrition. Standard gravimetric technique have been used in the majority of studies on the dry matter utilization of food by phytophagous insects (Waldbauer[5], Bhattacharya and Pant[1]),

It is now realised that utilisation of different dietary constituents of natural food is a prerequisite for a better understanding of host plant relationships.

In this study an effort was made to study the utilization of lipids from nine food plants by the larvae of *Spodoptera litura* (Fabricius) (Table I). Experiment was conducted in a BOD incubator maintained at $27{\cdot}5 \pm 1°C$, $90 \pm 5\%$ r.h. and 12 hr light : 12 hr dark photoperiod. Thirty larvae (0 to 24 hr old) were reared individually in plastic vials ($8 \times 3{\cdot}5$ cm) on each food plant. Gravimetric technique was used in estimating the amount of food eaten, faeces excreted and weight gain of insect (Waldbauer)[5]. Finally lipids were extracted from aliquot, left over food, faeces and pupae using soxhlet apparatus and petroleum ether as solvent to estimate the lipids utilization by this insect. Various indices like the coefficient of apparent digestibility of lipids (C.A.D.), the efficiency with which the digestible portion of lipids were converted to body biomass (E.C.D.) and the efficiency of conversion of ingested lipids to body biomass (E.C.I.) as proposed by Waldbauer[5] were computed.

Table I indicates that comparatively higher amounts of lipids were consumed by the larvae when reared on *Glycine max* (L) Merill var. PK–71–21 and UPSM–19, *Solanum melongena* L. and *Helianthus annuus* L. while only 6·62 and 4·63 mg lipids were consumed by the larvae on *G. max* var. Bragg and *Cajanus cajan* L.

However, the lipid content of pupae obtained on *G. max* var. PK–71–21 and UPSM–19 was significantly lower as compared with *S. melongena* and *H. annuus*. This indicates that there is no relationship between the quantity of lipids consumed and the amount of lipids retained in the body. This is probably due to the synthesis of lipids in insect body which occur *via* secondary pathways. The C.A.D. (lipids) varied among the three varieties of *G. max*. On var. UPSM–19 C.A.D. was 66% while varieties PK–71–21 and Bragg indicated comparatively lower digestibility. In other food plants, digestibility ranged from 29·8 to 41·9%. It is also clear that lipids obtained from *R. communis* were converted with greatest efficiency into body biomass. However, E.C.I. and E.C.D. showed almost similar trend on *C. cajan*, *H. annuus*, *S. melongena*, *L. acutangula* and *Corchorous capsularis* L. It is interesting to note that the efficiency of conversion of ingested and digested lipids to body substance on all the three varieties of *G. max* were significantly lower as compared to the rest of the food plants.

It may be noted that E.C.I. and E.C.D. values on all plants except *G. max* var. PK–71–21 indicated more than 100% efficiency of conversion. Such high values are mainly due to the accumulation of higher amount of lipids in pupae. This indirectly suggests that internal biosynthesis of lipids from carbohydrates or amino acids resulted into accumulation of higher quantity of lipids in pupae. It is known that lipids could be synthesized by insects (Kilby[4]). Wigglesworth[6] also proved with starvation and refeeding experiments that lipids are synthesized inside the body. Use of labelled material by Clements[2] also suggests synthesis of fatty acid molecule in *Schistocerca*. It is, therefore, clear that higher E.C.I. and E.C.D. values obtained in this experiment are mainly due to the estimation of additional amount of lipids synthesized in the body through secondary pathways. Somewhat similar higher E.C.I. for lipids

TABLE I

Consumption and utilization of lipids by the larvae of S. litura *on nine food plants*

Food plants	Lipid content in leaves (%)	Amount of dry matter consumed (mg)	Lipids consumed (mg)	Lipids excreted in faeces (mg)	Lipids in pupa (mg)	C.A.D.	E.C.I.	E.C.D.
R. communis	2·00	451·51	9·05	5·88	27·76	33·6	308·5	988·5
S. melongena	1·74	661·88	11·53	6·75	25·58	41·9	223·0	551·0
L. acutangula	1·60	607·48	9·75	7·24	15·08	26·1	181·1	611·3
G. max var. PK–71–21	2·87	419·86	12·06	7·87	11·34	34·9	94·1	273·7
G. max var. UPSM-19	2·22	502·40	11·13	3·81	12·08	66·0	109·1	170·0
G. max var. Bragg	1·52	436·31	6·62	3·70	7·24	44·3	109·9	248·8
C. cajan	1·47	315·11	4·63	3·05	11·20	34·1	242·0	720·1
H. annuus	1·96	568·53	11·13	7·65	24·96	31·6	225·8	737·4
C. capsularis	1·63	608·70	9·90	6·98	14·69	29·8	148·9	516·4
C.D. at 5%			1·48	1·04	3·14	4·8	22·0	135·0

was also reported by Hiratsuka[3] in *Bombyx mori*. It is, therefore, essential to note that computation of E.C.I. and E.C.D. values for various nutrients by using equation of Waldbauer[5] is possible only for the essential nutrients of the test insect. However, C.A.D. values for different nutrients can be calculated directly from Waldbauer's[5] equation because it involves estimation of nutrients consumed and amount of nutrients in the faeces during the experimental period.

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PARTHENOCARPY IN *TRICHOSANTHES DIOICA* ROXB. AND *MOMORDICA DIOICA* ROXB.

THE female plants of *Trichosanthes dioica* and *Momordica dioica* are cultivated by vegetative propagation in betel vine yards in the outskirts of Rewa. The other cucurbits that are cultivated are: *Coccinia indica*, *Lagenaria leucantha* and *Momordica charantia*. A servey of fifty betel yards revealed the total absence of male plants of *T. dioica* and *M. dioica*. In absence of the male plants, the female plants, as a result of external stimulus, produce parthenocarpic fruits. Recently, Lal[3] has reported the parthenocarpic fruit development in *Coccinia indica* by the stimulus of intergeneric pollinations and some previous workers[1-2] reported such a type of fruit formation in other cucurbitaceous plants by the application of growth promoting hormones. Since the phenomenon of parthenocarpy in *T. dioica* and *M. dioica* has been overlooked so far, the present investigation has been made.

The floral buds and flowers of both *T. dioica and M. dioica* were treated in four ways as follows: flowers left open for natural pollination, flowers pollinated with pollen grains of *Lagenaria leucantha*, flowers pollinated with pollen grains of *Momordica charantia* and flowers pollinated with a mixture of pollen grains of *L. leucantha* and *M. charantia*.

TABLE I

Parthenocarpic fruit setting (%) *in* T. dioica *and* M. dioica

Pollination conditions	Parthenocarpic fruit setting (%)	
	T. dioica	*M. dioica*
Natural pollination	58	36
Pollination with *L. leucantha*	67	40
Pollination with *M. charantia*	71	45
Pollination with *L. leucantha* and *M. charantia*	85	66

The percentage of parthenocarpic fruit setting is presented in Table I, which indicates that a higher percentage of parthenocarpic fruit setting is achieved as a result of pollinating the flowers with the extraneous pollens as compared with the naturally pollinated flowers in both the species. The percentage of fruit setting in both the species is further stimulated more when a mixture of pollen grains of *L. leucantha* and *M. charantia* is applied as against the pure pollen application. A lower fruit setting in natural pollination may be attributed to non-synchronization of anthesis and duration of corolla opening in these plants.

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INFLUENCE OF *RHODOTORULA* AND *AEROBACTER* ON PROTONEMAL GROWTH AND BUD INITIATION IN TWO MOSSES

SOME aspects of mixed cultures of *Barbula gregaria* (Mitt.) Jaeg. and *Timmiella anomala* Limpr. with a yeast (*Rhodotorula rubra*) and a bacterium (*Aerobacter* sp.) have been studied,