

# Effect of Herbicides on Seed Germination and Morphology of *Parthenium Hysterophorus L.*

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**ABSTRACT:** The present investigation deals with the effect of two herbicides chlorophenoxy acetic acid (2, 4 - D) and 2, 4, -Trichlorophenoxy acetic acid (2, 4, 5 - T) on percentage seed germination and two morphological parameters viz. shoot-length and number of internodes of an obnoxious weed *Parthenium hysterophorus L.* It was observed primarily that both the herbicides inhibited seed germination. Higher the concentrations of the weedicides lower the germination percentage. Thereafter it was found that all the concentrations of 2, 4 - D and 2, 4, 5 - T reduced the shoot length as well as number of internodes of *P. hysterophorus*. In the light of observations made it can be concluded that 75 ppm of 2, 4, 5 - T is the most effective treatment in controlling the growth of this weed.

**Key words:** Herbicides 2, 4 - D, 2, 4, 5 - T, *Parthenium hysterophorus L.*, Germination, Morphology.

## I. INTRODUCTION

*Parthenium hysterophorus L.* is a rapidly growing obnoxious weed causing great threat to agriculture and soil fertility. It is also hazardous to human being as it causes asthma, general illness, irritation and cracking of skin. It is regarded as a curse for bio-diversity and farmers.

It is one of the ten worst weed in the world. In India it is rated as the worst weed of the last Century. It is an herbaceous annual or ephemeral member of the Asteraceae reaching a height of 2 m in good soil and flowering within 4-6 weeks. It is also reported that *Parthenium* weed has remarkable power of regeneration. It completes about three generations in a year.

It attracted our attention due to its negative impact on human being, animals and crops. Hence it was decided to find suitable herbicides, so that it can be eradicated without causing any harm to the ecosystem. Herbicides are often the most effective tool for control of weeds. It is a substance used to kill unwanted herbaceous

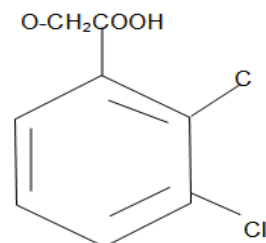
plants. Selective herbicide kills specific target while leaving the desired crop relatively unharmed.

For the present study 2, 4 - D & 2, 4, 5 - T selective herbicides have been selected after going through literature. Both are synthetic phytohormones. At higher concentration they are toxic to plant specially dicot plants. They are also non-toxic to human beings. Hence it was selected to study the effect of these herbicides on *Parthenium* weed to eradicate it.

The present study deals with the effect of above two herbicides on the percentage germination of seeds and morphology of *P. hysterophorus L.* in terms of shoot-length and number of internodes.

## II. MATERIALS AND METHODS

The herbicide 2, 4 - D Chlorophenoxy acetic acid (2, 4 - D) is one of the most commonly used herbicide in the world. It controls a wide number of broad leaf weeds while causing little to no injury to grass crop at normal use rate. The low cost of 2, 4 - D has also led to its continued usage today. It is an example of synthetic auxin (Plant hormone). Its organic & molecular formulae are as follows-

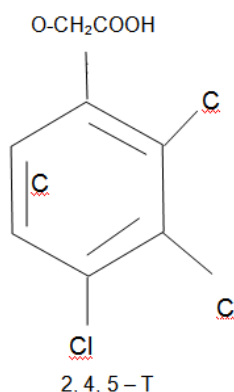


2, 4 - D

Molecular Formulae-  $C_8H_6Cl_2O_3$  Molecular Mass- 221.04 g/mole

2, 4, 5 - Trichlorophenoxy acetic acid (2, 4, 5 - T) is also a widely used broad leaf herbicide. It is of only moderate toxicity. It's organic & molecular

formulae are as follows-



Molecular Formulae-  $C_8H_5Cl_3O_3$  Molecular Mass- 255.48 g/mole

Ten percent solution of 2, 4 - D & 2, 4, 5 - T (spoulox) applied at 75 gallons per hectare gives complete kill of the weed Parthenium.

Seeds of Parthenium were obtained from Science College, Patna campus in the month of Different grades namely 25 ppm, 50 ppm, 75 ppm of herbicides 2, 4 - D & 2, 4, 5 - T were made in tap

water. For preparing these solutions 25, 50 and 75 mg of 2, 4 - D and 2, 4, 5 - T were dissolved in 1000 ml of water.

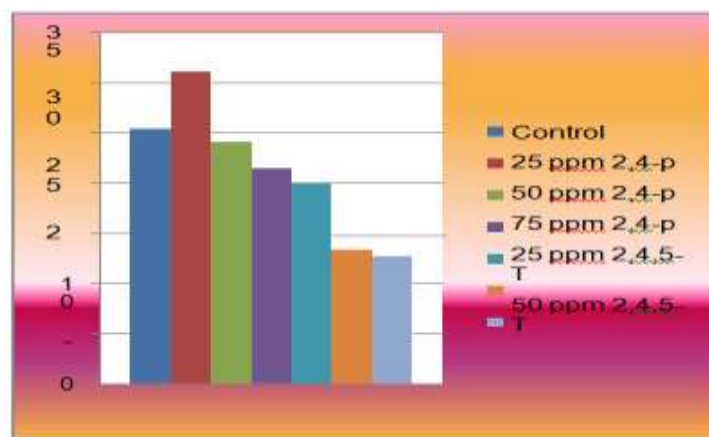
Uniform sized seeds were soaked in each of 25, 50 & 75 ppm solution of each of 2, 4 - D and 2, 4, 5 - T for 24 hours. Then 100 seeds of each treatment were spread on moist filter paper in Petri dishes. A set of 100 untreated seeds were also taken as control. After two days germination was counted. Emergence of radicle was taken as a parameter for germination of seeds.

Treated seeds in different concentrations and untreated seeds which act as control were sown in earthen pots of 12'' height containing garden soil and were allowed to grow. They were watered per week (after each seven days). When the plants reached maturity morphological growth was measured in terms of:

- ( I. ) Shoot length
  - ( II. ) Number of internodes
- ( I. ) Shoot length- Shoot length was measured after 30 days of plantation and a mean of five randomly selected plants was taken.

**Table 1.** Showing length of shoot in control and treated plants.

No.of Observati on	Control	2,4-D 25ppm	2,4-D 50 ppm	2,4-D 75 ppm	2,4,5-T 25 ppm	2,4,5-T 50 ppm	2,4,5-T 75 ppm
1.	27.8	28.6	26.2	20.0	14.2	19.8	19.7
2.	25.3	29.5	25.3	21.8	26.0	9.0	8.6
3.	29.2	34.0	27.0	22.2	22.0	14.0	13.2
4.	22.2	33.6	21.2	20.5	19.6	10.8	10.0
5.	22.6	29.6	21.0	20.8	17.8	13.0	12.0
Total	127.1	155.3	120.7	107.3	99.6	66.6	63.5
Mean	25.42	31.06	24.14	21.46	19.92	13.32	12.7

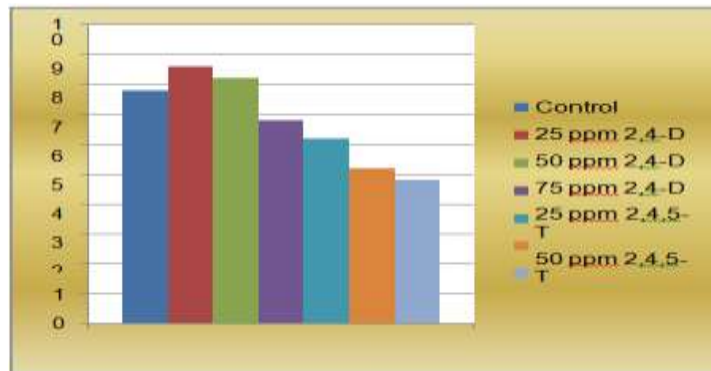


**HISTOGRAM 1.** Showing growth in control and treated plants.

( II. ) Number of internodes- Number of internodes was counted after 30 days of plantation and an average was taken for five randomly selected plants.

**Table 2.** Showing number of internodes in control and treated plants.

No.of Observation	Control	2,4-D 25 ppm	2,4-D 50 ppm	2,4-D 75ppm	2,4,5-T 25 ppm	2,4,5-T 50 ppm	2,4,5-T 75ppm
1.	8	8	7	7	8	6	5
2.	8	10	8	6	6	6	4
3.	7	8	10	8	5	4	5
4.	9	9	8	6	7	5	6
5.	7	8	8	7	5	5	4
Total	29	73	41	34	31	26	24
Mean	7.8	8.6	8.2	6.8	6.2	5.2	4.8



**HISTOGRAM 2.** Showing growth of internodes in control and treated plants.

### III. RESULTS AND DISCUSSION

The concept of weed control is as old as agriculture itself. As weed infestation seriously interfere with the production of crops, its removal from the crop is essential. Now a days chemical method for weed control is widely used.

In the present study the effect of two herbicides 2, 4 D and 2, 4, 5 – T has been studied on Parthenium hysterophorus L. This plant grows wild and poses a great threat to the mankind.

Different investigators have used different techniques to study the effect of herbicides, keeping in view their primary objective. In the present investigation pre-sowing soaking of seeds of P. hysterophorus in aqueous solution of 2, 4 – D and 2, 4, 5 –T was applied.

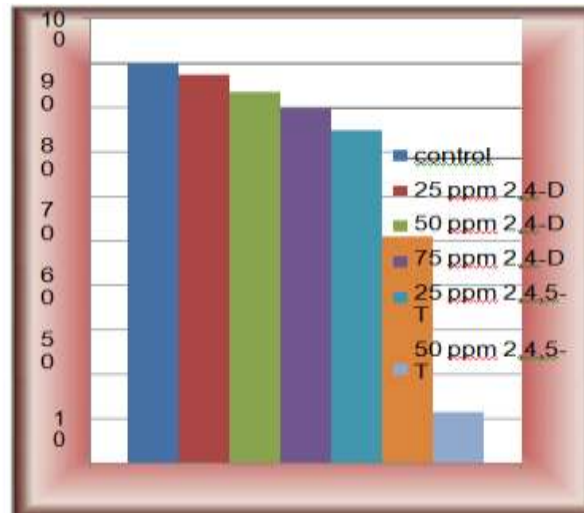
To start with, the effect of herbicides on germination of seeds was investigated.

#### Germination percentage

Treatment of seeds with 2, 4 – D and 2, 4, 5 – T significantly reduced the germination over control. Decrease in germination was observed with the increase in concentration of 2, 4 – D and 2, 4, 5 –T herbicides. Among all the treatments 75 ppm of 2, 4, 5 – T was found to be more effective in reducing the germination. The effectiveness of treatments in reducing the germination is in order of 75 ppm 2, 4, 5 – T > 50 ppm 2, 4, 5 – T > 25 ppm 2, 4, 5 – T > 75 ppm 2, 4 – D > 50 ppm 2, 4 – D > 25 ppm 2, 4 – D . (Table–3, Histogram–3)

**Table 3.** Percentage seed germination under control and different treatments of the two herbicides.

Observation/Treatment	1 <sup>st</sup> Reading	2 <sup>nd</sup> Reading	Mean
Control	90	90	90.0
2,4-D 25 ppm	87	88	87.5
2,4-D 50 ppm	84	83	83.5
2,4-D 75 ppm	80	80	80.0
2,4,5-T 25 ppm	73	74	75.0
2,4,5-T 50 ppm	52	50	51.0
2,4,5-T 75 ppm	11	12	11.5



**HISTOGRAM 3.** Showing germination under control and different treatments of the two herbicides. Saran and Mehta (1983) have observed an inhibition in germination by 10 and 100 ppm 2, 4, 5 – T.

The effect of the herbicides on growth was determined in terms of two morphological parameters. The morphological observations were made in terms of length of the shoot and number of internodes.

**Shoot length**

Seeds of *P. hysterophorus* treated with 25 ppm 2, 4 – D produced taller plants. Other two treatments of 2, 4 – D and all the three treatments of 2, 4, 5 – T used were found to be inhibitory on growth. Among all treatments, 75 ppm of 2, 4, 5 – T was found to be most effective in inhibiting the growth of the shoot. (Table-1, Histogram-1). The effectiveness in inhibiting the shoot growth is in order of 75 ppm 2, 4, 5 – T > 50 ppm 2, 4, 5 – T > 25

ppm 2, 4, 5– T > 75 ppm 2, 4 – D > 50 ppm 2, 4 – D > 25 pm 2, 4 – D .Sinha and Thakur (1961) observed complete control of nut grass by 2, 4 – D at 4 Kg/ha.

**Number of internodes**

The second morphological study was done on number of internodes. Plants treated with 25 ppm and 50 ppm of 2, 4 – D showed an increase in number of internodes over the control. 75 ppm 2, 4 – D and all the three treatments of 2, 4, 5 – T significantly reduced the number of internodes. Among the treatment 75 ppm of 2, 4, 5 –T was found to be more effective in reducing the number of internodes (Table-3, Histogram-3)



P.P.1 Effect of 2, 4 – D on growth of *P. hysterophorus*.



P.P. 2(i) & 2(ii) Effect of 2, 4,5 – T on *P. hysterophorus* L.

Bhapka (1960) reported complete killing of *Parthenium hysterophorus* L. by 2, 4 – Dichlorophenol and 2, 4, 5 – T. A decrease in seedling growth in *Parthenium* after 2, 4 – D treatment has been reported by Srivasu and Bakle (1989).

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