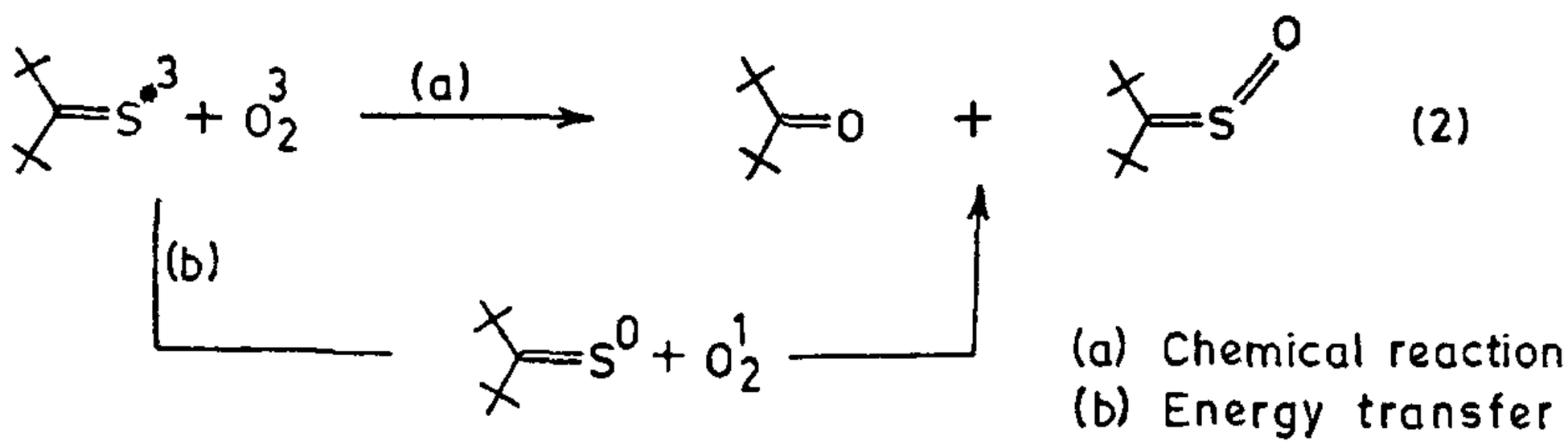

reactive state in the case of 1 is suggested to be the first excited triplet state of 1[4]. In the above oxidation of 1, either singlet or triplet oxygen may be involved as illustrated in eq. 2. The mechanism of the above anamolous oxidation of 1 is being actively pursued in our laboratory[5].

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1. Rajee, R. and Ramamurthy, V., *Tetrahedron Lett.*, 1978, p. 5127.
2. Ohno, A., Nakamura, K., Nakazima, Y. and Oka, S., *Bull. Chem. Soc. Japan*, 1975, 48, 2403; Barton, D. H. R., Guziec, F. S. and Shahak, J., *J. Chem. Soc., Perkin I*, 1974, (1974).
3. Carlsen, L., *J. Org. Chem.*, 1976, 41, 2971.
4. 1 is found to be stable in presence of oxygen in the absence of light.
5. Since the submission of our manuscript a publication on the same subject has appeared. Tamagaki, S., Akatsuka, R., Nakamura, M, and Kozuka, S., *Tetrahedron Lett.*, 1979, p. 3665. Results of these two studies are broadly similar. But, we wish to emphasise that the ratio of sulfine to ketone is solvent dependent. We have demonstrated the generation of singlet oxygen in this system by the isolation of oxidative products of dimethylsulphide, 1,3-diphenyl-isobenzofuran and cyclohexadiene upon excitation of 1 in their presence. Sulfine formation is quenched by singlet oxygen quenchers, such as Dabco, dimethylsulphide, cyclohexadiene and 1,3-diphenylisobenzofuran. Based on these it is suggested that sulphine formation proceeds through path *b*. Since di-*t*-butylketone is also produced by the dye sensitised oxidation but not quenched by singlet oxygen quenchers during self-sensitised oxidation it is suggested that 2 is produced by path *a* and *b*. The origin of solvent dependence is traced to the competition between path *a* and *b*. As most of the thioketone we are investigating gives only the corresponding ketones, we believe that di-*t*-butylthioketone is an exception to our original general mechanism (Ref. 1). Full details on the oxidation of hindered and unhindered thioketone will be published at a later date. Our thanks are due to the referee for bringing our attention to the above paper.

INCIDENCE AND CHEMICAL CONTROL OF MITES ON MANDARIN IN HIMACHAL PRADESH

DURING the survey of the commercial citrus orchards of Himachal Pradesh, the authors observed that 64% of the Nagpur mandarin fruits were badly deformed and remained stunted in growth. On examination, the fruits showed russetting on their rind and mites were found on these areas of the fruits. The mite population ranged from 5 to 23 per fruit in December–January (Table I).

Perusal of the data reveals that the Nagpur variety was the most susceptible with 64 and 72% of fruit *infestation with mite and rind disorder respectively.* It was followed by Srinagar, Sylhet, Emperor, Butwal and Kinnow. Verma and Bhalla[4] got these mites identified as *Brevipalpus phoenicis* and *Tyrophagus putrescentiae* belonging to families Tenuipalpidae and Tyroghyphidae respectively. *B. phoenicis* was the dominant among these two species. The affected fruits showed two types of symptoms on their skin. In the majority of the cases, these fruits had a circular russetting band and vertical streaks around the fruit.

In view of this, a control trial on Nagpur mandarin with *recommended doses of Kelthane and Omite* was conducted. The miticides were sprayed regularly at an interval of ten days throughout the season while water was sprayed on control plants starting from preblcom stage. To check the migration of mites from soil to the plants a strip of thiodemeton granules was made, in the soil, in the basins 25 cm from the trunk

TABLE I

Incidence of mite and rind disorder on different varieties of mandarin during December–January

Variety	Percentage of fruits infested with		Range of adult/ nymph mites per infested fruit
	Mite	Rind disorder	
	**	*	**	*	
Nagpur	53	(64)	58	(72)	5–23
Srinagar	25	(18)	29	(23)	2–6
Sylhet	24	(16)	26	(19)	1–4
Emperor	23	(15)	24	(17)	1–3
Butwal	22	(14)	21	(13)	1–4
Kinnow	12	(4)	15	(7)	0–1
C.D. at 5% level	1·58		0·73		..

* Figures in parentheses show percentage.
** Angular transformed data.

of treated plants during February. A circular sticky band (grease and aldrin) was made on the stem of treated plants at 30 cm above the ground level to be doubly sure for checking the migration of mites on the plant.

These studies revealed that on the untreated plants 62% of the fruits were found infested with mite during January. The mites did not appear on the treated fruits throughout the season whereas 67 and 63% of Kelthane and Omite treated fruits developed rind disorder, respectively, as compared to 60% in control. In other words, irrespective of the presence or absence of mite the rind disorder was observed. Hence it was felt that the mite might not be the cause for rind disorder.

According to Knorr[2], in Florida, the species associated with citrus leprosis is closely related *Brevipalpus californicus* Banks. The present disorder of mandarin seems to be entirely different from leprosis as far as symptomology of both is concerned. Control of both *Brevipalpus* mites and leprosis was obtained with an annual post-bloom application of either wettable sulphur or chlorobenzilate[1,3]. In the present studies the mite population was controlled by frequent spraying of miticides whereas the rind disorder could not be checked.

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1. Jeppsson, L. R., Jessor, M. J. and Complin, J. O., *J. Econ. Entomol.*, 1955, 48, 375.
2. Knorr, L. C., *Phytopathology*, 1950, 40, 15.
3. —— and Thompson, W. L., *Plant Disease Reptr.*, 1954, 38, 143.
4. Verma, T. D. and Bhalla, O. P., *Annual Report*, Department of Entomology–Zoology, College of Agriculture, Solan (HP)—1975.

SEEDLING HANDEDNESS IN *CAJANUS CAJAN* (L.) MILL SP.

SEEDLING characters in flowering plants in general and dicotyledons in particular have not been much studied. Compton[5] is the pioneer in studying the seedling handedness in Gramineae. No comparable work on any dicotyledon species is known, although dicotyledon seedlings have been used for taxonomic[4] and even genetic[6] studies. This paper deals with the studies on seedling handedness in *Cajanus cajan* (L.) Mill sp.

For this study 22 cultivars of *Cajanus cajan*, collected from India, Sri Lanka, Brazil, Peru and West Indies, and obtained through the courtesy of ICRISAT, Hyderabad, were used. Seeds were sown in earthen flats and their germination stages were observed. The seedlings (hypogeal) emerged on the third day of sowing and the two seedling leaves became prominent on the fifth day which closely overlap each other by their lateral margins (Plate I). The seedlings were sorted out based on the two major catogories of overlappings; the left-handed and the right-handed, as shown in Plate I. The seedlings in which the margin of right leaf overlaps the margin of the left are called left-handed and those in which the margin of the left leaf overlaps the margin of the right are called right-handed seedlings. This character lasts hardly for one day after which the leaves get separated and the overlapping is lost.

A total of 5,057 seedlings were scored for left and right-handedness, out of which 2,380 (47·06%) were left-handed and 2,645 (52·3%) were right-handed and the remaining 32 (0·64%) were neutrals. (A neutral seedling is that in which both the margins of one leaf enclose both the margins of the other). The L/R ratio on the total is 0·899. A similar excess of right-handed seedlings was observed by Compton[5] in *Avena*