

high amount of pollen sterility (76.75–93.85%), whereas the reciprocals showed fairly good pollen fertility (73.06–79.85%). However, the pollen grains were identical in shape (Figure 2). Hence, the sterility observed in the hybrids with *S. malabaricum* as ovule parent was presumed to be due to cytoplasmic differences as there were no chromosome irregularities. This is indicative of interaction of the cytoplasm of *S. malabaricum* with the genome of *S. indicum* resulting in male sterility. Similar type of sterility observed in the species crosses of different crop species was successfully used in the development of alloplasmic lines and is being utilized in commercial hybrid seed production of sunflower, maize, *Sorghum*, *Brassica*, etc.^{7–10}.

The remaining four combinations involving *S. indicum* and the two 32-chromosome species showed irregular chromosome association at metaphase I, such as the formation of trivalents and univalents in addition to normal bivalents. In respect of anaphase I separation, abnormalities such as unequal separation and laggards were observed (Table 1). As a result, sporads of two to ten cells were formed, leading to high percentage of pollen sterility, and the pollen grains exhibited heteromorphic nature (Figures 3 and 4). Hence, the pollen sterility was concluded to be due to chromosomal abnormalities in the hybrids since the two species crossed possessed different chromosome numbers and the chromosomes were only partially homologous^{6, 11}.

It would be important to mention that the present investigation has thrown much light on the cytoplasmic genic male sterility in sesame for the first time. The sterile hybrids of *S. malabaricum* × *S. indicum* (Figure 5) were backcrossed to the cultivated parent and are being evaluated in backcross generations. The results obtained so far have indicated that the degree of male sterility increased by the backcross (unpublished result). After five to six substitution backcrosses, male sterility will be almost complete and stable. Intensified efforts are being made to isolate highly pollen-sterile but female-fertile lines by enhancing the expression of pollen sterility in each backcross generation by appropriate selection of sterile plants and backcrossing to *S. indicum* as pair crosses. Thus, the present study was successful in identifying for the first time an appropriate gene-plasmon combination in *S. malabaricum*–*indicum* hybrid that would result in alloplasmic sterile line in sesame lending for commercial exploitation.

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Is there dimorphism for style lengths in monoecious figs?

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Contrary to the expectation, style lengths of flowers of seven tropical monoecious fig species exhibited normal distribution with a single mode; none of the species showed the expected bimodal distribution. In four of the species studied, nearly 100% of the flowers in a syconium had styles shorter than the mean length of the ovipositor of their pollinator wasp, indicating that the wasps can potentially usurp a greater proportion of the flowers than is generally thought. Thus, our results do not support the belief held for almost three decades that using style length as a strategy, figs can guard their flowers against complete depredation by wasps. The style lengths showed 3–4 times greater variation compared to the ovipositor length of their pollinator wasp. We suggest this to be a consequence of the evolutionary conflict between the fig and the pollinator over the allocation of flowers to wasp production and to seed production.

FOR almost three decades the interaction between figs (*Ficus* spp. Moraceae) and their species-specific pollinating wasps (Agaonidae, Hymenoptera) has been cited as one of the perfect examples of plant–pollinator mutualism^{1–3}. The flowers of figs are enclosed in an urn-shaped inflorescence, the syconium. The pollen-laden female wasps enter the receptive syconium through a specialized opening, the ostiole. These wasps can reproduce only within the syconium by ovipositing in the ovaries, on which the wasp larvae feed. It was believed that monoecious figs bear two distinct kinds of female flowers, those with short styles into which wasps can lay eggs and those with long styles into which they cannot as their ovipositor does not reach the ovary; the latter,

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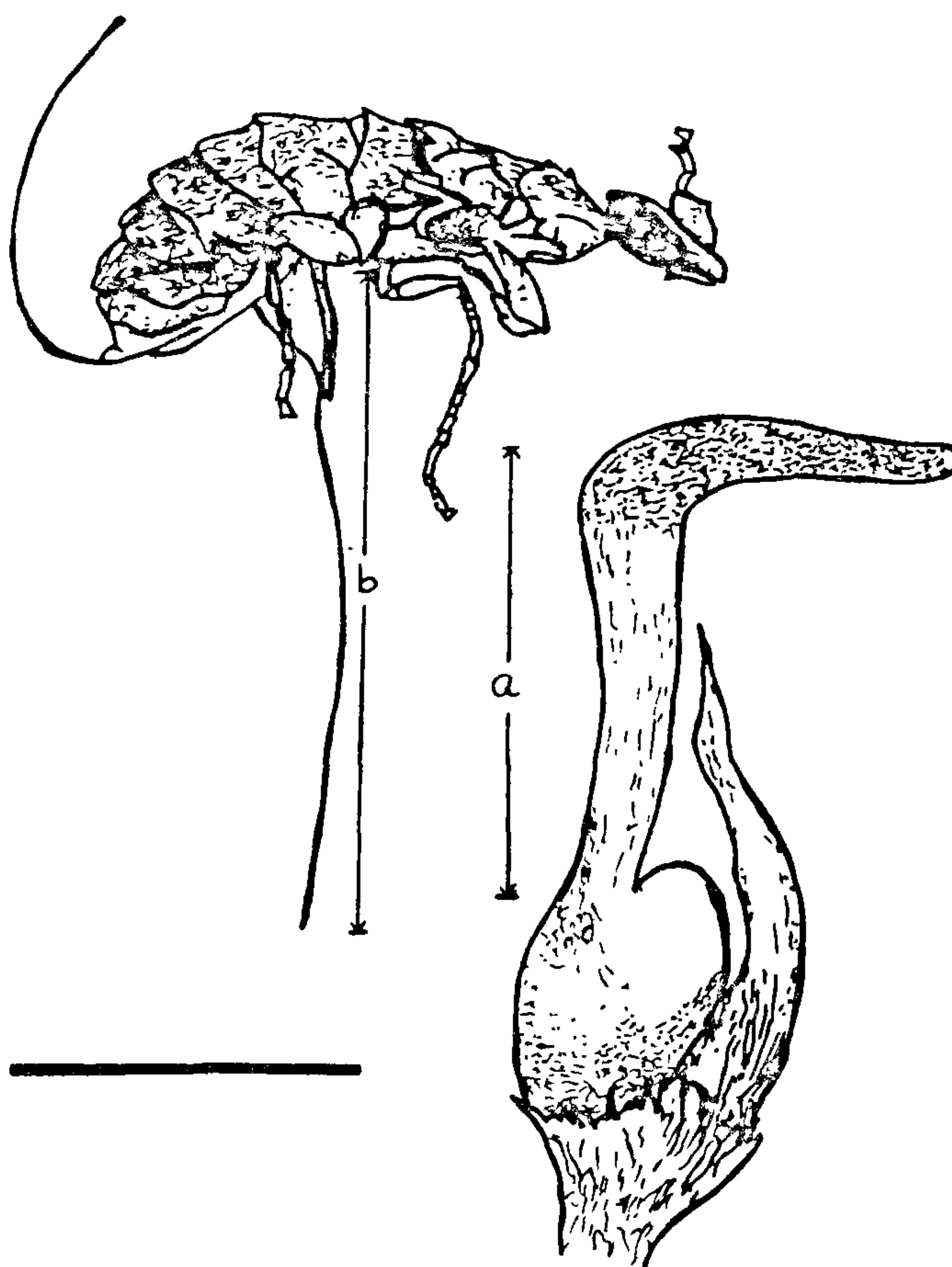


Figure 1. Schematic representation of style length (*a*) and ovipositor length (*b*) measured. Bar = 1 mm

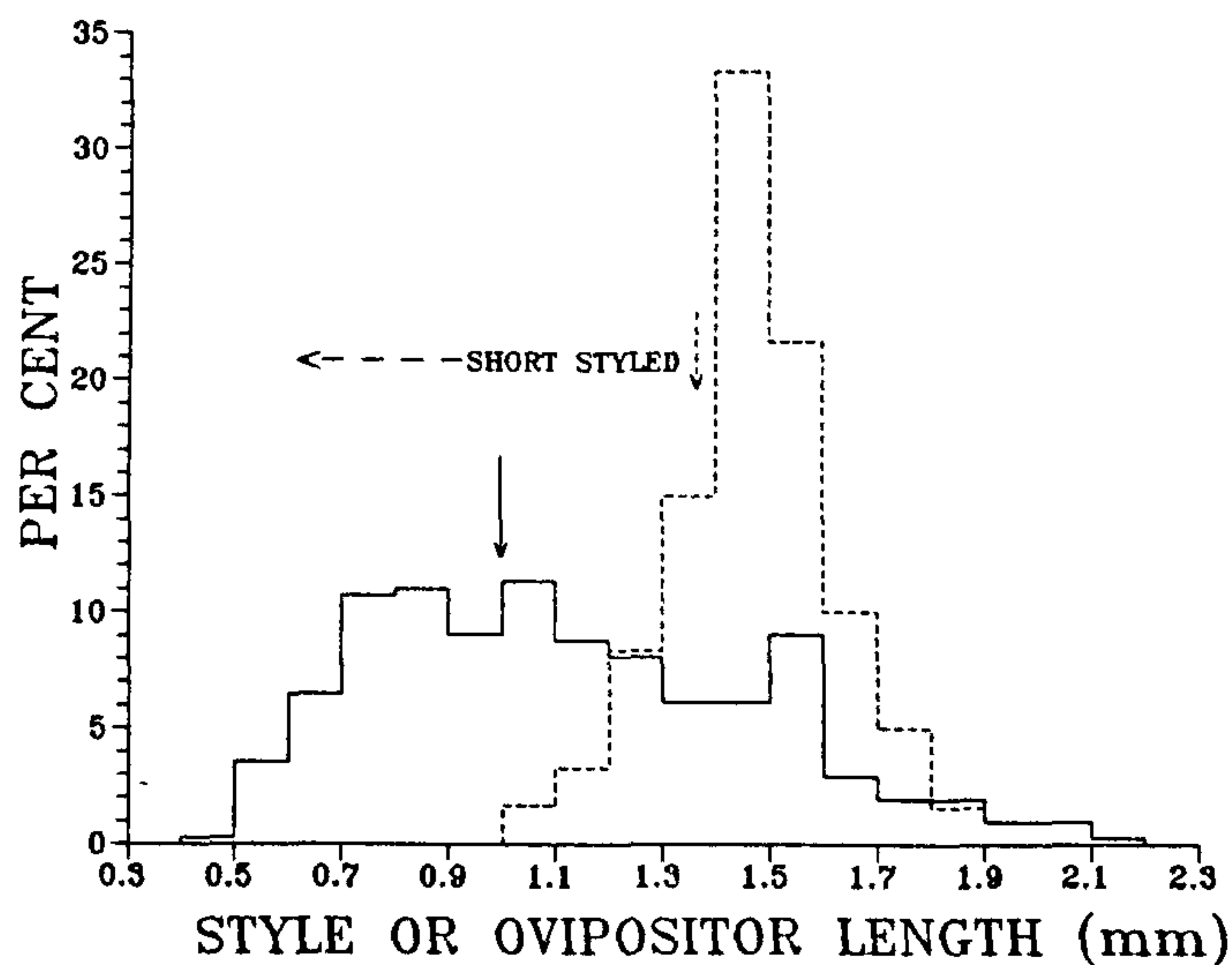


Figure 2. Distribution patterns of style lengths (solid) of *Ficus benghalensis* and ovipositor lengths (dotted) of its pollinating wasps (*Eupristina masoni*). Mean values of the style (solid arrow) and ovipositor (dotted arrow) lengths are also indicated. Flowers with style lengths smaller than the mean ovipositor length were considered short-styled.

Table 1. Mean style lengths of seven tropical monoecious fig species and the ovipositor lengths of their pollinating wasps*

Fig species	Style length (mm)				Ovipositor length (mm)				Percentage of short-styled flowers†
	n	\bar{x}	SD	CV (%)	n	\bar{x}	SD	CV (%)	
<i>F. benghalensis</i> L.	309	1.027	0.358	34.85	60	1.366	0.154	11.27	81.23 (79.09)
<i>F. racemosa</i> L.	61	1.023	0.222	21.70	50	0.988	0.053	5.36	48.33 (47.17)
<i>F. sp.</i>	150	0.723	0.313	43.29	30	1.172	0.042	3.58	93.00 (89.58)
<i>F. religiosa</i> L.	218	0.458	0.182	39.74	59	1.047	0.048	4.58	99.08 (99.53)
<i>F. mollis</i> Vahl.	103	0.441	0.140	31.75	34	0.415	0.032	7.71	47.58 (45.52)
<i>F. tsiatelia</i> Rheede	450	0.394	0.102	25.89	30	0.758	0.057	7.52	100.00 (100.00)
<i>F. drupaceae</i> Thunb	124	0.249	0.084	33.73	34	0.553	0.055	9.95	100.00 (99.32)

*The percentage of short-styled flowers was computed as the proportion of flowers with style lengths less than the mean ovipositor length of the respective pollinating wasps. Values in the parentheses indicate percentage of styles that would be shorter than the ovipositor length of any randomly chosen wasp, this was computed by comparing the style lengths of all the flowers sampled with the ovipositor lengths of all the wasps sampled, for a given fig-wasp association.

†K-S test indicated good fit ($p > 0.05$) to a normal distribution for all the seven species.

hence, produce mature seeds. It is argued that this dimorphism in style lengths apportions the flowers for seed and wasp production^{2,4}. The existence of such dimorphism in flowers is expected to lead to bimodal distribution of style lengths. This has frequently been discussed as an important strategy of figs in the context of the cost to be incurred by the fig to raise a seed⁵.

Recently, a few studies have questioned the ubiquity of this strategy among figs⁶⁻⁸. However, these studies are restricted to one species each, mostly from the neotropics and Africa. Till date there are no comparative studies involving a set of monoecious species to test the existence of stylar dimorphism⁹. In this communication, we report the data for style length distributions of seven tropical monoecious fig species. We discuss our results on the distribution patterns of style lengths and ovipositor lengths in the context of the percentages of flowers available for seed and wasp production.

We measured the length of the style (from the top of the ovary to the base of the stigma) and ovipositor (from the point of attachment to the body to the tip, after separating the sheaths) nearest to 0.01 mm under a microscope (Figure 1). Flowers from at least five receptive (B-phase¹) syconia and thirty pollinator wasps per species, collected from naturally growing fig trees in and around Bangalore (12°58'N, 77°35'E), India, were sampled for these measurements. As a preliminary test of bimodality, the goodness of fit of the style length to normal distribution was assessed employing the Kolmogorov-Smirnov test¹⁰.

Style lengths of all the seven species showed a continuous distribution; there was no indication of bimodality or the existence of discrete classes of short- and long-styled flowers (Table 1 and Figure 2; distribution patterns of style lengths of *F. benghalensis* and the ovipositor lengths of its pollinating wasps are shown as a representative example). All the species fit well to normal distribution and, hence, the test for bimodality was not attempted. This showed that style lengths of monoecious figs seem to exhibit a unimodal distribution without any distinct group of long- or short-styled flowers. However, it is possible to identify short- and long-styled flowers relative to the length of the ovipositor of the respective pollinating wasp. Surprisingly, this analysis showed that, in four out of the seven species studied, nearly 100% of the styles in syconium were shorter than the mean ovipositor length of their respective wasp, indicating that the pollinators can potentially usurp all the flowers; in *F. benghalensis* more than 80% of the female flowers were accessible to oviposition. These results contradict Murray's suggestion¹¹ that generally about half the styles are longer than the female wasp's ovipositor. Our results also question the existing belief^{4,5,12-15} that figs can guard their flowers against complete depredation by wasps using the style length as a strategy. Thus, the general belief of equal allocation of

flowers¹¹, based on style lengths, for the production of seeds and wasps does not seem to hold true in monoecious figs¹⁶.

Nevertheless, it is important to note that variation in the style lengths of a species was three to four times more than that in the ovipositor length of their respective pollinator wasps (Table 1). Such variation for style lengths compared to ovipositor lengths has also been reported earlier^{6,7}. Though the reason for this difference is not immediately clear, it is not unlikely that selection has favoured greater variance in style lengths as a plant strategy in evolutionary conflict between the fig and the pollinator, on the allocation of flowers to wasp and seed production.

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Uptake and tissue distribution of cadmium in albino rat after oral exposure to cadmium-contaminated edible mushroom and its effect on blood

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Pleurotus sajor-caju showed a fair amount of Cd²⁺ uptake from the metal-contaminated substrate. To study the uptake capacity, distribution and degree of accumulation of Cd²⁺ in different internal organs and blood, fungal-tissue-incorporated Cd²⁺ was administered orally to albino rats for a period of six weeks. Kidney and spleen exhibited maximum (5.40-5.50 µg g⁻¹ dry wt) uptake of Cd²⁺. In all cases depletion of Zn²⁺ was noted with increase in Cd²⁺ level. Cadmium caused reduction in body weight and increase in relative weight of kidney and spleen. Haematological changes included a sharp decline in the percentage of packed cell volume and in haemoglobin, and significant alteration in differential count. Metal uptake and toxicity were always higher when the standard diet was supplemented with inorganic Cd²⁺ instead of tissue-incorporated Cd²⁺.

BIOSPHERE is being increasingly contaminated by indiscriminate discharge of toxic heavy metals from various sources, the long effects of this practice will be hazardous to all living organisms. The use of metal-containing sprays, pesticides and fertilizers may also increase contaminants in the soil¹. It has been reported^{2,3} that the soil might get polluted with a variety of metals like As, Cd, Cr, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Se, V and Zn, which are mostly coming from industrial sources; naturally, therefore, their concentration in the soil is higher in the vicinity of an industrial area. Sometimes, mercury emitted from a source into the atmosphere is absorbed by leaves and, subsequently, moves to the humus through fallen leaves. Mushrooms usually grow on soil and other natural substrates which are sometimes contaminated with various heavy-metal pollutants. The uptake of these heavy metals by different edible mushrooms from various substrates has been reported earlier⁴⁻⁶. But no information is available so far regarding the consumption of tissue-(mushroom)-incorporated heavy metals by mammals and their distribution and accumulation in different internal organs and blood. The present communication deals with (1) the uptake of Cd²⁺ by *Pleurotus sajor-caju*, an edible fungus, (2) the distribution of Cd²⁺ in different internal organs and blood after oral exposure in albino rats, (3) extent of Zn²⁺ depletion in soft tissues due to the presence of Cd²⁺ and (4) the changes in haematological characteristics of mammalian blood.

The standard diet of rats purchased from a local market was supplemented with dried sporocarp powder of *P. sajor-caju* in 1:1 proportion and the Cd²⁺ content of both the standard and the Cd²⁺-supplemented diets were