

Effect of Temperature and Light on the seed germination of *Sida cordifolia* L.

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Abstract- *Sida cordifolia* commonly known as Indian ephedra belongs to family Malvaceae. The present paper highlights the effects of temperature and light exposures on the seed germination of *Sida cordifolia*. Seeds of *Sida cordifolia* were germinated temperature 40°C. The maximum seed germination % was recorded at 12 hours storage in refrigerator at 5-7 °C and 12 hours in oven at 100 °C. Blue light accelerates germination percentage. The best results were obtained during rainy and summer seasons while in winter seasons the percentage of germination becomes low.

Index Terms- *Sida cordifolia*, Temperature, Light exposures and Seed germination.

I. INTRODUCTION

Sida cordifolia L. is a perennial herb of the family Malvaceae. It is common weed of gardens, cultivated fields and waste lands. The plants grow in open, partial shaded and dens shaded places, both in grazed and ungrazed areas. The species is also reported on disturbed grounds such as cleared areas in forest found in boggy and marshy places. [1]

Sida cordifolia Linn. (Malvaceae) syn. Country Mallow is a small, erect, downy shrub. The leaves of the plant are cordate-oblong or ovate-oblong and fruits with a pair of awns on each carpel. Roots of the plant which constitute a drug are 5 - 15 cm long with few lateral roots of smaller size. The shrub grows up to 0.75 - 1.5 meters in height. The leaves are 2.5 - 7 cm long and 2.5 - 5 cm broad, with 7 - 9 veins. They are heart shaped, serrate and truncate. The flowers are small, yellow or white in color, solitary and axillaries. The fruits are moong-sized, 6 - 8 mm in diameter. [2]

Seed germination and early seedling growth are considered the most critical phases for establishment of any species and thus it is often emphasized that tolerance of seeds to various stresses during germination should be determined. Seed germination is an important stage of plant growth which is controlled by environmental factors as well as by physiological processes [3]. Dormancy of seed, especially those of arid zone plants are biologically significant in speeding or delaying germination until the environment is favourable for the development and establishment of seedlings. [4]

In the present study effect of temperature and light exposures were examined on the seed germination percentage in different seasons.

II. MATERIALS AND METHODS

Study sites

The study area is situated between 81°-15' east longitude and 24°-42' north latitude and is situated on Vindhya plateau at the height of 318 meter above m. s. l. The climate is mainly sub tropical and sub humid. The average annual rainfall of the region is 82.953 mm and relative humidity is 79.36 %. Present work was done in the four selected field of Rewa i.e. Kothi Compound, Civil Lines, A. G. College and Kuthuliya (Bichhiya). Information regarding the distribution of *Sida cordifolia* L. incorporated from various literatures, such as Flora of Madhya Pradesh [5], the wealth of India (vol. VI) and Indian Medicinal Plants (Kirtikar and Basu Vol. I to IV). [6]

Physiology of seed germination

The seeds of plant *Sida cordifolia* were collected from different localities for germination studies during the years 2005-2007. The seeds were preserved in glass stoppered bottles after getting cleaned and air dried, in a cool dry place at room temperature. Germination experiments were carried out extensively during the year 2005-2007. Germination of seeds was tried in between the moist filter papers place on moist cotton pads inside sterilized petridishes. A counted number of seeds were taken in each petridish. The observations were recorded daily and the germinated seeds were removed from the petridishes after counting. The observations in all sets were continued for atleast twenty days and were stopped when no further germination took place continuously after the specified period.

There were many methods given to break the dormancy of seeds and also observed the seed germination of *Sida cordifolia*.

Temperature treatment

To study the effect of temperature on breaking of the dormancy of seeds, different temperatures were given. 50 seeds were selected for each set and presoaked in water inside the petridishes for 24 hours. Then these seeds were incubated at different temperatures from 25°C to 60°C for 12 hours. After this treatment, seeds were set for germination.

Low and high temperature treatment

Three sets of selected soaked seeds were kept at low temperature i.e. inside refrigerator and high i.e. inside oven at 100°C for 12-12, 24-24 and 48-48 hours. Then germination response was calculated during the months of November – December (winter season).

Treatment with different monochromatic light

Soaked seeds of *Sida cordifolia* were exposed for germination under different cellophane paper viz blue, green, yellow, red and blue-red together (for far red) to obtain germination responses.

Effect of different light exposures in different seasons

Freshly collected seeds of *Sida cordifolia* in different seasons viz. rainy, winter and summer seasons during the years of 2005-2007 were used the study of different light exposures on seed germination. The petridishes were put in the five different light exposures like control (normal day and night cycle), continuous light, strong light, diffuse light and continuous darkness.

III. RESULTS AND DISCUSSION

Sida cordifolia L. belongs to family malvaceae, commonly known as “Indian ephedra” because of the presence of alkaloid ephedrin. In Hindi it is known as “Vatya” and in English it is known as “Country Mallow”. *Sida cordifolia L.* is a perennial herb of the family Malvaceae. It is common weed of gardens, cultivated fields and waste lands. [7]

Germination is a crucial phase in the life cycle of seed plants. An angiospermic seed may appear simple externally but has a complex ecophysiology for its germination mechanism. Seeds of many species exhibit some kind of inhibition for immediate germination, even when the environmental conditions are favourable for onset the process. [8]

Temperature plays an important role in germination of seeds. The results of effect of temperature treatment on seed germination are tabulated table 1 and 2. We have found the maximum germination percentage at 40°C. The germination percentage increases with increasing temperature upto 40°C but it decreases when temperature increasing from 40°C. There is no germination at 60°C. Seeds of *Sida cordifolia* go on losing their germinability with the increasing period of temperature in hours. Thermo control of seed germination in various species has been investigated by Dutta and Sen (1983). [8]

Table 3 shows that the alternate temperature treatment is quite effective in increasing the germination percentage of seeds. The best duration for such a treatment, however is limited to 12 hours storage in refrigerator at 5-7°C and 12 hours in oven at 100°C, after which the percentage germination becomes very low.

Table 4 shows that the percentage of germination did not change significantly from that of normal germination during winter season. Only blue light however accelerates germination percentage. The yellow and far-red light does not have any marked effect on the percentage of seed germination while the effect of green and red light was found to be nil on germination of *Sida cordifolia* seed. The germination percentage in seeds of *Sida grewioides* and *Sida spinosa* were studied by Chavan and Sen (1973). [9]

The results of different light exposures on germination percentage of *Sida cordifolia* seeds are tabulated table 5, 6 and 7. There is not any marked effect of light on the germination percentage of *Sida cordifolia* seeds. However, only accelerates the germination process. Sen, *et. al.*, 1966 [10] had also reported

that light was an important factor affecting the germination of seed. A similar result was observed.

Table 1 – Effect of Temperature treatment at 12 hours on the seed germination *Sida cordifolia L.*

S. No.	Temperature Treatment	Germination % in 20 days
	Control	80
1	25 ^o C	10
2	30 ^o C	12
3	35 ^o C	16
4	40 ^o C	20
5	45 ^o C	14
6	50 ^o C	11
7	55 ^o C	4
8	60 ^o C	Nil

Table 2 – Effect of Temperature treatment on the seed germination *Sida cordifolia L.*

S. No.	Duration in hours	Germination % in 20 days
	Control	80
1	6	18
2	12	17
3	18	16
4	24	12
5	30	10
6	36	6
7	42	4
8	48	Nil

Table 3 – Effect of alternate temperature treatment on the seed germination percentage of *Sida cordifolia L.*

S. No.	Duration of treatment given in hours	Germination % in 20 days
	Control	80
1	6 hr. Refrigerator (5-7 ^o C) and 6 hr. oven (100 ^o C)	48
2	12 hr. Refrigerator (5-7 ^o C) and 12 hr. oven (100 ^o C)	69
3	24 hr. Refrigerator (5-7 ^o C) and 24 hr. oven (100 ^o C)	36
4	48 hr. Refrigerator (5-7 ^o C) and 48 hr. oven (100 ^o C)	6

Table 4 – Effect of monochromatic light on the seed germination percentage of *Sida cordifolia L.*

S. No.	Duration of treatment given in hours	Germination % in 20 days
	Control	80
1	Blue	30
2	Green	Nil
3	Yellow	10

4	Red	Nil
5	Far red	10

Table 5 – Effect of different light exposures on the seed germination percentage of *Sida cordifolia* L. during rainy season

S. No.	Light Exposures	Germination % in 20 days
	Control	80
1	Continuous light	70
2	Strong light	74
3	Diffuse light	48
4	Continuous darkness	64

Table 6 – Effect of different light exposures on the seed germination percentage of *Sida cordifolia* L. during winter season

S. No.	Light Exposures	Germination % in 20 days
	Control	80
1	Continuous light	16
2	Strong light	22
3	Diffuse light	18
4	Continuous darkness	10

Table 7 – Effect of different light exposures on the seed germination percentage of *Sida cordifolia* L. during summer season

S. No.	Light Exposures	Germination % in 20 days
	Control	80
1	Continuous light	16
2	Strong light	24
3	Diffuse light	32
4	Continuous darkness	16

IV. CONCLUSION

Sida cordifolia L. is a perennial branched herb of the family Malvaceae. The seeds of *Sida cordifolia* have a viability period of 21 months. Germination initiation, germination speed and germination percentage were noted to be better in fresh seeds. Temperature lays an important role in the seed germination.

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