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ECOLOGICAL STUDIES ON SEED GERMINATION OF *BORRERIA ARTICULARIS* (LINN.) F.N. WILL

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Borreria articularis seed dormancy is due to some inhibitors, can be removed by thorough washing. Storage or cold + heat pretreatments followed by washing were found effective. The differencial dormancy and duration of washing pretreatment of seeds collected in various months might be the reason of emergence of seedlings in flushes after each rain.

Keywords : Seed germination; Dormancy.

Introduction

Borreria articularis, a kharif season agrestal, appears in flushes after each showers in semi-arid farming. In agrestals, dormancy is often highly developed or it may be that certain plant species have become weeds because of highly developed systems of dormancy they have evolved[1]. Seed germination studies of *B. articularis* have been reported[2-4] without revealing the mechanism by which the seedlings of this agrestal able to appear in flushes after each monsoon showers in semi-arid farming. And thus, the present study is aimed to understand the adaptive mechanism involved.

Materials and Method

Seeds of *B. articularis* were collected during the months of September, October and November for two consecutive years with ten replicates for each month. The morphological parameters of size, weight of hundred seeds were recorded using precalibrated microscope and monopan balance, respectively. The viability of seeds was tested using 0.1% TTC solution[5].

For seed germination studies, seeds were incubated in presterilized petridishes lined with single layer of filter paper and moistened with distilled water. Twenty seeds were employed for each petridish, treatments were tetraplicated, and performed in controlled growth room (1000 lux; 28± 2°C) conditions. Various seed pretreatments viz., dry heat (60°C), chilling (4°C), washing in running tap water were given to simulate natural conditions to which the seeds are exposed.

Results and Discussion

Early maturing seeds of *B. articularis* were light brown in colour, whereas the late ones were dark brown. In all collections, however, the colour changed to dark brown due to storage. The seeds were ellipsoidal in shape with one round and other truncate ends. Dorsal side was smooth but on ventral side there was a deep groove. Seeds produced during September and November were smaller in size and weigh less as compared to the seeds of October (Table 1). Fresh and one year old seeds exhibited only

Table 1. Seed morphological parameters and viability of *B. articularis*

Parameters \a	Collections during		
	September	October	November
Size (mm)			
Length	2.20 ± 0.4	2.40 ± 0.5	2.00 ± 0.7
Breadth	1.09 ± 0.6	1.60 ± 0.3	1.20 ± 0.6
Weight (mg 100^{-1})	292.0 ± 3.6	342.8 ± 2.2	195.5 ± 15.8
Colour	Light brown	Reddish brown	Dark brown
Viability (%)	100	100	100

\a = Data are based on mean of two years.

Table 2. Effect of different pretreatments on the percentage seed germination of *B. articularis*

Treatments\a	Duration	Germination\b
Control	-	13.3 ± 5.8
Storage	one year	16.7 ± 5.8
Heat	one month	16.7 ± 5.8
Cold	one month	10.0 ± 0.0
Washing	one day	43.3 ± 5.8
Heat + cold	one month each	26.7 ± 5.8
Cold + heat	one month each	40.0 ± 10.00
Heat + cold + washing	one month each & one day washing	63.3 ± 5.8
Heat + cold + washing	one month each & two days washing	70.0 ± 10.0
Cold + heat + washing	one month each & one day washing	70.0 ± 10.0
Cold + heat + washing	one month each & two days washing	100 ± 0.0

\a = For seeds of October collection only; \b = Results after ten days and percent mean data are based on two years, except storage treatment.

Table 3. Effect of washing in running water on the percentage seed germination of *B. articularis* collected in various months.

Collection month	Duration of washing (days)	Germination			
		Fresh\a		One year stored\b	
		I	II	I	II
September		-	3.3 ± 5.8	-	13.3 ± 5.8
October	0	-	13.3 ± 5.8	-	16.7 ± 5.8
November		-	-	-	
September		-	36.7 ± 5.8	-	40.0 ± 0.0
October	1	-	43.3 ± 5.8	-	56.7 ± 5 . 8
November		-	-	-	36.7 ± 5.8
September		13.3 ± 5.8	40.0 ± 10.0	30.0 ± 10.0	60.0 ± 10.0
October	2	26.7 ± 5.8	56.7 ± 5.8	36.7 ± 5.8	70.0 ± 10.0
November		-	-	-	63.3 ± 5.8
September		30.0 ± 10	56.7 ± 5.8	-	-
October	3	40.0 ± 10	70.0 ± 10.0	-	-
November		-	3.3 ± 5.8	-	-
September		33.3 ± 5.8	63.3 ± 5.8	-	-
October	4	36.7 ± 5.8	70.0 ± 10.0	-	-
November		-	10.0 ± 10.0	-	-

\a = Results after ten days and the percent mean data are based on two years; \b = Results after ten days and the percent mean data are based on one year; I = Germination recorded in running water; II = Germination recorded in petridish; - = No germination / Not performed.

13.3% and 16.7% germination, respectively, indicating some dormancy mechanism of the seeds. Pretreatments of cold and heat, when employed individually showed no enhancement of germination. However, significant increase in percent germination was recorded when seeds were pretreated with cold + heat and washed in running water. Pretreating the seeds in cold plus heat, one month each, followed by washing for two days removed the dormancy completely and cent percent germination was recorded (Table 2). It was found that washing in running tap water increased percent germination from 3.33 to 63.33, 16.33 to 70, and 0.0 to 10% (fresh collections); 13.3 to 60, 16.7 to 70 and 3.3 to 63.3% (one year stored) for seeds collected during September, October and November, respectively. Germination percentage increased when one year stored seeds were pretreated in running tap water for different number of days and required lesser duration of washing. Cent percent germination could be obtained for September and October collections, but November col-

lection showed a maximum of 63.3% germination (Table 3). Thus, it is clear from these studies that the dormancy is due to some inhibitors which are removed upto certain extent by thorough washing. Storage or cold plus heat pretreatments followed by washing were found effective to achieve cent percent germination, except for November collections and the seeds showed differential dormancy, being least in October collections.

The presence of germination inhibitors in seeds has been reviewed[6], *Alternanthere sessilis* seeds possess inhibitors in the pericarp and washing the seeds prior the germination was effective to improve germination percentage[7]. Seeds of *Stipa* spp. which failed to germinate in any light, temperature and scarification conditions, showed an increase in germination when seeds were kept in running water. Fluctuating temperatures induced fracturing of the seed coats and also easy leaching of water soluble inhibitors that existed in seed coat. This attributed to the higher percentage of germination of *B. articularis* seeds which were pretreated in alternating tempratures and then washed in running water. A combination of all such conditions normally exists in the crop fields of arid zone, which thus become an ideal habitat for the establishment of *B. articularis*. The differential duration requirement of washing for seeds collected in various months might be the reason of emergence of *B. articularis* seedlings in flushes after each monsoon rain.

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