dark; conidia produced within 48 hours and mature perithecia within a week; growth intermediate. Aerial hyphae pale brown to hyaline, branched, thin walled, septate and nearly all ends terminating into endoconidiophores, 2–6 μ in width. Submerged hyphae similar except darker and much interwoven. Endoconidiophores pale brown, hyaline at the tip, 25–125 × 4–6 μ, endoconidia of two types one hyaline, cylindrical, truncate at the ends, 11–16 × 4–5 μ and the other pale brown to olive brown, barrel-shaped to sub-globose, smooth to rough walled, 9–16 × 6–13 μ.

Perithecia superficial to immersed, the bases brown to black, globose, sometimes flattened, 130–200 μ in diameter, unornamented or with undifferentiated hyphae attached, neck black, hyaline at the tip, slender upto 850 μ long and 20–35 μ in diameter at the base and 10–20 μ at the tip, ostiolar hyphae hyaline, slender, tapered to a blunt tip, 8–15 in number, 50–90 × 2–3 μ. Asci not seen; ascospores with gelatinous sheath often forming a brim, hat-shaped structure, 4·5–8 × 2·5–5·5 μ.

The fungus has been identified as *Ceratocystis fimbriata* Ells. & Halst. (Hunt, 1956) and confirmed by the Commonwealth Mycological Institute, Kew (IMI 166925).

When spore suspension of *C. fimbriata* was sprayed on surface sterilized, healthy oranges under aseptic conditions, no symptoms appeared. It seemed that the pathogen enters through wounds or injuries caused during harvesting, transportation, storage or by insects, hence, the injection technique was adopted to test the pathogenicity. 0·5 ml of spore suspension was injected in each of the six healthy fruits with hypodermic syringe and incubated at 25° C separately in polythene bags. Equal number of fruits injected with sterilized distilled water were kept as control. After 7–8 days of inoculation, fruits lost their hardness and became pulpy. Soft rot condition developed after 11 days with a rancid odour and complete change in colour while in the control fruits remained healthy. The pathogen was reisolated and was identical with the original isolate.

This is the first report of soft rot of sweet orange incited by *Ceratocystis fimbriata* Ells. & Halst.

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ENERGY CONSERVING EFFICIENCY OF NATURAL AND MODIFIED GRASSLANDS AT GORAKHPUR

The efficiency with which solar energy is converted into chemical energy of plant protoplasm, in natural and modified ecosystems is of great importance, since it has a significant bearing in the net primary production, by autotrophs.

Some valuable data are available on the energetics of arctic and temperate countries. But, relatively few are available on the tropical countries. In India, the energy conserving efficiency of the grasslands has been evaluated by Singh and Misra[1], Gupta[2], and Mall *et al.*[3].

The present study deals with the monthly changes in energy conserving efficiency of natural (control) and modified "clipped" stands of *Desmostachya bipinnata* in a typical grassland of Gorakhpur area during the grand growing season (July–October).

The study was carried out during 1973 in two plots of 20 × 20 m size, within the campus of Gorakhpur University. Whereas, one plot control (CP) was kept as such, the other (ClP) was modified by "clipping" the above-ground vegetation at mid-height in June, 1973. The net dry matter production was evaluated by "Short term Harvest Method" of Odum[4]. The calorific values were estimated by Oxygen Bomb Calorimeter, and have been expressed in Cal/g dry weight (Table I). The energy captured by *D. bipinnata* was calculated by multiplying the net production with its calorific values. Since data on the interception and albedo were not available for the sites, the efficiency of energy capture was evaluated by expressing the energy captured, as percentages of half the solar radiation received during the period (Table II), which is roughly equivalent to the solar radiation available to plants for photosynthesis (Terrien et al.[5]). The data of solar radiation was obtained from the Department of Meteorology, Government of India, Poona. The total solar radiation for the whole year was 1704160 K Cal/m^2 and for the grand growth period (July to October) 571300 K Cal/m^2.

The data in Table I show that calorific values for above ground parts of *D. bipinnata* range from 3·982 to 4·135 in CP and 4·012 to 4·231 K Cal/g in ClP and for the underground parts from 3·866 to 4·024 in CP and 3·797 to 3·982 K Cal/g in ClP, thus showing higher calorific values in ClP than CP for aboveground parts and in CP than ClP for underground parts. This finding is in conformity with the observation of Wedin[6] and Gupta[2] for the aboveground parts. Further, the energy content for the aboveground parts was

TABLE I

Rate of dry matter production (g/m²/month) and energy content (Cal/g) of the aboveground (AG) and underground (UG) parts of Desmostachya bipinnata *in the control (CP) and clipped (ClP) plots during the grand growth period*

Months	Rate of production				Energy content			
	Control		Clipped		Control		Clipped	
	AG	UG	AG	UG	AG	UG	AG	UG
July ..	+100	+164	+186	—	4135	4024	4231	3982
August ..	+162	+215	+265	+184	4049	3989	4159	3941
September ..	+197	+253	+317	±225	4002	3913	4086	3853
October ..	+189	+152	+205	+213	3982	3866	4012	3797

\+ Production of dry matter; — Loss of dry matter.

TABLE II

Rate of energy capture (K Cal/g) and % Energy conserving efficiency of the AG and UG parts of Desmostachya bipinnata *in the CP and ClP during the grand growth period*

Months	Solar radiation K Cal/m²	Energy captured				% Energy conserving efficiency			
		Control		Clipped		Control		Clipped	
		AG	UG	AG	UG	AG	UG	AG	UG
July ..	149110	413·5	659·9	788·4	—	0·55	0·88	1·06	—
August ..	142290	655·9	857·6	1102·1	525·1	0·92	1·25	1·54	0·73
September ..	140100	788·4	989·9	1295·2	866·9	1·12	1·41	1·84	1·23
October ..	139800	752·6	808·8	822·4	587·6	1·08	1·16	1·25	0·84

higher than that of the underground ones in both the stands. This is in concurrence with the findings of Golley[7,8] for temperate grasslands and Gupta[2] for tropical grasslands.

The data in Table II indicate a contrasting behaviour of the aboveground and underground efficiencies of the two experimental plots. While the clipping enhances the calorific values, net production and efficiency of the aboveground parts ($t^* = 4·243$) it retards them for the underground parts ($t^* = 3·277$). This is probably due to the increase in the aboveground dry matter production, at the expense of the underground parts[1]. Statistical analysis also revealed a positive correlation ($r = +0·895$) between the efficiency and the dry matter production.

The maximum efficiencies by the aboveground and the underground parts were recorded in September (Table II). For the grand growing period the efficiencies were 2·037% in CP and 2·125% in the ClP and for the whole year were 0·68% and 0·70% for the same plots respectively. The values were similar to those obtained by Gupta[2] for the *Dichanthium* community (CP = 0·65%, ClP = 0·98%) at Gyanpur and Asthana (unpublished data) for *Cynodon* community (CP=0·71%, ClP = 0·84%) at Gorakhpur. Comparatively much lower values (0·33%, 0·35%) were recorded by Singh and Misra[1] for the undisturbed and biotically disturbed grasslands at Varanasi and 0·38% and 0·33% for the natural *Dichanthium* and *Sehima* communities at Ujjain and Ratlam respectively by Mall *et al.*[3].

The study thus shows that the Desmostachya stands in the grasslands of Gorakhpur are highly productive and the productivity can be enhanced by clipping.

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* Significant at 5% level.

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A NEW BASE NUMBER FOR THE GENUS *CHEIRANTHUS* L.

SPECIES of the genus *Cheiranthus* (family Cruciferae) are popular garden ornamentals. Except for a doubtful count of 40–42 chromosomes in *Cheiranthus allionii* L., the remaining seven species possess numbers multiple of 7 (Fedorov[2]). The genus, obviously, is monobasic.

Cheiranthus cheiri L. has in the past been worked out by Jaretzky[3] (1928), Manton[4] (1932) and Sakai[5] (1935) who report it as a diploid with $2n = 14$. While making a chromosome survey of the cultivated plants, two cultivated populations of *Cheiranthus cheiri* L. were found to have $2n = 12$. With regard to their behaviour, the plants were quite stable. At prophase the chromosomes pair perfectly and form six bivalents. At metaphase two bivalents are slightly larger in size than the other four (Fig. 1). Most of the bivalents have

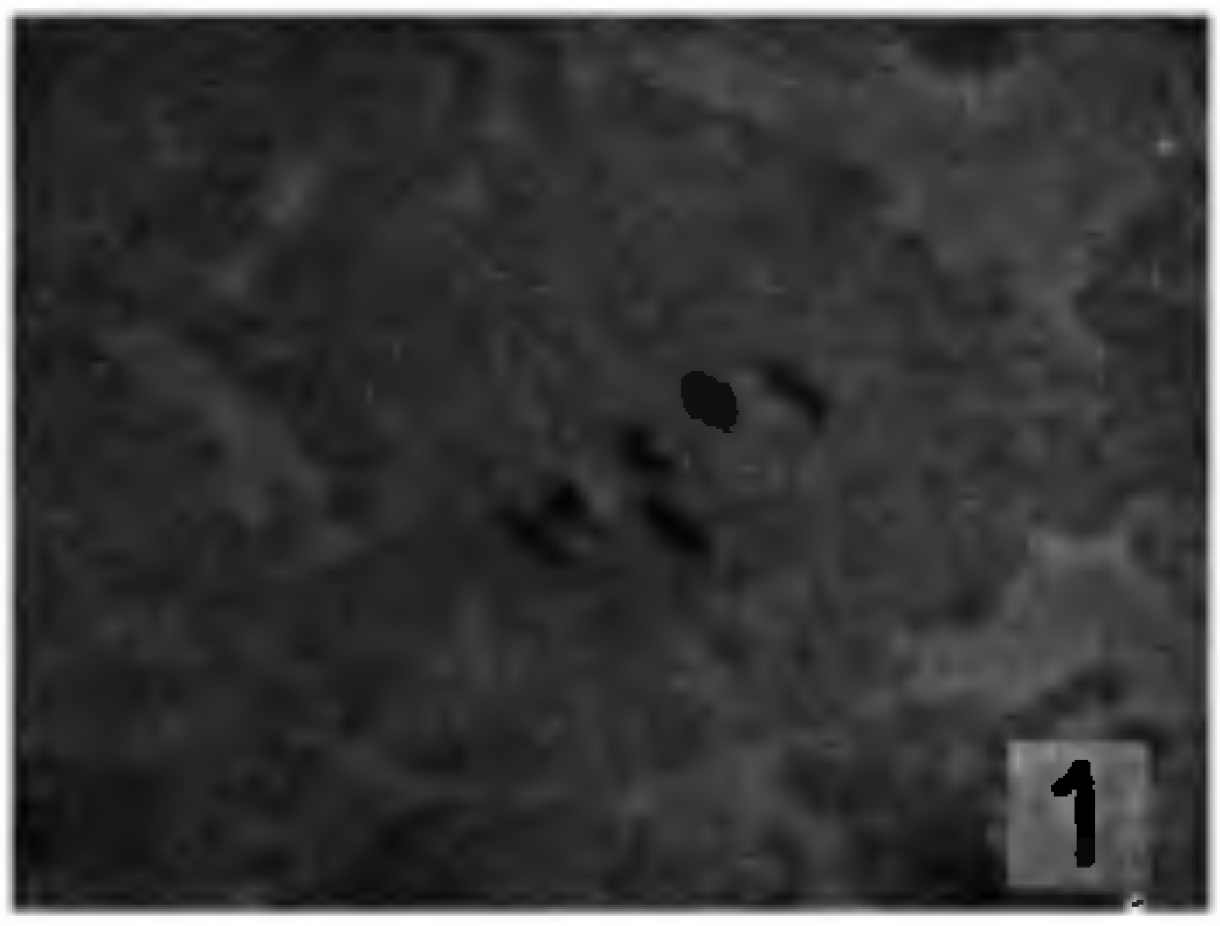

FIG. 1. A pollen mother cell at Metaphase 1 bearing 6 II × 6000.

a single chiasma. The distribution of chromosomes at anaphase-I is quite regular. On account of normal meiosis, the plants produce viable pollen and set abundant seed indicating that the plants are amphimicts. This, therefore, creates the possibility of a second base number $x = 6$ not only for this species but for the genus as a whole.

The tribe Hesperideae to which *Cheiranthus* belongs is polybasic with $x = 7$, 8, 10, 12 and 13 (Fedorov[2], Darlington and Wylie[1]). The present count for *Cheiranthus cheiri* is interesting because 6 is the smallest number so far known in the tribe.

In view of the existence of diverse base numbers, aneuploidy seems to have played a major role in evolution within this tribe. Hybridization of the two cytotypes of *Cheiranthus cheiri* should form a very interesting line of investigation as it is likely to reveal the relationship between the two chromosome races.

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RHIZOPUS STOLONIFER, CAUSING SOFT ROT OF SQUASH (*CUCURBITA PEPO* L.)

Soft rot disease caused by *Rhizopus stolonifer* (Fr.) Lind. is severe under storage and transit conditions but it is not true always. Reports are available to support the view of its being a disease causing agent under natural conditions (Singh *et al.*)[4].

During the course of investigations of diseases of cucurbits in the month of July and August, 1973, a severe rotting of squash fruits (var. *Patty Pan*) was observed at Experimental Farm, Hessaraghatta, Bangalore. The infection may commence from any point of the fruit. The fungus was found to attack on young to mature fruits and flowers. The disease is characterised by water-soaked areas on the surface of the fruit which in turn covers the entire surface and makes the fruit soft. The affected tissues disintegrate and make the flesh soft and pulpy. After about 3–4 days whisker like sporangiophores develops which bears sporangia on their tips. The mycelial growth is fluffy and continue to grow until entire surface of the fruit is covered. The infected fruits turn completely black and become soft and watery (Fig. 1). The humid weather favours the severity of the disease. Approximately 20–25% of the flowers and fruits were found to be infected under natural conditions.