It is evident from the distribution of various secondary metabolites that uniformly negative results are obtained for alkaloids, cyanogenic glycosides (HCN test A), indoles, methylene dioxy compounds (Labat test), saponins (Saponin test A), steroids and triterpenoids (Liebermann–Burchard, Noller's and Salkowski tests) and uniformly-positive results for phenols, flavonoids (Shinoda test), syringyl radicals (Maule test) and tannins. The activity of the polyphenolase enzyme is either immediately or slowly positive in all the taxa studied, as evidenced by the results of Cigarette and Hot water tests.

The present study indicates the occurrence of the anthraquinones in all the species except *M. frondosa* and *R. dumatorium*. The presence of aucubin compounds (Ehrlich test) is noticed in *G. jasminoides* and *R. dumatorium*. They are absent in the rest of the taxa. The catechol-tannins (HCl/Methanol test) are present in *M. erythrophylla*, *N. cadamba*, *N. orientalis* and *R. dumatorium*. Juglone (Juglone test A) a rare napthaquinone, is found in *R. dumatorium* only. The leucoanthocyanins are present in all the species of *Gardenia* and *Nauclea* and absent in those of *Mussaenda* and *Randia*. Lignans, the dimers of cinnamic acids, are present in all the three species of *Nauclea* studied. The presence of syringaldehyde is inferred to be rather equivocal in *G. gummifera* and *M. luteola* on account of the development of green colour in the lignified elements for Syringin test. In all the other taxa its total absence is recorded.

The above data lend support to the division of the Rubiaceae into such tribes as Gardiniae, Mussandae and Naucleae etc. and the ten taxa studied could be identified on the basis of the same. Further a perusal of the several similarities in the chemical characters exhibited, indicate close kinship among them.

The authors are highly grateful to the Director, Department of Horticulture, Lalbagh Garden, Bangalore for the permission to collect the plant material. KK and MR are thankful to Dr M. V. Pattabhiraman, for encouragement.

5 July 1983; Revised 15 September 1983

SEED GERMINATION BEHAVIOUR OF HALOPHYTES IN INDIAN DESERT: 1. *SUAEDA FRUTICOSA* (LINN.) FORSK.

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THE most critical stages in the life cycle of halophytes are the periods of germination and establishment[1], because of the fact that imbibition of water is retarded by low water potentials in the soil solution. In many areas of the Indian desert salinity/alkalinity and water stress are the most important factors limiting plant growth.

Suaeda fruticosa (Linn.) Forsk., commonly known as saltwort grows well in highly saline soils of the Indian desert. This special trait of the species can be assigned to its outstanding ability to withstand the extreme conditions of soil salinity. However, its seeds germinate only after rains which leach out much of the salt from their close environment to deeper soil layers[2]. In the present investigation, the effect of various salts which are common in saline soils, and mannitol, which is non-toxic to plants, was studied to understand whether the inhibition of germination is due to osmotic or toxic effects of different ions.

Twenty seeds were placed in each petridish containing a filter paper moistened with 4 ml of aqueous solutions of 100, 500, 1,000, 5,000 and 10,000 ppm concentration of each of the following salt solutions of NaCl, $MgSO_4$, Na_2SO_4, $CaCl_2$ and mannitol. Control received only distilled water. Electrical conductivity of each of the test solutions was determined. Daily observations were taken for 15 days and the moisture level of the germinating media was maintained throughout the experiment.

Data obtained are given in table 1. Germination was found to vary in the different media. Lower concentrations of all the salts affected the germination differently *e.g.* in the case of NaCl, 100 ppm and 500 ppm stimulated the germination, 100 ppm of Na_2SO_4, 100 and 500 ppm of $MgSO_4$, 100–1,000 ppm of $CaCl_2$, were also found to stimulate the germination. In the case of mannitol the maximum germination was found at 1,000 ppm. Higher concentrations, however, of all the salts suppressed the germination. Seeds of *S. fruticosa* showed a wide range of tolerance towards $CaCl_2$, though, its conductivity was found fairly high. After 15 days of immersion, seeds from 10,000 ppm of all the salts were transferred to distilled water, 5000 and 10,000 ppm mannitol sol-

Table 1. *Effect of various concentrations of salts on percentage seed germination of S. fruticosa.*

Concentration (ppm)	NaCl		Na_2SO_4		$MgSO_4$		$CaCl_2$		Mannitol	
	EC	G	EC	G	EC	G	EC	G	EC	G
0 (control)	–	62.5 ± 2.5	–	62:5 ± 2.5	–	62.5 ± 2.5	–	62.5 ± 2.5	–	62.5 ± 2.5
100	0.2	71.6 ± 2.9	0.2	71.6 ± 2.9	0.2	67.5 ± 17.6	0.2	73.3 ± 14.2	–	65.0 ± 8.6
500	0.8	68.5 ± 8.5	0.9	60.0 ± 5.0	0.8	67.5 ± 3.5	0.9	76.6 ± 12.6	–	67.5 ± 3.5
1,000	1.8	60.0 ± 5.0	1.8	65.0 ± 10.0	1.4	56.7 ± 7.6	2.3	73.3 ± 2.9	–	80.0 ± 0.0
5,000	7.7	23.3 ± 10.4	6.5	53.3 ± 2.8	4.0	41.7 ± 2.9	8.9	51.7 ± 15.2	–	75.0 ± 7.0
10,000	15.5		12.2	26.7 ± 7.6	7.2	33.3 ± 7.6	17.1	30.0 ± 7.0	<0.1	31.6 ± 2.9

EC = Electrical conductivity of the solutions at 25°C (milimhos/cm) and G = Germination (%)
– = EC not measurable.

utions, separately. The additional germination, found after transferring the seeds from saline to non-saline media, is described below. In the case of NaCl, germination raised to 50%, 65%, and 45% respectively, from zero, proving that higher concentration of NaCl retards germination because of osmotic effects. Similarly, in the case of Na_2SO_4, the additional germination was 20%, 50% and 15% respectively, indicating that because of the lowering of osmotic potential of surrounding medium, the seeds failed to germinate at 10,000 ppm concentration. However, the immersion in the corresponding concentration of $MgSO_4$ and $CaCl_2$ was found toxic, as the additional germination was found to be 10%, 5%, 5% and 10%, zero, zero, respectively. The rate of seed germination was also speeded up after the transfer to non-saline medium. This may be of some significance under natural conditions because seeds that could not germinate under extreme salinity stress may have evolved a mechanism to rapidly germinate when the salt stress is relieved[3].

It is, therefore, evident from the data obtained that it is because of the combination of the two factors osmotic and ionic, that the seed germination is controlled. Since, the seeds of *S. fruticosa* can tolerate the moderate concentrations of different salts, it grows well in the salines of Indian desert.

Thanks are due to Prof. H. C. Arya, for facilities. Valuable suggestions from Dr D. C. Bhandari and financial assistance from CSIR to RBJ are also duly acknowledged.

8 December 1982; Revised 26 September 1983

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A BROOMRAPE (*OROBANCHE AEGYPTIACA*) FEEDING ON COTTON

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BROOMRAPES are achlorophyllus parasitic seed plants. They are leafless herbs of the family Orobanchaceae living on roots of other plants and produce whitish, yellowish, brownish or purplish stems above the ground. More than 130 species are recorded mostly from north temperate regions[1].

The parasite consists of stout fleshy stems covered by small, thin scaly leaves. The flowers appearing in the axil of leaves produce very small and black coloured seeds which remain viable in the soil for several years.

The radicular apex of the broomrape seedlings is directly transformed into the haustorial organ, which penetrates into the roots of the host from where it draws nourishment. The growth of the host is checked and it remains stunted and may even die as the parasite obtains all the nutrients from host.

Orobanche species feeding on Cotton

On cotton parasitic *Orobanche* is not known. We report here an *Orobanche* species which was observed