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Allelopathic Effect of Phyllanthus Niruri on Parthenium Hysterophorus L.

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Abstract—*Biodiversity is variability in species of living being on earth. It is important for healthy environment, because it plays a major role in ecosystem. So, we need to conserve it. But, because of natural and human interference, this biodiversity is come in threaten category. Natural and semi natural destruction is mainly caused by invasion of alien species. In the recent years, it is seen that competition between native and alien species gain momentum in nature. Alien species are pervasive threat and it is driver of global environment change contributing to the loss of biodiversity. A number of alien species are unwanted in a specific location for a number of reasons, so called them as weeds. Parthenium hysterophorus L. is found to be the second most densely populated deadly and aggressive weed with allelopathic properties. This research study have been reported with common naturally occurring weeds as controlling agents for Parthenium hysterophorus, because some other allelopathic weeds and plants to suppress the weed infestation is the most cost effective and environment friendly method for weed control. The current study was conducted to test the inhibitory potential of aqueous extracts of root, stem and leaves of weed species Phyllanthus niruri on seed germination and seedling growth of Parthenium hysterophorus L. under laboratory conditions. The aerial parts are most effective part of plant. The radicle was more inhibited in petri dishes. Inhibitory effect increases with increasing aqueous extract concentration. Therefore, further investigations will be required under green house and field conditions for pragmatic recommendation of species selection in the frame of weed species mediated ecological management of Parthenium hysterophorus L.*

Keywords*: DE = days extract; RL = root length; SL = shoot length; d= dry; rd = root dry.*

1. INTRODUCTION

Biodiversity is variability in species of living being on earth. It is important for healthy environment, because it plays a major role in ecosystem. So, we need to conserve it. But, one of the main threats to biodiversity in the world is the destruction of habitats by natural and human interference. Natural and semi natural destruction is mainly caused by invasion of alien organisms which has been recognized as one of the serious and inestimable problem because existing aliens do not disappear and sometimes continue to spread. So, they are called as pervasive threat and it is important driver of global environment change. Invasive species are the growing problem for the world both ecologically and economically. In the recent years, creating competition between native and alien species has gain momentum. Numerous plants are reported to possess allelopathic potential and effort has been made to use them in weed control. Natural products release from allelopathic plants may help to reduce the use of synthetic herbicides for weed management. *Parthenium hysterophorus* L. is found to be the second most densely populated deadly and aggressive weed, which is attributed to its allelopathic properties. The present study is the observation that *Parthenium hysterophorus* L. plants are very scanty from fields infested with some other allelopathic weeds and utilizing allelopathic plants to suppress the weed infestation is the most cost effective and environment friendly method of weed control.

Phyllanthus niruri, commonly known as Stone breaker or bhumyamalaki, belongs to family Euphorbiaceae. It is common kharif weed found in both agricultural fields and wasteland. It is originated in India and occurring as winter weed throughout the hotter parts. It is also distributed throughout tropical and sub tropical regions. The plant is annual herb, in which flowering and fruiting occur in July-August. It has allelopathic properties, due to wide range of photochemical, so spread vigorously and covers large area. Therefore, an allelopathic approach has been tried under this investigation for controlling *Parthenium hysterophorus* L. Because, use of some other allelopathic weeds and plants to suppress the weed infestation is the most cost effective and environment friendly method for weed control.

2. MATERIAL AND METHODOLOGY

Aqueous extracts of leaves, stem and root of *Phyllanthus niruri* were obtained by soaking 25 g fresh plant material in 100 ml water for 3 days, 5 days, 7 days, 9 days and 11 days at room temperature. Extract were filtered and stored in refrigerator. Seeds of *Parthenium hysterophorus* L. were sown on twice folded filter paper seed beds in sterilized petri dishes. Filter papers were moistened with aqueous extracts of root, stem and leaves of different concentrations while control received in water. There were 15 seeds in each plate. Petri

plates were incubated for 3DAS, 5DAS, 7DAS, 9DAS, 11DAS, 13DAS, 15DAS, 17DAS and 19DAS. At each above mentioned time, number of seed germinated and their root and shoot lengths were recorded.

3. OBSERVATION

Phyllanthus niruri (Root Extract)

TABLE 1: Number of seed germinated

Extract / Day after sowing	3DE	5DE	7DE	9DE	11DE
3DAS	nil	1	1	2	nil
5DAS	nil	1	1	2(d)	nil
7DAS	nil	1	1	2(d)	nil
9DAS	3	2(1d)	1(d)	2(d)	nil
11DAS	3	2(d)	1(d)	2(d)	nil
13DAS	4(1rd)	2(d)	dry	2(d)	nil
15DAS	4(1rd)	2(d)	dry	dry	nil
17DAS	4(2rd)	2(d)	dry	dry	nil
19DAS	4(3d+1rd)	2(d)	dry	dry	nil

TABLE 2: Seedling growth (Len. of Root)(in cm)

Extract	3DE	5DE	7DE	9DE	11DE
Day after sowing	RL	RL	RL	RL	RL
3DAS	nil	1.00	1.20	1.80	nil
5DAS	nil	1.70	1.45	0.95	nil
7DAS	nil	1.50	1.66	0.95	nil
9DAS	1.40	1.25	1.20	dry	nil
11DAS	1.66	1.35	0.80	dry	nil
13DAS	1.60	dry	dry	dry	nil
15DAS	1.58	dry	dry	dry	nil
17DAS	1.53	dry	dry	dry	nil
19DAS	1.68	dry	dry	dry	nil

TABLE 3: Seedling growth (Len. of Shoot)(in cm)

Extract	3DE	5DE	7DE	9DE	11DE
Day after sowing	SL	SL	SL	SL	SL
3DAS	nil	nil	2.20	0.80	nil
5DAS	nil	nil	2.45	0.40	nil
7DAS	nil	nil	2.40	0.40	nil
9DAS	0.80	0.20	2.20	dry	nil
11DAS	1.40	dry	2.10	dry	nil
13DAS	1.40	dry	dry	dry	nil
15DAS	1.45	dry	dry	dry	nil
17DAS	1.43	dry	dry	dry	nil
19DAS	1.50	dry	dry	dry	nil

Phyllanthus niruri (Stem Extract)

TABLE 1: Number of seed germinated

Extract / Day after sowing	3DE	5DE	7DE	9DE	11DE
3DAS	nil	nil	nil	nil	nil
5DAS	nil	nil	nil	nil	nil
7DAS	1	nil	1	nil	nil
9DAS	2	nil	1(d)	nil	nil
11DAS	2(d)	nil	1(d)	nil	nil
13DAS	2(d)	nil	dry	nil	nil
15DAS	2(d)	nil	dry	nil	nil
17DAS	2(d)	nil	dry	nil	nil
19DAS	3(d)	nil	dry	nil	nil

TABLE 2: Seedling growth (Len.of Root) (in cm)

Extract	3DE	5DE	7DE	9DE	11DE
Day after sowing	RL	RL	RL	RL	RL
3DAS	nil	nil	nil	nil	nil
5DAS	nil	nil	nil	nil	nil
7DAS	1.20	nil	0.60	nil	nil
9DAS	1.24	nil	0.80	nil	nil
11DAS	1.35	nil	0.80	nil	nil
13DAS	1.20	nil	dry	nil	nil
15DAS	1.00	nil	dry	nil	nil
17DAS	dry	nil	dry	nil	nil
19DAS	dry	nil	dry	nil	nil

TABLE 3: Seedling growth (Len.of Shoot)(in cm)

Extract	3DE	5DE	7DE	9DE	11DE
Day after sowing	SL	SL	SL	SL	SL
3DAS	nil	nil	nil	nil	nil
5DAS	nil	nil	nil	nil	nil
7DAS	1.10	nil	nil	nil	nil
9DAS	0.80	nil	nil	nil	nil
11DAS	0.65	nil	nil	nil	nil
13DAS	0.40	nil	dry	nil	nil
15DAS	0.44	nil	dry	nil	nil
17DAS	dry	nil	dry	nil	nil
19DAS	dry	nil	dry	nil	nil

Phyllanthus niruri (Leaves Extract)

TABLE 1: Number of seed germinated

Extract / Day after sowing	3DE	5DE	7DE	9DE	11DE
3DAS	nil	nil	7	5	nil
5DAS	nil	nil	7(d)	5(d)	nil
7DAS	nil	nil	8(d)	5(d)	nil
9DAS	nil	nil	9(d)	5(d)	nil
11DAS	nil	nil	7(d)	6(d)	nil
13DAS	nil	nil	dry	dry	nil

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15DAS	nil	nil	dry	dry	nil
17DAS	nil	nil	dry	dry	nil
19DAS	nil	nil	dry	dry	nil

TABLE 2: Seedling growth (Len.of Root) (in cm)

Extract	3DE	5DE	7DE	9DE	11DE
Day after sowing	RL	RL	RL	RL	RL
3DAS	nil	nil	1.86	2.20	nil
5DAS	nil	nil	1.84	2.00	nil
7DAS	nil	nil	1.66	2.00	nil
9DAS	nil	nil	1.64	1.86	nil
11DAS	nil	nil	1.64	1.80	nil
13DAS	nil	nil	dry	dry	nil
15DAS	nil	nil	dry	dry	nil
17DAS	nil	nil	dry	dry	nil
19DAS	nil	nil	dry	dry	nil

TABLE 3: Seedling growth (Len. of Shoot)(in cm)

Extract	3DE	5DE	7DE	9DE	11DE
Day after sowing	SL	SL	SL	SL	SL
3DAS	nil	nil	2.10	1.84	nil
5DAS	nil	nil	1.80	1.64	nil
7DAS	nil	nil	1.60	1.28	nil
9DAS	nil	nil	1.60	1.26	nil
11DAS	nil	nil	1.58	0.80	nil
13DAS	nil	nil	dry	dry	nil
15DAS	nil	nil	dry	dry	nil
17DAS	nil	nil	dry	dry	nil
19DAS	nil	nil	dry	dry	nil

4. RESULT AND DISCUSSION

From the present study this species provided a strong reduction on germination and early seedling growth of *Parthenium hysterophorus* L. under laboratory conditions in petri dishes. Inhibitory effects increased with increasing aqueous extract concentration of leaves, stem and root. *Parthenium hysterophorus* L. radicle was more inhibited in petri dishes.

Evidence showed that these plant release a diversity of allelochemicals viz. common lipids, sterols, alkaloids and flavanoids into the environment, which released by volatilization, root exudation, death and decay of plants and lecheates from living and decaying residues. These allelochemicals exhibit inhibitory responses on various morpho-physiological functions of receiver plants and such responses being observed to be dose dependent. There concentrations required for control of weeds on a field scale are impracticably higher. Therefore, further investigations will be required under green house and field conditions for pragmatic recommendation of species selection in the frame of weed species mediated ecological management of *Parthenium hysterophorus* L.

5. CONCLUSION

Increasing attention has been given to the role and potential of allelopathy as a management strategy for conservation of biodiversity against weeds. There is a great demand for compounds with selective toxicity that can be readily degraded by either the plant and by the soil micro organisms and provide new strategies for maintaining and increasing biodiversity in future.

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