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BRIEF COMMUNICATION

Temperature Responses of Seeds in *Ipomoea pes-tigridis* L.

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Abstract. Nine categories (*a*—*i*) of seeds in *Ipomoea pes-tigridis* showed diverse germination responses at desiccating high temperatures (65 °C). These nine "generative ecotypes" have assured the persistance of their race by producing sets of seeds suitable for a set of temperature conditions in the Indian desert, where high desiccation of seeds is a major natural controlling factor.

The fundamental aspect of a seed is to germinate and produce its offspring but seeds of many species exhibit some kind of inhibition to immediate germination even when the environmental conditions are favourable for the onset of germination. Seed-coat inhibition is probably a common cause of dormancy in most of the arid zone plants which entirely prevents absorption of water (AMEN 1968, MISRA 1963).

Temperature is considered to be one of the most important factors in germination regulating mechanism and a special agent in certain conditions for breaking dormancy in seeds of arid zone plants. SEN and CHATTERJI (1965) reported that seeds of *Calotropis procera* could stand the dry heat of high temperature without affecting normal germination. The present paper is especially concerned with the temperature responses of the nine different types of seeds of *I. pes-tigridis* (BHATI and SEN 1977). Studies were carried out under laboratory conditions as well as in natural conditions in the field.

All the nine types of seeds (BHATI and SEN 1977) were collected from nine different plants from the environs of Jodhpur. Seeds were taken out of the capsule, cleaned and stored in plastic bottles under laboratory conditions. The initial weight of 100 seeds (one year old) was taken in replication and the seeds of each were divided into two lots. The first lot of seeds was kept for dry heat pretreatment in an oven at 65 °C for different durations and seeds of the second lot were kept in nine plots of 4 × 4 m for natural heat treatment from 13th March to 28th June 1977 when the rain came. The oven desiccated seeds were weighed for their moisture loss and kept for

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TABLE 1
Variability in *I. pes-tigridis* L. showing a differentiation into several forms

Leaf character	Categories	Seed colour	Seed indumentum, hair length [μm]	Weight of 100 seeds [mg]	Seed size L	Seed size B
Simple entire or slightly dissected	*a*	Yellow	Sparse, 15	2360	4.0	3.00
	b	Yellowish brown	Sparse, 15	2582	4.5	3.50
	c	Brown hairy	Sparse, 15	2080	4.5	3.50
	d	Blackish — brown smooth	Absent, 0	2110	4.0	2.50
Highly dissected 3—5 lobes	*e*	Black smooth	Absent, 0	1920	4.0	3.00
Highly dissected 5—11 lobes	*f*	Black	Sparse, 33	2055	4.0	2.50
	g	Black	Dense, 51	1630	4.0	2.75
	h	Black	Dense, 66	1530	3.5	2.00
	i	Black	Dense, 75	1215	3.0	2.00

L = length; B = breadth.

germination. The germination experiment was carried out in 9 cm Petri dishes lined with a single layer of filter paper under continuous light (1000 lx) at 30 ± 2 °C. The criterion of germination was visual detection of radicle protrusion. All the tests were replicated, each set being in triplicate and each Petri dish contained 10 seeds.

Ipomoea pes-tigridis is one of the most common rainy season weeds in the cultivated fields of the Indian arid zone. Nine categories of seeds (*a*—*i*) were collected from different plants. These seeds differ in size, weight and colour and they have smooth or differently hairy seed-coats. Seeds of categories *a*, *b*, *c* and *d* are yellow, brown, brown with few hairs and blackish brown smooth, respectively, produced on different plants bearing simple or slightly dissected leaves, while seeds of category *e* are black and smooth, produced on plants bearing highly dissected leaves with 3—5 lobes. Seeds of categories

TABLE 2
Percentage moisture loss after different durations of dry heat pretreatment [h] in seeds of *I. pes-tigridis* (*a*—*i*)

Categories	Time [h] 24	48	72	96	120
a	12.2	12.2	12.2	12.2	12.2
b	5.0	5.0	5.4	5.4	5.4
c	2.5	2.5	2.5	7.5	7.5
d	9.0	9.0	9.0	9.0	9.0
e	10.0	10.0	10.0	10.0	10.0
f	9.0	9.0	9.0	9.5	9.5
g	1.0	1.5	1.5	1.5	1.5
h	0	0	0	0	0
i	0	0	0	0	0

TABLE 3

Effect of dry heat pretreatment at 65 °C for different durations [h] on percentage germination of nine categories of seeds of *Ipomoea pes-tigridis* L. Observations were made after 4 days

Categories	Dry heat pretreatment [h]					
	0	24	48	72	96	120
a	100	100	100	100	100	100
b	100	100	100	100	100	100
c	100	10	10	10	5	0
d	100	0	0	0	0	0
e	90	30	0	0	0	0
f	60	30	20	20	20	10
g	40	20	15	10	10	10
h	0	5	5	10	10	15
i	0	5	5	10	10	20

f, *g*, *h* and *i* are black in colour but they differ in the size and hair growth on the seed coat. They are produced on different plants bearing highly dissected leaves with 5—11 lobes. Details of nine categories of seeds are given in Table 1.

The normal seeds of *Ipomoea pes-tigridis* categories *a*—*e* showed 100% germination, and that of categories *f* and *g* showed 60 and 40 per cent of germination while that of categories *h* and *i* showed no germination. When these seeds were provided with dry heat pretreatment for 24, 48, 72, 96 and 120 h, seeds of categories *c*, *d*, and *e* developed dormancy and showed no germination while *f* and *g* showed very poor germination and that of categories *h* and *i* started showing germination but seeds of categories *a* and *b* remained unaffected. Moisture loss of different seeds due to dry heat pretreatment was also observed (Table 2). It is evident from Table 2 that the highest moisture loss (12.2%) was observed in category *a* while there was almost no moisture loss in categories *h* and *i*.

Data on effect of dry heat pretreatment are presented in Table 3. It is evident from this table that seeds of categories *c*, *d* and *e* showed no germination, while in control condition in which no dry heat treatment was given they showed 100, 100 and 90% germination thus showing inducement of dormancy which is secondary in nature. Further, it is also evident that seeds of catogeries *a* and *b* showed no effect but those of categories *f* and *g* showed lowered inhibition in percentage of germination when compared with control. It is also interesting to note that seeds of categories *h* and *i* started germinating though they were initially dormant.

Experiments carried out in natural condition also showed inducement of dormancy in seeds of categories *c*, *d* and *e*, while initially dormant seeds of categories *h* and *i* started showing germination and the remaining categories *a*, *b*, *f* and *g* showed germination as usual.

Restriction of germination to a relatively narrow range of temperatures may be regarded as an adaptation that aids in delimiting the season in which the plant can start its life cycle. It would thus be of particular adaptive value in regions or habitats where temperature is the most variable environmental factor (JUHREN *et al.* 1956, WENT 1949, 1952, SEN 1977). A response to pretreatment with high temperatures which has been reported in seeds of oil palm is considered as an adaptation to a tropical climate with a severe dry season (REES 1961).

SHARMA and SEN (1974) reported that in *Merremia dissecta* and *M. aegyptia* hard seed-coat dormancy is not primary in nature. They also said that the desiccation of seeds was achieved slowly, spreading over a number of days, after which they presented hard seed-coat dormancy, a secondary development for which the structure differentiation had already taken place. BOHRA and SEN (1974) observed that in black and yellowish black seeds of *Crotalaria medicaginea* when given dry heat pretreatment at 70 °C for 6 days, a higher percentage of germination was observed in the latter than in the former. In the present investigation it was observed that seeds of categories *c*, *d* and *e* developed dormancy which is secondary in nature, while an increase in germination percentage was observed in seeds of categories *h* and *i*.

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