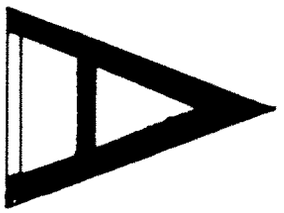

GERMINATION BEHAVIOUR

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"A seed is an end and a begining, it is the bearer of the essentials of inheritance, it symbolises multiplication, and dispersal, continuation and innovation, survival, renewal and birth." Heydekar (1973)

Seeds produced by plants, get dispersed in the immediate vicinity or get dispersed to far off places through various agents, would remain dormant till the onset of favourable conditions. Innumerable observations on germination responses have established that control of the process is exercised mainly through physical factors present in the environment. Experiments have also established that extent of these factors especially light, temperature and humidity which favour germination vary from species to species. Vegis (1963); Lang (1965); Amen (1968); Heydekar (1973); Mayer & Poljakof-mayber (1975); Marme (1977); Schoffer (1977); .mt3

Tavlorson and Hendricks (1977); Rolston (1978); Evenari (1980-81, 1984, 1985); Bewley & Black (1982); Sen (1982); Murray (1984); Khan (1977, 1984) and others have emphasised differences in germination responses of different plant species.

Although, the fundamental aspect of the seed is to germinate and produce its offspring, but seeds of many desert plant species exhibit some kind of inhibition of immediate germination. Dormancy period of seeds of arid-semiarid plant species varies from few months to few years. The dormancy exhibitted by these seeds could be due to

a) thick seed coat,

b) rudimentary embryos

c) physiologically immature embryos,

d) due to presence of inhibitors.

Germination of these seeds are also affected to a greater extent by unfavourable environmental conditions. The restricted distribution and small size of populations of few taxa could be reflection of the nature and germination behaviour of seeds and their distribution.

Germination studies over and above the morphological, micromorphological, cytological studies have been taken up with a view to getting a deeper insight into the reproductive strategies adopted by these plant species for their survival

mechanism under the arid-semiarid conditions.

Seeds of 10 taxa failed to germinatewhen tried for their germination under laboratory conditions though they showed imbibation. Treatment of seeds with various concentrations (0.25%, 0.5%, 1%) of Thiourea was tried to break the dormancy of seeds. Among the 10 taxa tried Pavonia arabica, Pavonia zeylancia, Indigofera argentea and Chascanum marrubifolium showed favourable response from 26% to 34% of germination to 1% Thiourea. Similar promotary effect of thiourea has been reported by Esashi et al (1979) and Subhash (1981).

Among the various pretreatments tried, soaking of seeds in hot water (70oc + 2oc) for 20 min. and their subsequent soaking in cold water (room temperature) for a period of 24 hrs. improved the germinability of seeds except those of Pavonia arabica, Pavonia zeylanica, Fagonia indica, var. schweinfurthii,Seddera latifolia and Chascanum marrubifolium. Seeds of Capparis cartilaginea showed 45.8% germination in response to their presowing soaking in normal water only. However, Acid scarification of seeds and their subsequent soaking enhanced the germination of seeds. The above treatment brought about 41% of germination in seeds of Abutilon pannosum and Launaea resedifolia.

Two plant harmones viz. Gibberelic acid (GA) and Indole-Acetic-Acid (IAA) have been tried at various concentration in isolation and in combination to better the germination of seeds. All the taxa tried showed an increase in the percentage of germination with increase in the concentration of plant hormones. The highest percentage (60%) of germination under the influence of 30 ppm GA was observed in the seeds of Senra incana and the lowest (28.4%) was observed in the case of Chascanum marrubifolium. The response of all other taxa to 30 ppm GA varied between 39% to 59%. IAA at a concentration of 30 ppm brought about the highest percentage of germination of 58.5% in the seeds of Abutilon pannosum. However, IAA, at the same concentration failed to improve the germination of seeds (24.8%) of chascanum marrubifolium to the same extent as that of Abutilon pannosum. Response of seeds of all other taxa to 30 ppm IAA varied from 42.5% to 56%. When these two hormones were tried in combination there was a marginal improvement in germination of seeds of Senra incana and Abutilon pannosum. A similar trend was also observed in the germination behaviour of Seddera latifolia and Chascanum marrubifolium. However, combination of harmones failed to show the same effect in the case of Capparis cartilaginea.

The observed failure of germination of seeds even after the imbibition of water clearly suggests the existence of

dormancy. This shows that seed coat is not impervious to water and gases (Come & Tissaoui (1973)). Thus, the observed inability of seeds to germinate may be due to the physiologically immature embryos or the presence of inhibitors. The improved germination of seeds observed following hot water treatment and subsequent soaking in water for a period of 24 hrs indicate the removal of some water soluble inhibitors (LaCroix & Staniforth, 1964 ; Brant et.al., 1971). However, the inability of seeds of Pavonia arabica, Pavonia zeylanica and Fagonia indica var. schweinfurthii to germinate even after soaking treatment reveals the presence of some other blocks of germination or the insufficient soaking period. The germination of seeds of the above taxa observed after acid scarification may be due to improved permiability of seed coat as observed by Brant et al (1971), Win Pe et al (1975) and Townsend & Mc Ginnies (1972) in Coronilla varia, Centrosema pubescence and Astragalus cicer.

The stimulation of germination of seeds noticed under the influence of GA and IAA clearly suggests the extremely low endogenous level of these hormones. The other possibility could be the masking of the effects of these hormones by inhibitors which could be removed to a great extent by the presowing soaking in water. The control of the process of germination by the inhibitor-promoter complex has been shown

in number of cases by various workers, viz. Frankland & Wareing (1966), Webb et.al.(1973), Wareing et. al. (1973), Tillberg (1977), Jones & Stoddart (1977), Wareing (1982), Tran and Cavangh (1984) and others.

The marginal improvement in germination of seeds observed under the combination of GA and IAA may be due to a slight additive effect of these hormones. (Kato, 1958 ; Karssen, 1989).

The presence of thick seed coat, inhibitors, low level of hormones, quiescent embryos coupled with the unfavourable environmental conditions may be responsible for the failure of seed germination or seed dormancy (Ballard, 1973 ; Thomas O' Toole, 1979 and Karseen 1980-81).

The extremely arid - semiarid conditions coupled with the action of soil microflora may be playing a important role in softening the thick seed coat and thus rendering it more permeable to moisture and gases. The endogenous inhibitors may be getting leached out during the rainy season. The low temperature prevalent during winter season also will be inducing the synthesis of promoters such as gibberelins. All the above mentioned sequence of events would be favouring the germination of few seeds represented by small sized populations. This could be one of the strategies of the

survival mechanisms of various taxa growing in the study area.

The observed meiotic abnormalities as reflected in low pollen fertility, occurrence of persistent tapetal cells, poor seed setting, coupled with unfavourable environmental conditions could be responsible for small population of various taxa. The presence of xeromorphic nature of plants having unique characteristics, macro and micromorphological features must be rendering tolérence mechanisms to the unfavourable conditions. A combination of the above mentioned factors may be responsible for restricted distribution and small population of various taxa under arid and semiarid conditions of study area. .pa

Table 13 : Effect of Thiourea, GA_3 ,IAA and GA_3 + IAA on germination of seeds of some selected Plant Taxa

TAXA TREATMENTS	Water Room temp.	Hot water 70°+ 2°c	Thiourea			GA_3 in ppm				IAA in ppm				GA_3 + IAA in ppm			
			0.25%	0.5%	1 %	5	10	20	30	5	10	20	30	5	10	20	30
Capparis carti-laginea	45.8					33.3	40.0	46.8	58.8	39.4	40.0	46.7	55.6	30.6	36.6	44.0	48.6
* Abutilon pannosum	-	34.5 40.6				28.9	36.6	40.6	55.5	30.0	43.6	53.0	58.5	26.5	39.7	50.4	61.2
* Pavonia arabica	-	0.0 22.4	12.1	16.3	34.4	18.4	28.0	31.9	40.1	21.9	26.0	34.5	45.6	29.0	32.7	40.7	51.7
* Pavonia zeylanica	-	0.0 26.8	23.5	28.4	32.5	21.0	24.0	30.7	39.4	20.0	26.1	32.6	40.0	20.0	26.7	36.6	42.0
* Senra incana	-	20.5 36.6			33.6	40.0	49.8	60.0	31.3	36.6	46.6	56.4		33.4	47.3	52.3	64.7
* Fagonia indica var. schweinfurthii	-	0.0 20.6				20.4	24.4	32.6	40.6	21.4	26.6	30.5	37.5	20.2	23.4	28.7	37.6
* Indigofera argentea	-	0.0 26.6	6.0	20.0	31.2	13.4	20.2	36.2	50.2	14.4	17.5	27.4	46.6	20.4	28.2	36.7	50.1
Launaea resedifolia	-	28.7 41.0				39.7	40.7	45.8	54.0	40.0	42.0	46.0	56.0	38.6	41.7	49.0	60.6
Seddera latifolia	-	26.6				17.4	28.4	32.4	39.6	19.8	29.0	36.1	42.5	18.4	22.2	37.4	48.2
* Chascanum marrubifolium	-	12.5	10.9	14.5	26.6	6.8	8.4	15.5	28.4	7.4	11.4	18.6	24.8	10.4	20.0	27.6	35.4

* Acid scarification coupled with hotwater presowing soaking treatment. All figures indicate percentage germinations of seeds