taken as a unit for classification. A comparative study illustrates that the telsons of the three species differ considerably from each other. The detailed nature of the telson has been brought to the maximum possible, by SEM (figures 4, 5 and 6). Figure 4 shows the fine structure of the telson of E. michaeli. The spines on the dorsal edges are dissimilar and slender which also indicates the presence of secondary spines. In the case of C. indica the spines are fairly strong and progressively longer from basal to the distal end. The secondary spines are more conspicuous (figure 5). The dorsal spines in the telson of L. maduraiensis are non-identical looking like short, broad-based, conical projections (figure 6). The exact position and emergence of the bifid filament in the telsonic raji on the concerned species have aptly been confirmed from the study using SEM.

The conchostracan egg is invariably covered with a thick shell covering, which protects the embryo from mechanical injury and to enable the embryo of these ephemeral pond phyllopod crustacean, to survive drying. It has been observed from the present study that the outer structure of the eggs of these species is interestingly distinct from each other. The surface of the egg of E. michaeli shows deep fissure-like pockets with prominently raised ridges (figure 7). The egg shell surface of L. maduraiensis, on the other hand, is almost smooth with a few feebly marked depressions (figure 9). Thus from the present study it can be suggested that the egg morphology of Conchostraca may be considered as one of the primary criteria for identification.

The three distinguishing features of the species of Conchostraca are external growth lines on the surface of carapace, the number of arrangements of spines on the telson and the morphology of the surface of the egg. It is apparent that the application of SEM to systematic studies of Conchostraca, can provide a valuable tool to the investigator, particularly if micrographs of diagnostic characters could be gathered into a reference atlas.

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REGULATION OF K+ AND NA+ IN
DIPLACHNE FUSCA (LINN) P BEAUV, AN
ALKALI HALO PHYTE

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Plants survive under salt stress by adopting processes like restricted uptake of potentially toxic ions, compartmentation of these ions within the cells and by excretion1. The latter process is one of the most important features among some halophytes, enabling them to thrive very well under such conditions. The remaining two features are common among halophytes as well as glycophytes. Besides these, plants try to maintain younger parts relatively free from such ions by retaining them in more mature parts2. The leaf sheath, which is an integral part in gramineae, was noted to accumulate higher concentration of sodium2. However, its importance in regulating K+ and interaction with Na+ has not received due attention.

Diplachne fusca (Linn) P Beauv (an alkali halophyte) was grown at three levels of sodicity viz pH 9.5, 9.8 and 10.0 (ESP 52, 69 and 80 respectively) under pot culture conditions. Plants growing at pH 8.1 (ESP 7) served as control. Out of fully expanded leaves, the first four from top along with their sheaths were sampled from each level after two months of growth. Leaf sheath was separated from lamina and each was analysed separately in triplicate for Na+ and K+ contents by using flame photometer. It is interesting to note that each leaf sheath had higher K+ content than its respective lamina in control plants (figure 1). The same trend was maintained at three-sodicity level also in the first three leaf sheaths. On the other hand in the fourth leaf sheath, the K+ content was relatively lower than its lamina. The first lamina and sheath had the highest and fourth, the lowest K+ content, at each level. Contrary to this, Na+ content was the lowest in the first lamina and sheath, and highest in the fourth (figure 2). In each case, leaf sheaths had higher Na+ content than their respective laminae.
Figure 1. Effect of sodicity on K⁺ content of different laminae (a) and leaf sheaths (b) of Diplachne fusca.

Figure 2. Effect of sodicity on Na⁺ content of different laminae (a) and leaf sheaths (b) of Diplachne.

*D. fusca* is a salt excreting grass and grows very well under sodic condition even at pH as high as 10.3. Because of this excreting nature, this alkali halophyte controls its internal ionic composition. Besides this, leaf sheath seems to play an important role in regulating Na⁺ content of its lamina by retaining the major portion of the Na⁺. This is more evident in the fourth leaf sheath where its K⁺ content was lower than that of lamina at three levels of sodicity. Higher concentration of Na⁺ in the mature leaves has been suggested because of prolonged uptake via transpiration stream in barley. This explains well the distribution of Na⁺ among laminae of different ages. However, it does not apply to the leaf sheath as the first leaf sheath which had higher Na⁺ content than its lamina despite the fact that it was still covered with the subsequent sheath and thus not fully exposed to environment for transpiration like its lamina. The highest K⁺ content in the first lamina may be explained by its direct supply through transpiration stream and import from more
mature leaves as K⁺ is one of the most mobile element. Such mobility or retranslocation of Na⁺ is known to be poor. It may be inferred from the high concentration of K⁺ in leaf sheaths that certain specialised cells have a higher requirement of K⁺ which under salt stress retain most of the Na⁺ during its translocation sparing former for more important function and thus keeping laminae relatively free from Na⁺ beside its excretion. These mechanisms seem to help in regulating ionic concentration in D. fuscum and keeping younger parts relatively free from Na⁺ and favouring its growth without inhibition under such adverse edaphic environment.

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MOISAC DISEASE OF CITRUS IN INDIA

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A MOSAC disease of citrus was reported1,2 from Andhra Pradesh as a disorder of mosambi (Citrus sinensis (L) Osbeck). During our recent surveys of citrus growing regions of the country with a large scale indexing programme, mosaic symptoms were observed in citrus orchards in Andhra Pradesh, U.P. Hills, Maharashtra, Rajasthan, Meghalaya, Manipur, Assam and Arunachal Pradesh. The symptoms on the orchard trees were more or less similar to greening disease but a closer inspection of the affected trees revealed that the mosaic infection was almost uniform, whereas trees infected with greening showed irregular distribution of the disease. Budwood collected from various places was indexed at the Indian Agricultural Research Institute, New Delhi, its Regional Research Station, Pune, and Citrus Research Station, Tinsukia, Assam. Symptoms of mosaic were also observed in the experimental kagzi-lime nursery plants grown in the glass-house at Delhi. This suggested the seed-borne nature of the virus.

The disease was easily transmitted by bud and wedge grafting from the bud-woods, collected from various States. In glass-house, the symptoms of the disease appeared after 70–90 days of budding/grafting. Transmission up to 100% was observed in the bud-woods collected from norther eastern States. The initial symptoms of the disease in the glass-house inoculated mosambi seedlings appeared as mild chlorosis, followed by severe mosaic pattern on the newly developed leaves (figure 1c). On mature leaves, chlorosis was severe and the leaves became leathery in texture (figure 1b). The inoculated plants were comparatively stunted and less vigorous in growth.

The disease was not transmitted by citrus psylla, Diaphorina citri Kuway; aphids, Toxoptera auranti B.d.F., Dactynotus jacae L but was transmitted by Myzus persicae Sulz and Aphis craccivora Koch in a non-persistent way. The transmission percentage was recorded up to 60% and 40% respectively.

The following citrus species and cultivars were susceptible: sweet orange (Citrus sinensis (L) Osbeck) cvs Mosambi, Sathgudi, Washington navel; Indian acid-lime (C. aurantifolix (Christm) Swingle) cvs., Kagzi nimbu, Rangpur lime (C. limonica Osbeck); grape fruit (C. paradisi (Macf), mandarin (C. reticulata Blanco) cvs Cleopatra mandarin, Nagpur Santra, Sukkam orange, Kinnow orange, lemon (C. limon L.) cvs Lisbon lemon, Pummelo (C. grandis L. Osbeck), bale (Aegle marmelos Corred). The symptoms on these hosts were similar to those observed on sweet orange except in Sukkam orange. In this, symptoms appeared as chlorosis of the leaves with clear mosaic pattern, extreme reduction of the leaf lamina and wavy margin of leaves on inoculated plants within 30–40 days (figure 1d).

In an experiment, 10 plants of Sukkam orange were graft inoculated with the mosaic virus. Simultaneously another set of 10 plants of similar age were inoculated with greening. Typical mosaic symptoms appeared much earlier and quite conspicuous in Sukkam orange compared to typical greening. Therefore, Sukkam orange be considered as a differential host for detection of greening and mosaic viruses. Further distinction can be made by inoculating, bale plant which is susceptible to mosaic but not to citrus greening.