neutral reaction (pH 6·8-7·0) and medium in available zinc (DTPA extractable zinc—1·1 ppm). First fully opened leaves were collected when the heads were mature for harvesting. For CA assay the leaves were washed with three changes of glass-distilled water. Weighed amounts of the fresh leaves were macerated with 0 005 M solution of cysteine in a pre-cooled mortar and pestle. The resulting slurry was squeezed through four layers of muslin cloth and the filtrate was centrifuged at 8,000 rpm for 20 minutes at 0 to 4° C in a refrigerated centrifuge (K 70). The supernatant was used as crude enzyme source. Activity was determined mannometrically[7]. Protein in enzyme was determined by the method of Lowry *et al.*[5] using Bovine serum albumin as a standard. Total zinc was determined by atomic absorption spectrophotometer in leaves collected similarly which were washed with detergent (Teepol), 0·1 N HCl and distilled water, dried at 60° C, ground and digested using a diacid (Nitric Perchloric) mixture.

Results (Table I) indicated that both soil and foliar application of zinc increased the yield, total dry matter, leaf zinc content and CA activity significantly. Further, there was significant positive correlation between leaf zinc and CA activity ($r = 0·782$), leaf zinc and yield ($r = 0·685$) and CA activity and yield ($r = 0·737$). The correlation between CA activity and yield was better than that between leaf zinc and the yield. While the increase in leaf zinc content due to soil and foliar application of zinc was similar, the increase in CA activity due to foliar application of zinc was 50% more than that due to soil application. It has been suggested that while the leaf zinc content indicates the amount of total zinc present, the enzyme activity may serve as an index of the amount of active zinc present in the leaves[3]. Okhi[6] has observed in soybean that when the substrate zinc level was increased from 10 to 100 $\mu$g/l although leaf zinc content did not show any increase, the CA activity increased four fold and the symptoms of Zn deficiency were reduced to a trace. These results suggest that although based on increase in yield and leaf zinc content, the effects of soil and foliar application of zinc were similar, the data on CA activity indicated that foliar application of zinc may be better than soil application. The study also revealed that CA activity might serve as a better index of zinc nutrition of cabbage than leaf zinc content.

The authors are grateful to Dr. T. R. Subramanian, Senior Soil Scientist, for his valuable suggestions and for going through the manuscript, and to the Director, Indian Institute of Horticultural Research, Bangalore, for providing the necessary facilities.

Indian Institute of Horticultural Research, Bangalore,
*March* 16, 1979.

B. R. V. IYENGAR,
D. K. PAL,
Y. SELVARAJ.

1. Bar-Akiva, A. and Lavan Ruth, *J. Hort. Sci.*, 1969, **44**, 359.
2. Dwivedi, R. S. and Randhawa, N. S., *Plant and Soil*, 1974, **40**, 445.
3. Edwards, C. E. and Mohamed, A. K., *Crop. Sci.*, 1973, **13**, 357.
4. Keilin, D. and Nann, T., *Nature*, 1939, p. 144.
5. Lowry, O. H., Rosebrough, N. J., Fare, A. L. and Randell, R., *J. Biol. Chem.*, 1939, **193**, 265.
6. Okhi, K., *Crop. Sci.*, 1978, **18**, 79.
7. Roy Waywood, E., *Methods in Enzymology*, 1955, **2**, 836.
8. Wood, J. G. and Silbʃ, P. M., *Aust. J. Sci. Res B.*, 1952, **5**, 244.

## SCAB OF *OCIMUM BASILICUM*—A NEW DISEASE CAUSED BY *ELSINOE ARXII* SP. NOV. FROM BANGALORE

WHILE screening $F_2$ segregants and parents of the varietal crosses of French basil (*Ocimum basilicum*) × Kamakasturi—(local variety of *Ocimum basilicum*) against *Cercospora ocimicola* ciferi a new disease causing scab symptoms on leaves and tender twigs was found consistantly associated. First it was thought that both the symptoms were due to one and the same fungus. However these symptoms could be distinguished on the basis that plants infected with *Cercospora* alone or both *Cercospora* and scab pathogen showed complete defoliation, whereas those which were having only scab symptoms showed little defoliation with puckering, cupping of the leaves and distortion of the tender twigs. This paper deals with the symptomatology, diagnosis and identity of causal organism of this new scab disease caused by a species of *Elsinoe*.

*Symptoms Diagnosis and Pathogenicity Tests*

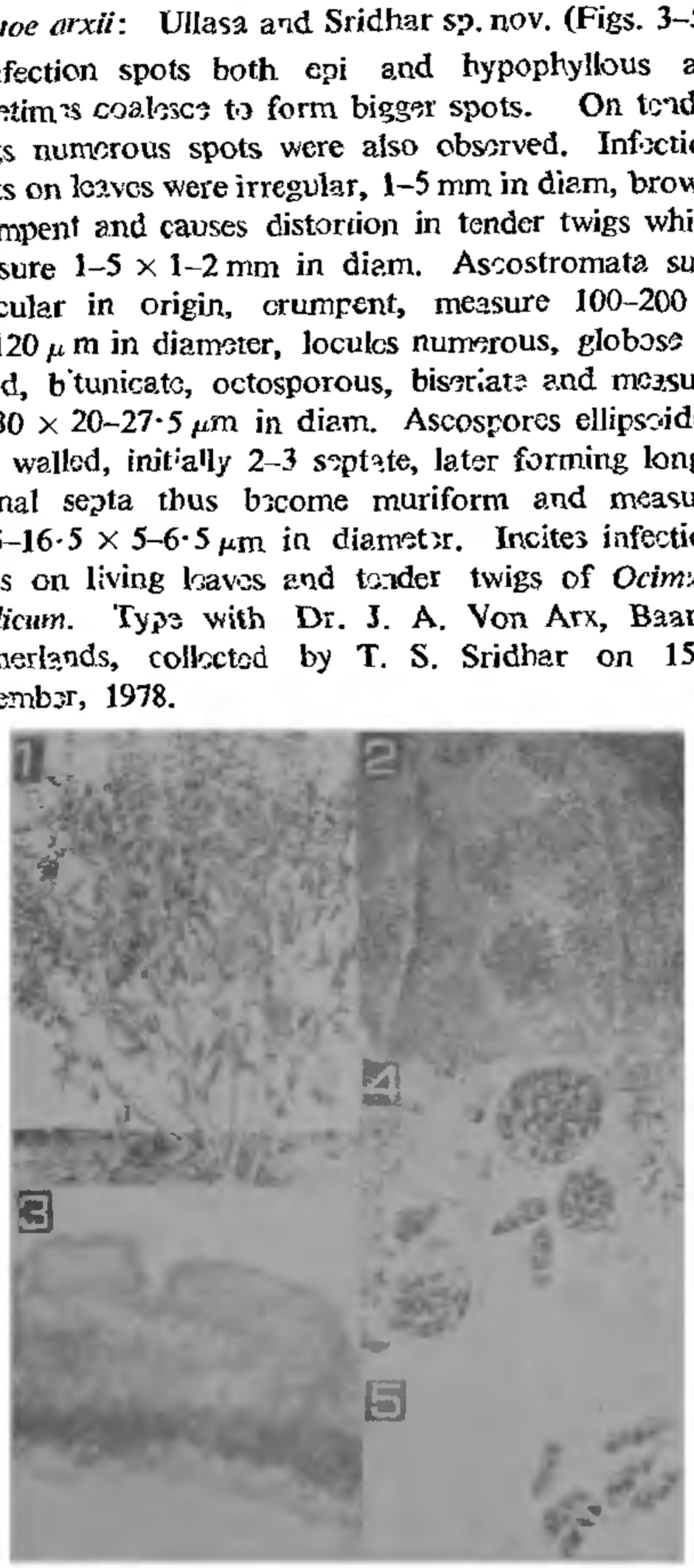
The initial symptoms start as minute innumerable spots scattered or aggregated throughout the leaf surface either on one or both the leaf surface. These minute spots are either circular or irregular varying from 0·5 mm to 5 mm. When these numerous spots coalesce they may cover the entire leaf blade or one or few sector of the leaf blade. These infection spots constitute innumerable pin heads representing stroma of the ascomycete. Slight cupping and puckering of the leaves were also observed in some cases. When tender twigs are attacked they show the symptoms of distortion. Since no member of the family Labiatae was found infected by any species of *Elsinoe*, this fungus is described as new to science after Dr. J. A. Von Arx, a distinguish mycologist for his outstanding contribution to this field of science.

The fungus was isolated in pure culture on potato Dextorse Agar medium. Pathogenicity tests were

conducted under field conditions following standard inoculation techniques. Typical symptoms of infection appeared 6–8 days after inoculation and the optimum temperature and humidity for successful infection ranged from 22–26° C and 80–90% respectively.

*Elsinoe arxii*: Ullasa and Sridhar sp. nov. (Figs. 3–5).

Infection spots both epi and hypophyllous are sometimes coalesce to form bigger spots. On tender twigs numerous spots were also observed. Infection spots on leaves were irregular, 1–5 mm in diam, brown, erumpent and causes distortion in tender twigs which measure 1–5 × 1–2 mm in diam. Ascostromata subcuticular in origin, erumpent, measure 100–200 × 60–120 μm in diameter, loculos numerous, globose to ovoid, bitunicate, octosporous, biseriate and measure 25–30 × 20–27·5 μm in diam. Ascospores ellipsoidal, thin walled, initially 2–3 septate, later forming longitudinal septa thus become muriform and measure 13·5–16·5 × 5–6·5 μm in diameter. Incites infection spots on living leaves and tender twigs of *Ocimum basilicum*. Type with Dr. J. A. Von Arx, Baarn, Netherlands, collected by T. S. Sridhar on 15th December, 1978.




FIGS. 1–5. Fig. 1. *Ocimum basilicum* plant showing scab symptoms due to *Elsinoe arxii*. Fig. 2. Habit of the fungus (Enlarged). Fig. 3. Section through ascostroma × 100 Approx. Figs. 4 and 5. Asci and ascospores × 350 Approx.

*Elsinoe arxii* : Ullasa and Sridhar sp. nov. (Figs. 3–5)

Infectionis maculae epi vel hypophyllae in foliis, dispersae, saepe, coalescentes et ramis numerosae, maculae in foliis irregulares, 1–5 mm diam, brunnae, elevatae, sed in ramis tumide et verrucas 1–5 mm latas, 1–2 mm crassas formantes; ascostromata subcuticularia, erumpentia 100–270 μm lata 40–120 μm crossa; Loculi numerosi globosi vel ovodei, bitunicati, octospori, distichi 25–30 × 20–27·5 μm; ascosporae ellipsoideae, tenuiter tunicatae primum 2–3 septatae, postea septis longitudinalibus praeditae at tune muriformes 13·5–16·5 × 5–6·6 μm. Incitat maculas in foliis et ramis viventibus *Ocimum basilicum* L. Typus ad J. A. Von Arx Netherland. Leg. T. S. Sirdhar, 15th December 1978, Hessaraghatta, Bangalore.

Conidiophore bearing minute conidia representing *Speciloma* stage of *Elsinoe* was found closely associated with this fungus.

The authors are grateful to Dr. H. S. Sohi, Senior Plant Pathologist, for his interest in this study. Our thanks are also due to Dr. J. A. Von Arx, Director, Central Type Cultural Collection, Baarn, Netherlands, for confirming the identity of the fungus.

Indian Institute of Horticultural Research,
255, Upper Palace Orchards,
Bangalore 560 006,
*May* 19, 1979.

T. S. SRIDHAR.
B. A. ULLASA.

---

## SURVIVAL OF *ALTERNARIA TRITICINA*, INCITANT OF LEAF BLIGHT OF WHEAT

THE leaf blight of wheat caused by *Alternaria triticina* Prasada and Prabhu is known from different states in India[1,2,4]. A study of the mode of survival of the pathogen was carried out during the summer months of 1975 and the results are reported here.

The blighted leaves were cut into small pieces and kept in unsterilized soil in earthenware pots on the surface and at depths of 5 cm and 10 cm. Some pots were incubated outdoors and others indoors. Entire infected earheads were stored in paper bags in the laboratory. The infected material was periodically removed, surface sterilized and plated out. The survival of spores in soil was studied by adding a thick suspension of spores to soil surface and covering it with a 2–5 cm layer of soil. The soil with spore suspension was collected periodically by removing the top layer, suspending a sample in sterilized water, centrifuging and plating out. The pathogenicity of thei solated colonies was verified by spraying the spore suspensions on five week old plants of a susceptible wheat variety (Kalyan Sona).

*Alternaria triticina* could survive for only two months in the plant debris placed on the surface of the soil and for four months in the debris buried in soil. It was present after three months in the leaf material while it could be obtained from the infected seeds even after ten months. The spore suspension in soil lost viability