1. Mehta, P. R., Joshi, N. C., Rao, M. H. and Renjhen, P. L., *Sci. Cult.*, 1964, **30**, 259.
2. Marathe, T. S., Summanwar, A. S. and Ram, R. D., *Curr. Sci.*, 1982, **51**, 435.
3. Summanwar, A. S. and Marathe, T. S., *Curr. Sci.*, 1982, **51**, 47.

ANOMALOUS SYMPTOMS OF LOOSE SMUT DISEASE OF WHEAT

J. S. DHIMAN

Department of Vegetable Crops, Punjab Agricultural University, Ludhiana 141 004, India.

LOOSE smut caused by *Ustilago nuda* (Jens) Rostr. var. *tritici* is a serious disease of wheat in India[1,2]. The disease, as a rule, is characterised by the production of black powdery mass of chlamydospores in place of grains[2]. The present communication reports some anomalous symptoms of the disease. These symptoms appeared as silvery grey elongated and irregularly distributed sori on flag leaf (figure 1d), leaf sheath (figures 1a, c, d), peduncle of the spike (figures 1a–d) and the glumes of the lowermost spikelet (figure 1b). Some of the sori on the peduncle ruptured lengthwise (figures 1c, d) to release the brownish black powdery spores. Their microscopic examination confirmed their identity to those of *U. nuda* var. *tritici* in shape, colour and size[2]. The flag leaf became split and shredded when the sori on its both sides ruptured and the spores released. The smaller sori on the exterior of glumes of the lowermost spikelets (figure 1b), however, did not repture.

The abnormal symptoms similar to those described in the above paragraph have not been earlier reported in India. The sporulation of *U. avenae* (Pers.) Rostr. in Oat leaves[3,4] and flower stalk[4] has, however, been reported in other regions of the world. The occurrence of sporulation on vegetative parts has been attributed to the environmental factors[1,4,5] and/or genetic constitution of the fungus[6]. Since the pathogen has been described as 'keeping pace with the growing point'[7], it is probable that the plant growth may be faster than that of the systemic mycelium of the pathogen. As a result, the inflorescence remains either partially or completely free of infection and the fungus lagged behind in lower vegetative parts may either sporulate (figure 1) or bring about certain morphological changes[7–9]. The sporulation in vegetative parts may help rapid and effective dissemination of the wind-borne spores to healthy flowers. Furthermore, the smuttiness of the flag leaf may enhance its transpiration and adversely affect the photosynthesis by diminishing the light penetration.

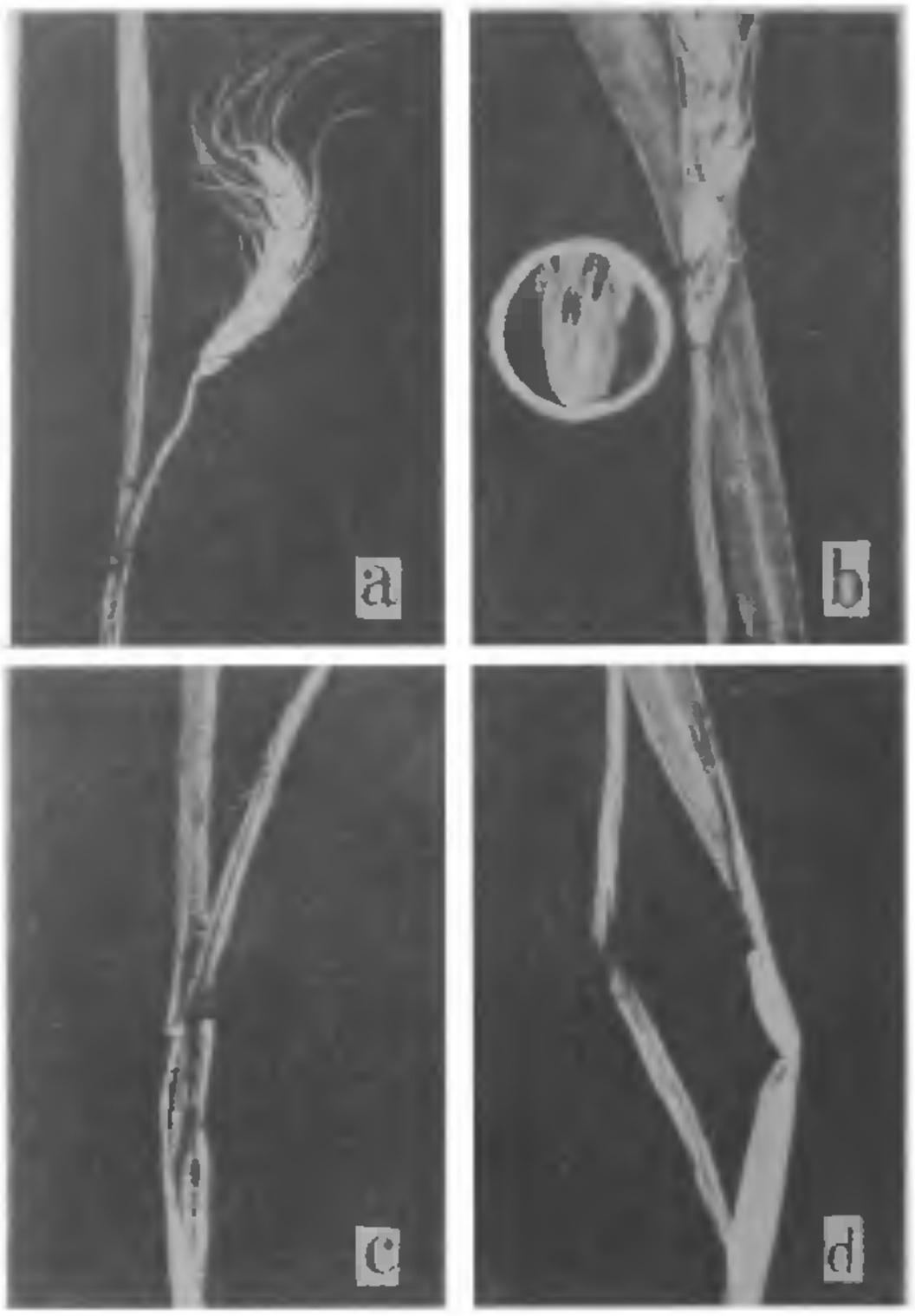

Figure 1. Anomalous symptoms of loose smut disease of wheat. **(a)** Irregularly distributed sori on flag leaf, leaf-sheath and peduncle of the spike, **(b)** elongated, unruptured sori on peduncle and exterior of lowermost spikelets. Encircled figure is the close-up of the latter **(c–d)**. Lengthwise rupturing of sori on flag leaf, leaf-sheath and peduncle.

27 April 1983; Revised 17 August 1983.

1. Gothwal, B. D., *Indian J. Mycol. Plant Pathol.*, 1972, **2**, 171.
2. Joshi, L. M., Srivastava, K. D., Singh, D. V., Goel, L. B. and Nagarajan, S., *Annotated compendium of wheat diseases in India*. ICAR, New Delhi, 1978, p. 332.
3. Bartholomew, L. V. and Jones, E. S., *J. Agric. Res.*, 1923, **24**, 569.

4. Mills, J. T., *Trans. Brit. Mycol. Soc.*, 1966, **49,** 651.
5. Kavanagh, T., *Phytopathology*, 1961, **51,** 189.
6. Popp, W. and Hanna, W. F., *Agriculture*, 1935, **15,** 424.
7. Batts, C. C. V. and Jeater, A., *Trans. Brit. Mycol. Soc.*, 1958, **41,** 115.
8. Kulkarni, S., *Curr. Sci.*, 1979, **48,** 88.
9. Tingey, D. C. and Tolman, B., *J. Agric. Res.*, 1934, **48,** 631.

INHERITANCE OF TWO INDUCED LETHAL CHLOROPHYLL MUTATIONS IN MUNGBEAN

J. R. BAHL and P. K. GUPTA
Department of Agricultural Botany, Meerut University, Meerut 250 005, India.

IN a mutation programme in mungbean (*Vigna radiata* (L.) Wilczek), two varieties (ML-5 and K-851) were subjected to treatment with *gamma rays* and EMS, separately and in combination. Two lethal chlorophyll mutations, *albina* and *chlorina* were observed in M_2 generation. The nature of inheritance of these chlorophyll mutations was studied up to M_4, with the help of heterozygous plants obtained in segregating rows and in each case monogenic recessive inheritance was observed[1]. The mutants *albina* and *chlorina* could be either due to two different alleles on the same locus or due to mutations at different loci; if located on different loci, they could be linked or independent. Due to their recessive lethal nature, the mutations will be available only in heterozygous plants, which cannot be distinguished phenotypically. The results of an experiment to study the inheritance of these two mutations are presented in this communication.

Albina and *chlorina* chlorophyll mutations in mungbean were maintained with the help of heterozygous plants in the segregating rows. Three random plants from a row segregating for *albina* were crossed in all combinations with three plants from a row segregating for *chlorina*. Six hybrids were obtained. F_1 hybrids were grown along with selfed progenies of the six parent plants. Segregation in the selfed progenies was studied to locate hybrids derived from heterozygous × heterozygous cross. Only one such hybrid was available amongst the six hybrids grown. F_2 generation from this hybrid was grown on plant to progeny basis and data on segregation were recorded.

In F_1 generation, derived from a cross between heterozygous *albina* and heterozygous *chlorina* one hybrid was represented by eight normal plants. In F_2 generation, four types of segregations were obtained (table 1). Type I was normal and no segregation was observed. Type II and type III segregated for *albina* and *chlorina* separately, whereas type IV segregated for both. The test of goodness of fit was applied and the results are given in table 1, which showed clear 3:1 segregation in type II and type III, and 9:3:4 in type IV. In type IV, recessive homozygotes for both loci were assumed to be included in *chlorina* seedlings. Gene symbols *aa* and *cc* were assigned for *albina* and

Table 1 *Segregation ratios of F_2 plants obtained from cross of heterozygous plants for albina and chlorina chlorophyll mutations.*

Type	No. of Row row*	Row no.	Segregation in F_2 Normal	Albina	Chlorina	*P* (3:1) in II & III and *P* (9:3:4) in IV
I	1	1	198	–	–	–
II	3	1	123	38	–	0.5–0.7
		2	66	17	–	0.3–0.5
		3	61	16	–	0.3–0.5
III	2	1	37	–	14	0.5–0.7
		2	140	–	48	0.8–0.9
IV	2	1	112	29	37	0.05–0.1
		2	59	14	24	0.2–0.3

* *P* (1:1:1:1) = 0.8–0.9.

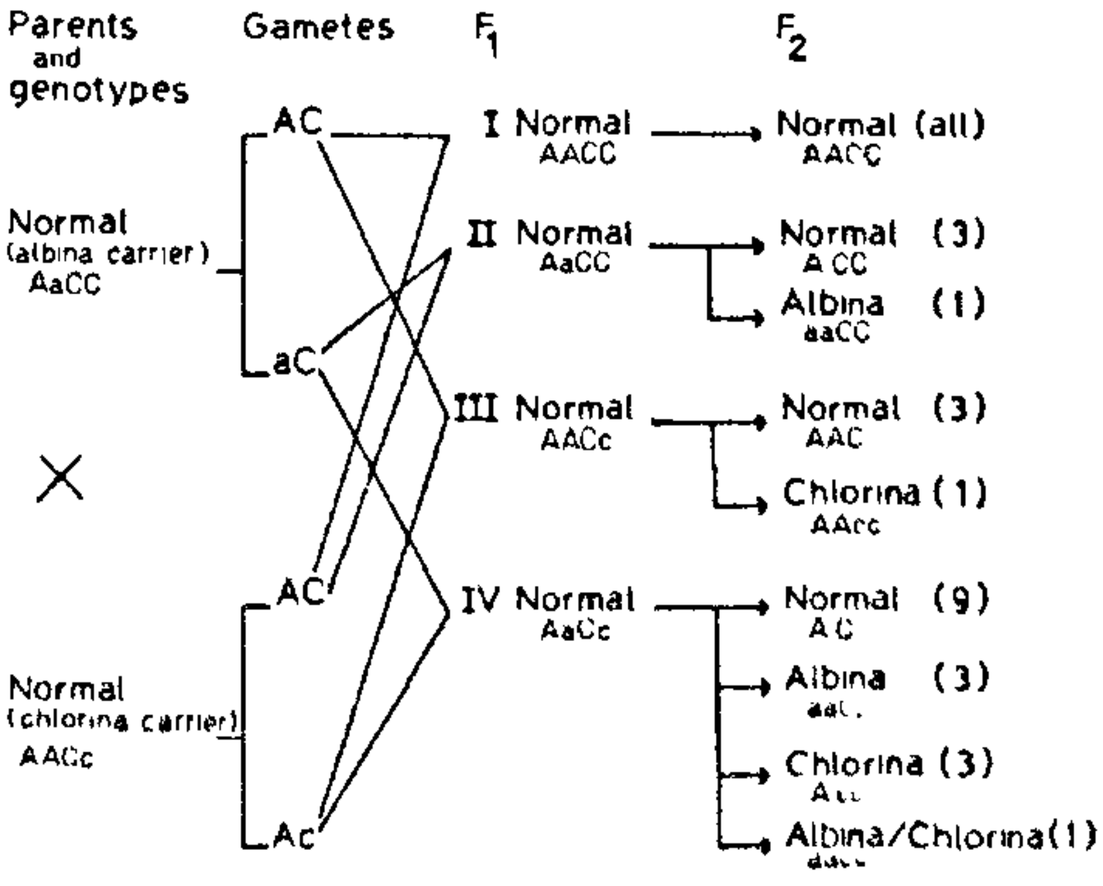

Figure 1. Segregation pattern in the progeny of a cross between heterozygous plants for *albina* and *chlorina* chlorophyll mutations in mungbean.