study indicates distinct changes in the level of total phenols of the plants due to *Azospirillum* inoculation. More importantly, the shoot portion where the larvae initiate damage recorded larger quantity of phenols in *Azospirillum* inoculated plant in both the cultivars than in the uninoculated control. An increase of 102.15% phenolic compounds in the shoots of CSH 9 and 10.88% in Co 26 was noticed. Since there was an increase in the concentration of phenolics due to *Azospirillum* and again these phenolic compounds would have acted as distasteful factors only in higher concentration[4], in the present investigation, *Azospirillum* inoculation reduced the shootfly incidence. Further, the chromatographic analysis of the phenolic compounds revealed that in both Co 26 and CSH 9 sorghum varieties there were two to three phenol positive spots (R_f 0.86, 0.76, 0.89, 0.81 and 0.68) in the uninoculated plant. However in the *Azospirillum* inoculated varieties there were distinct qualitative changes in the phenolics resulting in greater number of spots. (R_f 0.89, 0.77, 0.84, 0.73 and 0.62). A variety of phenolic compounds was observed in the young sorghum plants by Stafford[11] who found dhurrin, aspigenindin, lutedinidin, cyanidin and lignin as the major phenols occurring in the tissues of young sorghum plants. Further dhurrin in its glycosidal form at higher concentration has been found to deter the feeding of *Locusta migratoria*[5,12].

The enhancement of phenolics by *Azospirillum* treatment may confer some sort of resistance to plants against shootfly feeding and thereby low incidence in the treated plants. Therefore, *Azospirillum* inoculation has greater importance in imparting resistance towards shootfly in sorghum.

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LITTLE KNOWN ATTRIBUTES OF SOME MANGROVE PLANTS OF THE KARNATAKA COAST

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DURING a field study of the ecology of mangroves of the Karnataka coast a few unusual or unreported morphological features were observed in *Avicennia alba* Bl., *Bruguiera gymnorrhiza* (L.) Savgny, *B. cylindrica* (L.) Bl. and *Ceriops decandra* (Griff.) Ding Hou, which warranted a study to put on record an overall perspective of their presence in coastal environment.

On the flat and low-lying estuarine banks of the river Mulki in the Udupi taluk are seen the formation of *A. alba* and its root system. Apart from the long cable roots radiating horizontally in all directions from the central basal portion of trees, and producing pencil-like pneumatophores which project above the mud level, the authors observed aerial roots on trunk up to 65 cm above the ground level. They are up to 1.2 cm in diameter and showed regular dichotomous branching system (figure 4). At no stage were they found penetrating the mud or becoming prop-like structures as in other mangrove taxa.

Another instance of aerial roots from the branches was observed in a few sporadic trees of *B. gymnorrhiza* on the saline banks of the river Kali in the vicinity of Karwar. This plant unlike *Rhizophora* species prefers soils with a sandy content and produces moderately buttressed basal portion and geniculate pneumatophores. The aerial roots on the trunk are up to 45 cm long, relatively thick, and protrude *in*

Figures 1–4. Aerial roots from the trunk of *Bruguiera gymnorrhiza* (L.) Savigny; **2.** Multiple viviparity in *Ceriops decandra* (Griff.) Ding Hou; **3.** A specimen of *Bruguiera cylindrica* (L.) Bl. from the new locality, Paduvari - Baindoor Hole; **4.** Dichotomously branching aerial roots from the trunk of *Avicennia alba* Bl.

situ towards the ground (figure 1). However, their growth was found to be limited and they were not found to resemble prop roots of *Rhizophora* species.

In both cases, it is safe to conclude that the aerial roots are of no mechanical advantage to the trees, but probably assist in increasing their total respiratory surface as observed by the presence of lenticels around the roots, and their anatomical similarity to pneumatophores or prop roots.

B. cylindrica is recorded all around the east coast and also in the Andaman and Nicobar islands[1,2]. Along the west coast, its presence is reported in the Bassien creek near Naigaon of Thana taluk of the Konkan coast, the Kali nadi banks near Karwar of the Karnataka coast, and near Quilon of the Malabar coast of Kerala. In the present field survey, its presence was noticed along the muddy flats of Baindur hole near Paduvari of the Coondapur taluk in the Dakshina Kannada district of the Karnataka coast (figure 3). This new locality record of its presence in the intertidal regions of estuarine rivers of the Karnataka indicates that this species is far and sporadically spread along the west coast of India.

C. decandra is common along the estuarine rivers of the Karnataka coast. It forms pure stands, especially towards the landward edges of tidal banks. *Ceriops*, like other mangrove species, is viviparous and possesses a fruit very similar to *Rhizophora* but with 5 or 6 calyx lobes instead of 4, while the hypocotyl is distinctly 5 angled when approaching maturity and almost black instead of green. In a few plants growing along the muddy estuarine banks of the Alvekodi at Shirror hole in the Coondapur taluk in the Dakshina Kannada district of the Karnataka coast the authors however, observed a few instance of two hypocotyls from the same fruit (figure 2).

Instances of the occurrence of two or more hypocotyls from a single fruit have been reported in many taxa of eumangroves[3-9]. This feature for *Ceriops decandra* is the first record for the Karnataka part of the Malabar coast. The reversed pear-shaped relatively small fruit with 5 small persistent calyx lobes bearing two hypocotyls of unequal size and length was observed on a few shrubs growing on the rather muddy flat areas around Alvekodi, which are flooded by the normal high tides. This multiple viviparity as reported in a few mangrove taxa is actually caused by the development of seeds of adjacent locules of a single ovary. It is tempting to speculate that multiple viviparity may correlate quite well with the saline conditions of the environment and this can be considered as part of a syndrome of characters connected with adaptations to overcome environmental hazards.

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GRANIFEROUS TRACHEARY ELEMENTS IN THE HAUSTORIUM OF *SCLEROPYRUM WALLICHIANUM* ARN. (SANTALACEAE)

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A MAJORITY of the taxa of Santalaceae are root hemi-parasites attacking a variety of host plants by means of haustoria. The demonstration of a unique type of tracheary elements with granules in their lumen in the haustoria of some Santalaceous taxa[1-3] and their enigmatic role in haustorial function has led to the search for similar structures in the remaining taxa of the family. In this paper, we record the presence of graniferous tracheary elements in the haustorium of *Scleropyrum wallichianum* Arn., a root hemiparasite of the Santalaceae as earlier studies on this taxon have failed to document them[4].

The haustoria of *S. wallichianum*, measuring up to 12 mm in diameter and 9 mm in height, were collected from Petdoor, Subrahmanya and Hulical ghats in Karnataka, on the roots of *Hopea ponga* (Dennst.) Mabberly (figure 1A), *H. recophloea* Dyer,