

very close to normal individuals. But the IgM level showed significantly higher value ($P < 0.001$) in VDRL-positive patient.

The concentration of gamma globulin in acute and chronic infections varied from statistically insignificant to marked increase¹³, depending upon the type and duration of infections. Infectious diseases frequently leading to the development of polyclonal gammopathy include bronchiectasis, tuberculosis, leprosy, syphilis¹⁴, etc. The extent to which immunoglobulin level varies in different chronic infections and diseases is not known. But the association of hypogammaglobulinemia or hypergammaglobulinemia with many diseases has been reported¹⁴. In certain cases the level of immunoglobulin may indicate its association with a particular disease. In the present study it has been found that the immunoglobulin level, particularly IgM, increased markedly in VDRL-positive patient and suggests strong association between IgM level and VDRL-positive patient.

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MULTIPLE VIVIPARITY IN A FEW TAXA OF MANGROVES

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MANGROVES possess adaptive features in their structural and physiological set-up that help them to survive where other plants cannot. Among the adaptive features to overcome the severe effects of the tidal environment, is the viviparity exhibited by a few taxa, namely *Bruguiera*, *Ceriops*, *Kandelia* and *Rhizophora* of the Rhizophoraceae confined to mangrove habitat.

In the Rhizophoraceae habitual viviparity is a common feature among the above mentioned taxa. Under normal conditions only one seedling emerges out while still attached to the fruit stock and protrude down to varied lengths.

During the recent field studies of the Kollur-Haladi riverine mangrove complex near Kundapur of the Dakshina Kannada district of the Karnataka State, we saw unusual cases of multiple viviparity in *Bruguiera gymnorrhiza* (L.) Savigny, *Kandelia candel* (L.) Druce and *Rhizophora mucronata* Poir. (figures 1-5) which warranted an anatomical study since there are very few published reports of multiple viviparity in mangroves¹⁻⁵.

B. gymnorrhiza is scarcely distributed on the estuarine banks. Its frequency, however, is more in the muddy islands under tidal influence. Many of the trees bore fruits bearing a single cylindrical hypocotyle and also there were fruits with two hypocotyles in varied stages of development (figures 4 & 5). A striking feature of these plants is the unusual multiple viviparity, especially, in those plants which grow slightly away from the estuarine influence. This feature, though not very common after a careful search, revealed that many plants had fruits with two hypocotyles. The protruding hypocotyles from the same

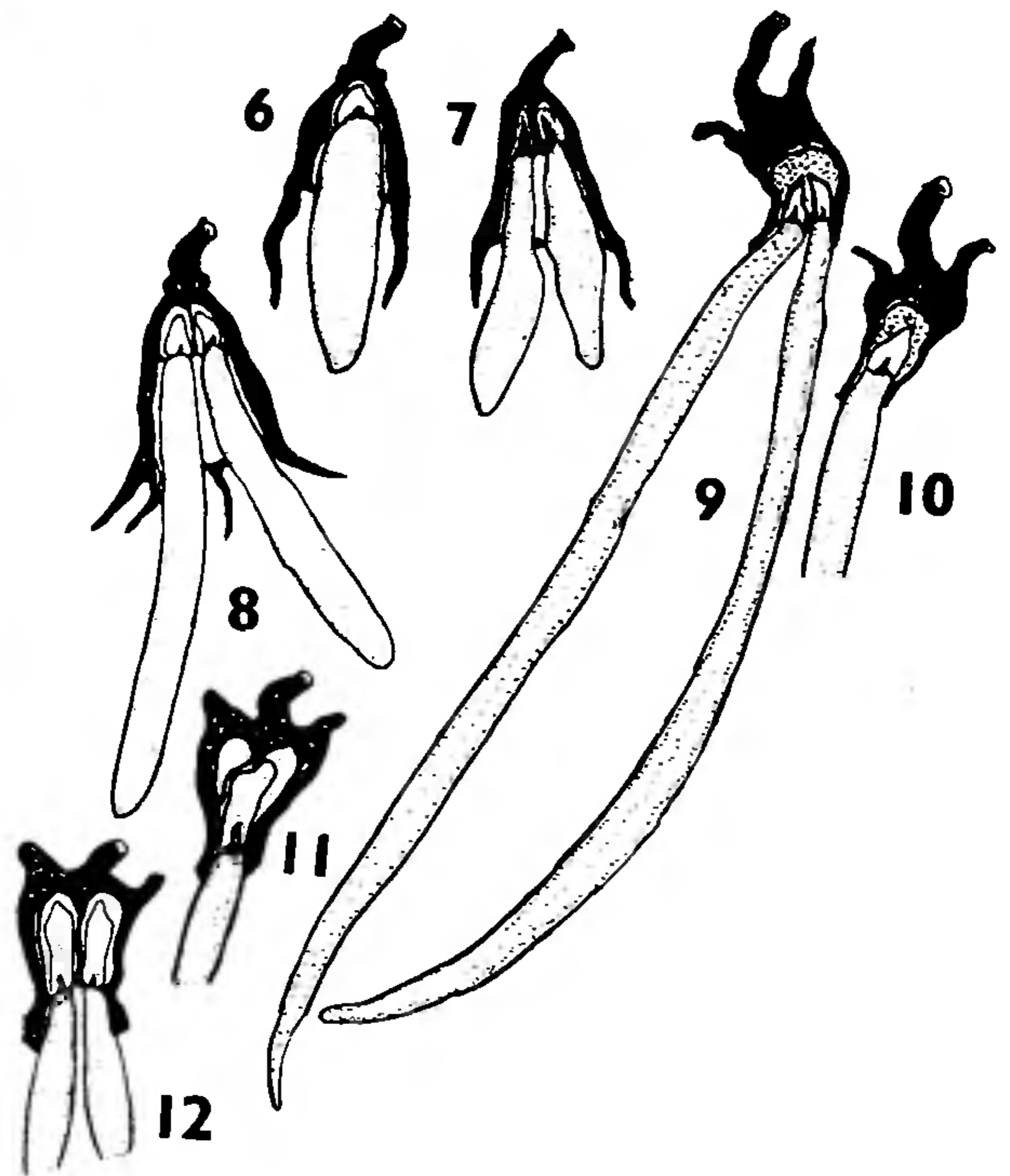


Figures 1–5. Multiple Viviparity in Mangroves. 1, 2. *Kandelia candel* (L.) Druce. 3. *Rhizophora mucronata* Poir. 4, 5. *Bruguiera gymnorrhiza* (L.) Savigny.

fruit are observed to be equal or unequal in length, and also varied in shape to a certain extent.

The ovary in *Bruguiera* is inferior, 2–4 locular with 1–2 pendulous ovules in each. It is observed that among the ovules all but one is suppressed under normal situations (figure 6). In a few cases there are indications that within the ovary all but two locules show slight enlargement, and in each enlarged locule one of the two ovules is suppressed. The growing ovules from each cell develops simultaneously in a viviparous manner (figures 7–8). The unusual feature as far we are aware is the first record for *B. gymnorrhiza* in India and second record for this genus since this feature is reported for *B. cylindrica* (L.) Bl. from Andaman group of islands⁵.

The second instance of the occurrence of the multiple viviparity is observed in *R. mucronata* Poir., growing along the shores of the Kodi lagoon (figure 3). As usual, one could observe only one long hypocotyle



Figures 6–12. Longitudinal sections of fruits. 6–8. *Bruguiera gymnorrhiza* (L.) Savigny, 9–10. *Kandelia candel* (L.) Druce. 11–12. *Rhizophora mucronata* Poir.

emerging out of each fruit up to a length of 36 cm. However, it was not common to observe two protruding hypocotyles from a single fruit borne by trees growing along the estuarine banks.

The ovary in *Rhizophora* is inferior, 2-celled and ovules 2 per each cell. Normally all the ovules are suppressed except the one which develops and emerges out as a pendent seedling (figure 11). In the present case, one ovule from each locule has emerged out simultaneously in a viviparous manner (figure 12). There are recorded instances of two to three seedlings from a single fruit of this species from Mangrove habitats at Bombay³, Pitchavaram⁴ and also from Sri Lanka coasts¹. This phenomenon in this species is the second record for South India and the first record for the Karnataka part of the Malabar Coast.

The third instance of the occurrence of multiple viviparity is observed in *Kandelia candel* growing along the upstream under less saline habitats (figures 1–2). Normally the ovary is inferior, 1-celled and 6-ovuled. The fruit bears a single hypocotyle as a normal feature (figure 10). In the present study it is observed

that in a few fruits all but two ovules are suppressed, which in turn emerge out simultaneously in a viviparous manner (figure 9). This phenomenon for this species as far we know is the first record in India.

Vivipary in eumangroves is habitat related and physiologically significant from the perspective of saline habitat. The unusual multiplicity of seedlings from a single fruit is intriguing. Whether this is under genetic control or under environmental stress is so far, not clear.

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CASSIA SERICEA S. TO FIGHT PARTHENIUM HYSTEROPHORUS LINN.

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THE fight against *Parthenium hysterophorus* Linn, a gregarious weed is being much discussed for more than a decade. The harm it does to human beings, livestock and to crop plants is well documented¹⁻⁷. Among the methods advocated for its control, spraying chemicals^{6,8} and introducing host-specific biotic agents^{9,10} have drawn much attention. However, the implementation of these methods is yet to make a significant impact on *Parthenium* population.

It is common to control the weeds in cultivated lands by dense planting of some vigorously growing crop adopting the principle of crop competition. However, the same cannot be extended to vacant lands and

roadsides which are the reservoirs of unwanted weeds. In these unprotected places, the cattle are likely to graze away or the other biotic factors may destroy the introduced plant leaving the weeds to grow more vigorously in a competition-free environment. If such principle has to be adopted effectively to vacant lands, the plant introduced to fight the weed has to be harmless, not grazed readily by cattle, but useful to a certain extent and at the same time affect the growth of the weeds like *Parthenium* by its more vigorous growth and/or allelopathic effect. All such qualities are found in *Cassia sericea*, which has established in Dharwad and Belgaum districts where it has substantially controlled the growth of the pernicious weed, *Parthenium*.

C. sericea is considered a native of tropical South America, particularly West Indies and Brahmias and its introduction is more recent¹¹ than that of *Parthenium*^{12,13}. A survey of many places in Dharwad and Belgaum districts in the past few years revealed that the places where *Parthenium* grew gregariously earlier have been gradually and effectively invaded by *C. sericea* and the growth of the former has been considerably smothered.

C. sericea is an erect or branching annual (figure 1), 20-180 cm tall, growing in conspicuous colonies (figure 2) along the railway lines, roadsides and wastelands^{11,14}. It is often mistaken for *C. tora* which it resembles to a considerable extent. The key characters enlisted in table 1 help in their correct identification.

In addition to smothering the growth of the gregarious weed *Parthenium*, the plant has its own uses. The tender leaves are eaten as vegetable while the older lush green foliage serves as green manure. The leaf extract is believed to heal some specific types of eczema. The dried stems can also be used as fuel. The seeds are dry-fried and blended with coffee beans and powdered.

The growth and spread of *C. sericea* may prompt the biologists and environmentalists to consider that it may also become a menace. However, the botany of *C. sericea* reveals that a single plant in a colony produces hardly 300-600 seeds in contrast to *Parthenium* which produces as many as 8,000-10,000 seeds. Its spread is limited as the pods do not shatter and the heavy seeds are not wind propagated as in *Parthenium*. Its spread can be checked and its removal is easier than that of *Parthenium*.

As the spread and initial establishment of *C. sericea* is relatively slow, the intentional introduction of this harmless but useful plant by human assistance in *Parthenium*-infested lands can effectively smother the