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INHERITANCE OF A SPIKELETLESS CHARACTER IN PEARL MILLET

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DURING the rainy season of 1983, an S_2 progeny of pearl millet (*Pennisetum americanum* (L.) Leeke), derived from IP 9503, an accession collected in Ghana¹, was found to be segregating for plants with normal and spikeletless spikes. The spikeletless mutant is characterized by the complete absence of spikelets from its entire spike (figure 1), although involucreal bristles occur normally in mutant plants. The mutant plants produce relatively more tillers than the normal plants. Koduru and Krishna Rao² have recently summarized the literature on the inheritance of various qualitative characters in pearl millet. They did not report the occurrence or inheritance of the spikeletless trait amongst 21 spike and reproductive traits. The present note reports the inheritance of this character.

Remnant seed of the S_2 progeny segregating for the spikeletless mutant was replanted in the post-rainy season of 1983. The segregation pattern based on 52 plants showed a good fit to a ratio 3 normal : 1 spikeletless (table 1), indicating that the spikeletless trait may be inherited as a monogenic recessive. This hypothesis was tested by studying the segrega-

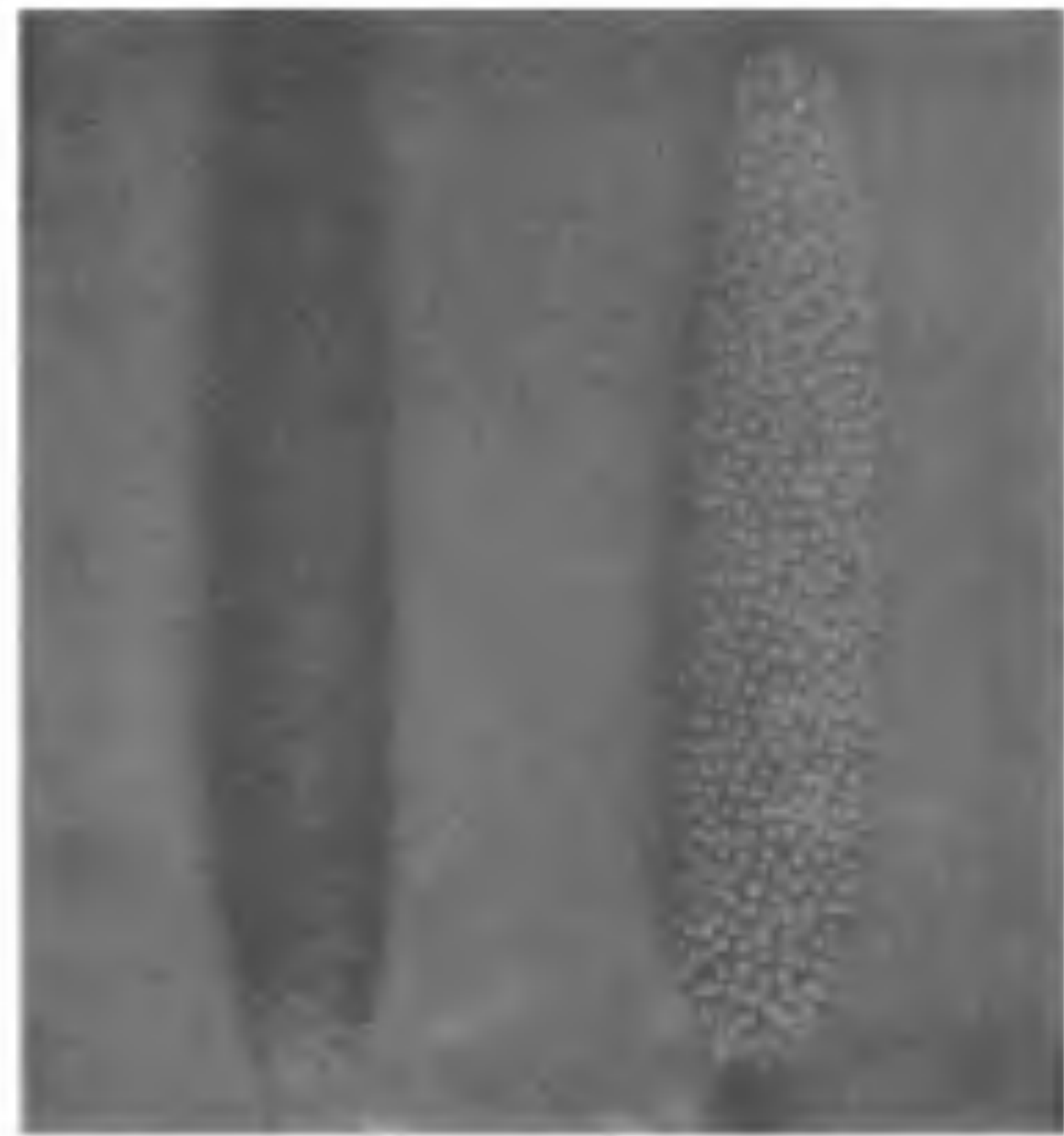


Figure 1. Pearl millet. Spikeletless spike (left) and normal spike (right).

tion ratios in (i) S_3 progenies derived from selfing normal plants of the S_2 progeny, and (ii) F_2 progenies derived from crosses between two normal inbred lines and the plants heterozygous for the spikeletless allele.

According to the one-gene hypothesis, one-third of the normal plants in the S_2 progeny would be dominant homozygous and would breed true, whereas two-thirds of the normal plants, would be heterozygous and would segregate in the ratio of 3 normal : 1 spikeletless. Out of 13 S_3 progenies, 3 bred true for normal plants, and 10 segregated for normal and spikeletless plants, showing a good fit to 2:1 ratio ($\chi^2 = 0.615$; $P = 0.5-0.3$). The segregating S_3 progenies, consisting of 447 plants, showed a good fit to 3 normal : 1 spikeletless plants and the heterogeneity test³ showed the segregation ratio across progenies to be homogeneous (table 1).

Normal plants of the segregating S_3 progenies were selfed as well as crossed onto two inbred lines: 81 B and 843 B. The S_4 progenies were grown to identify those segregating for normal and spikeletless plants. This enabled us to finally select the F_1 hybrids involving those plants from S_3 progenies that were heterozygous for the mutant trait. Four such F_1 hybrids, two each involving 81 B and 843 B, were selected and selfed to produce F_2 progenies. According to the one-gene hypothesis, half of the F_2 progenies would breed true for normal plants, and the other half would segregate for spikeletless plants. Five F_2 progenies were grown from each of the four crosses. Out of 10 F_2 progenies involving

Table 1 Segregation for normal and spikeletless plants, and χ^2 tests in S_2 , S_3 and F_2 progenies of pearl millet

Accession/ Cross	Progeny		Number of plants		3:1 ratio		Heterogeneity	
	Type	Number	Normal	Spikeletless	χ^2	P	χ^2	P
IP 9503	S_2	1	38	14	0.31	0.7-0.5	-	-
IP 9503	S_3	10	350	97	2.60	0.2-0.1	5.92	0.7-0.5
81 B \times Het. S_3 *	F_2	5	197	61	0.25	0.7-0.5	7.47	0.2-0.1
843 B \times Het. S_3 *	F_2	5	168	57	0.01	>0.9	12.54	0.02-0.01

*Heterozygous normal plant from S_3 progeny.

81 B, 5 bred true for normal plants, and 5 segregated for spikeletless plants, exactly fitting a 1:1 ratio. A similar exact fit to a 1:1 ratio was found for the F_2 progenies involving 843 B. The segregating F_2 progenies, consisting of 225-250 plants, derived from crosses involving either 81 B or 843 B, showed a good fit to a ratio 3 normal : 1 spikeletless (table 1). The segregation pattern, however, was homogeneous for F_2 progenies involving 81 B and heterogeneous for those involving 843 B.

The segregation patterns, both for S_3 and F_2 progenies, confirmed the hypothesis that the spikeletless trait is inherited as a monogenic recessive. The gene symbol *sl* is proposed for the recessive allele. Since the spikeletless plants cannot reproduce, the recessive allele can only be maintained in the heterozygous state. The spikeletless mutant may be a useful marker for linkage studies, and a tool for developmental studies.

19 January 1987

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PHYLLODY—A NEW MENACE TO THE SUNFLOWER LEADING TO STERILITY

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SUNFLOWER (*Helianthus annuus* L.), an important cash crop is known for its high quality oil content. It is a potential high yielding cash crop to Indian

farmers who are well versed with the recent sunflower technology. But this crop is known to suffer by more than 35 infective diseases which cause an average annual loss of 12% in yield from nearly 12 million ha. crop in the world¹. The susceptibility of this crop to virus and virus-like diseases was reported earlier^{2,3}. During a survey and field visits made in 1985-87, the sunflower phyllody (figure 1) or virescence was frequently observed in commercial sunflower cultivars in Bijapur, Gulbarga, Raichur and Bidar districts of Karnataka. The symptoms produced by this disease are entirely different from the earlier reported mosaic disease in India^{2,4}. This prompted investigations on sunflower phyllody symptoms and its incidence.

During 1985-86 and 1986-87, some plants in our experimental plots showed virescence symptoms in the capitulum. Mechanical sap inoculation from the infected plants to healthy plants failed its transmission. This phyllody called as aster yellow disease is the only common virus-like disease in North America. It is recently established as incited by Mycoplasma-like bodies (MLB)⁵. It has been reported⁶ to be transmitted primarily by the leaf hopper, *Macrostelus devisus* Ubl. This vector is found on a wide variety of plants; *Amrasca biguttula biguttula* Ishida (=) and *Empoasca devastans* (Distant) have been found to be important leaf hoppers of sunflower in Karnataka. Their importance as vectors of this disease is yet to be known.

The survey and field visits revealed that the incidence of phyllody (figure 1) was 0.8, 0.6 and 0.5% in the taluks of Yadgir, Aland and Gulbarga respectively. Its incidence in commercial sunflower cultivars in Gulbarga averaged 0.7%, and 1.5, 3 and 2.7% respectively in Bijapur, Basavana Bagewadi and Bagalkot taluks of Bijapur. At Raichur, it was 0.5% in modern cultivar. In Bidar district, the phyllody was 0.7, 0.47, 0.23% in Bidar, Bhalki and Aurad taluks respectively.

The characteristic symptoms of this disease on *Helianthus annuus* L. cv Morden and hybrid geno-