

## ALLELOPATHIC EFFECT OF *LANTANA* EXTRACTS ON SPORE GERMINATION OF *RICCIA BILLARDIERI* MONT ET NEES

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Allelochemicals present in different plant parts of *Lantana camara* affected the process of spore germination. Its root, stem and leaf contain some harmful chemicals, which inhibited the spore germination of *Riccia billardieri* Mont et Nees. Root extract of *Lantana* had little adverse effect on the process of spore germination while the leaf extract affected the process most adversely. The probable reason may be the presence of higher concentration of allelochemicals in the leaf extract than that of the stem and root. Maximum spore germination was observed in control and with the increase in concentration of extract the percentage of germination decreases.

**Key words:** *Lantana*, *Riccia billardieri*, spore germination, allelopathy

Plants produce chemicals that directly or indirectly influence the environment. These chemicals are called allelochemicals. Allelopathic chemicals from *Lantana camara* are able to repel other plants. Reports are available on allelopathic interactions of different plants. However, very little work has been done on allelopathic effects of *Lantana* on bryophytes. Wadhvani and Bhardwaja (1981) studied the effect of *Lantana camara* L. extract on spore germination of fern *Cyclosorus dentatus* (Forsk.) Ching, and reported that *Lantana* leaf extract was found to be most potent in its inhibitory action.

Chaudhary and Kothari (2002) studied the allelopathic effects of *Lantana camara* on spore germination of *Bryum cellulare* Hook. The study revealed that root, stem and leaf extracts not only retarded the time taken for spore germination but also the percentage spore germination. Kothari and Chaudhary (2001) also reported that extracts of root, stem and leaf of *Lantana camara* proved inhibitory for germination of the spores of *Asterella angusta* Steph. a thalloid liverwort. Allelopathic effects may

be due to the presence of allelochemicals in *Lantana camara* (Raghavan 1976) like phenolic compounds, triterpenoids, essential oils and flavonoids. Therefore, an attempt has been made to carry out experiments on certain physiological processes such as spore germination which is responsible for the spread of Liverworts year after year in nature.

### MATERIALS AND METHODS

Fresh material of *Lantana camara* was collected from Udaipur and root, stem and leaves were dried in oven at 80°C for 24 hours. These plant parts were then chopped into small pieces and 10 g each of root, stem and leaves was soaked separately in 100 ml double distilled water for 24 hours. This extract of each organ was filtered with simple filter paper and autoclaved at 15 lb pressure for about 15-20 minutes and required percentage (2, 4, 6, 8, 10, 15, 20, 30, 40%) were prepared by adding half Knop's liquid medium. Spores of *Riccia billardieri* were collected from Udaipur, India. To prepare spore suspension in double distilled sterilized water, the capsules were first surface sterilized with 2% solution of calcium hypochlorite, before rupturing them to liberate the spores. The 0.01 ml spore suspension containing approximately 30-40 spores was spread in petri-dishes lined with Whatman's filter paper no. 1, moistened with different concentrations of *Lantana* root, stem and leaf extract in half Knop's liquid culture medium. The medium was prepared by dissolving  $\text{NaNO}_3$  (0.375 gm),  $\text{CaCl}_2 \cdot \text{H}_2\text{O}$  (0.125 gm),  $\text{KH}_2\text{PO}_4$  (0.125 gm),  $\text{MgSO}_4$  (0.125 gm),  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$  (4.00 mg) in one litre of double distilled water. One litre of medium was supplemented with one ml of modified Nitsehe's trace element. The



**Table-1:** Showing effect of different concentrations of leaf, stem and root extract of *Lantana camara* on *Riccia billardieri* spore germination at 10<sup>th</sup>, 20<sup>th</sup> and 30<sup>th</sup> day in Half Knop's medium.

Concentration	On 10 <sup>th</sup> day				On 20 <sup>th</sup> day				On 30 <sup>th</sup> day				
	LRE	LSE	LLE	Mean	LRE	LSE	LLE	Mean	LRE	LSE	LLE	Mean	
Control	42.570	42.570	42.570	42.570	54.500	54.500	54.500	54.500	63.240	63.240	63.240	63.240	
2%	28.940	23.330	18.695	23.655	41.150	24.985	19.660	28.598	44.990	30.890	23.775	33.218	
4%	20.685	15.890	10.635	15.737	26.065	17.045	13.675	18.928	31.250	26.330	20.585	26.055	
6%	16.595	11.510	9.025	12.377	21.665	14.345	12.490	16.167	26.930	23.920	15.090	21.980	
8%	12.125	9.100	4.930	8.718	15.260	12.600	8.005	11.955	23.190	21.415	11.605	18.737	
10%	8.275	5.830	0.000	4.702	14.580	10.535	3.725	9.613	15.265	16.495	6.520	12.760	
15%	4.930	3.290	0.000	2.740	11.785	7.725	0.000	6.503	14.115	13.805	3.375	10.432	
20%	0.000	0.000	0.000	0.000	8.310	3.935	0.000	4.082	10.905	7.710	0.000	6.208	
30%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.815	0.000	0.000	2.272	
40%	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Mean	13.412	11.152	8.585	11.050	19.332	14.567	11.206	15.035	23.671	20.381	14.419	19.490	
SEm	1.25	1.25	1.25	0.721	1.14	1.14	1.14	0.657	0.74	0.74	0.74	0.43	
CD 5%	3.61	3.61	3.61	2.1	3.289	3.289	3.289	1.899	2.133	2.133	2.133	1.23	
Extract Medium (m)													
SEm			0.395				0.36				0.234		
CD 5%			1.141				1.104				0.675		
Mean square of different days for spore germination													
Source	d.f.			10 <sup>th</sup> day				20 <sup>th</sup> day				30 <sup>th</sup> day	
Between extracts (m)	2			116.657**				333.441**				439.776**	
Between concn. (c)	9			1104.75**				1627.76**				2088.32**	
M x C	18			10.129**				26.62**				25.744	
Error	30			3.122				2.594				1.091	

\*\*Significant at 1% level of significance: LRE - *Lantana* Root Extract; LSE = *Lantana* Stem Extract; LLE = *Lantana* Leaf Extract

cultures were maintained at  $22 \pm 2^\circ\text{C}$  temperature. Three replicates were used in each case and observations were recorded using stereoscopic binocular microscope (Olympus).

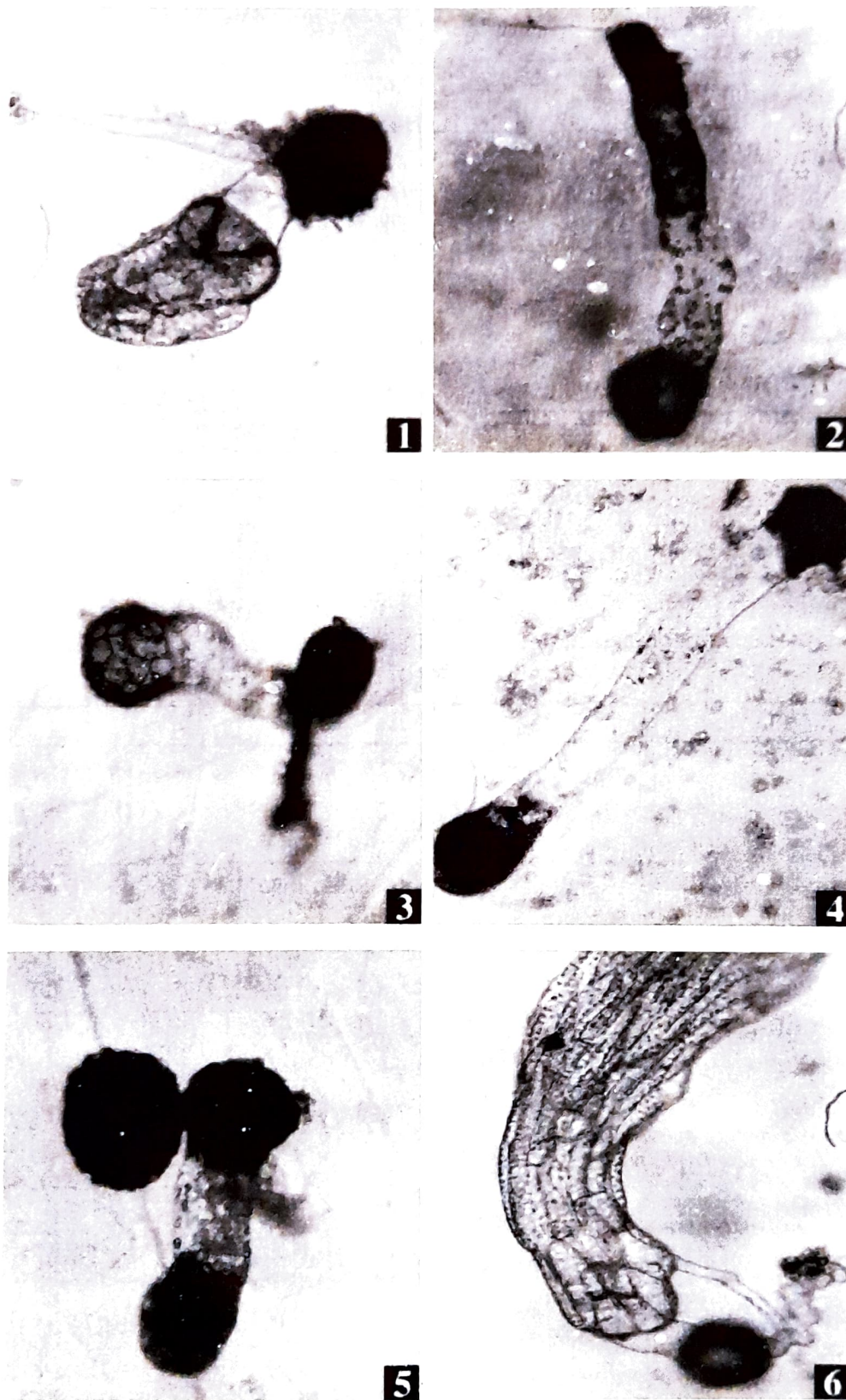
## RESULTS AND DISCUSSION

On 10<sup>th</sup> day, Table (1) shows that addition of different extracts resulted in decrease in regeneration per cent as compared to control. The highest regeneration was recorded in control, which was 42.57%. The regeneration was observed only up to 15%(4.93) concentration of root extract, 15%(3.29) concentration of stem extract whereas 8%(4.93) of leaf extract. The mean value for regeneration per cent was maximum for root extract (13.41) followed by stem extract (11.15) and leaf extract (8.58). It is evident from the mean values that there was complete inhibition of regeneration in 20 % of

concentration and above.

At 20<sup>th</sup> day, the maximum per cent of regeneration was observed in control i.e. 54.5%. In root extract the regeneration was observed up to 40%(6.67). The regeneration was observed upto 20%(8.31) concentration of stem extract and 10 % (3.72) concentration of leaf extract. The mean value for regeneration per cent was maximum for root extract (19.332) followed by stem (14.57) and leaf extract (11.20). Further it is seen from the mean values that regeneration occurred from 5% concentration to 20% concentration.

It was observed that the percentage of regeneration increased with the passage of time. At 30<sup>th</sup> day, control resulted in highest percent of regeneration i.e. (63.24). In root extract, the regeneration was observed upto 30% (6.81). The



Figures 1-6: Effect of different extracts of *Lantana* on Spore germination of *Riccia billardieri* in Half Knop's medium (HKM)  
Fig. 1 HKM (control); Fig.2 15% *Lantana* root extract; Fig. 3 30% *Lantana* root extract; Fig. 4 8% *Lantana* stem extract; Fig. 5 10% *Lantana* stem extract; Fig.6 2% *Lantana* leaf extract



regeneration was observed upto 20% (7.71) concentration of stem extract and 15% (3.38) of leaf extract. The mean value for regeneration per cent was maximum for root extract (23.67) followed by stem (20.38) and leaf extract (14.42). Table (1) shows that increase in concentration resulted in respective decrease of regeneration per cent.

It is revealed from statistical analysis that between concentrations difference was significant. The difference between different extracts (root, stem and leaf) was significant. and their interaction was also significant on 10<sup>th</sup>, 20<sup>th</sup> and 30<sup>th</sup> day.

Leaf extracts of *Lantana* inhibited the spore germination process to the maximum as compared to stem and root. Root extract least affected the process of spore germination. Our results were similar to Kothari and Chaudhary (2002,2001) who found that the extracts of *L. camara* inhibited the spore germination of *Bryum cellulare* Hook. and *Asterella angusta*. This effect may be attributed to the maximum percentage of allelochemicals in the leaf extract. Allelochemicals are present in decreasing order in leaf, stem and the root extract. This might be a dominant factor in the disappearance of *Riccia* in the habitats occupied by *Lantana camara* varieties. With the increase in concentration the process of spore germination was progressively decreased. An increase in the period spore

germination occurred as compared to control. The probable reason for this effect may be due to the degrading effect of the extract with increase in time period. As stated by Rice (1984) the various phenolic compounds released by different parts of *Lantana camara* might be adversely affecting the spore germination.

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