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# Efficacy of Chemical Weedicide and Bio Weedicides against *Parthenium Hysterophorus*

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**Abstract:** *Parthenium hysterophorus* is a noxious weed in many parts of the world including India. It may cause allergic respiratory problems, contact dermatitis, mutagenicity in human and live stock. Crop production is drastically reduced by its allelopathy. Also its aggressive dominance threatens biodiversity. Hence an integrated approach is necessary for its effective control. An experiment was carried out in laboratory of Kalaburagi University, Karnataka, India to study the effect of a chemical herbicide named Ammonium salt of Glyphosate 71% SG, aqueous plant extract of *Cassia sericea* as bio herbicide and commercially available Eucalyptus oil on the seeds of *Parthenium hysterophorus* which are collected from different parts of the Kalaburagi Karnataka. The 20 seeds of parthenium were placed in each sterile petri plates of 10 cm diameter with Whatman filter paper in it. The seeds are supplied with Ammonium salt of Glyphosate 71% SG. chemical solution of concentration 0.001%, 0.002%, 0.05%, 0.01%, 0.02% and same concentration of Eucalyptus oil, and also aqueous extract of *Cassia sericea* of concentration of 1%, 5%, 10%, 25%, 50% are observed to study the germination%, and Inhibition% of *Parthenium* seeds. The study revealed that as concentration of chemical herbicide increases the rate of germination of *Parthenium* seeds decreases. The highest inhibition (100%) was seen in 0.01, and 0.02% concentration and lowest is seen in 0.001% (86%) of chemical herbicide. And The plant extract of *Cassia sericea* also found to be inhibitory. The inhibition was maximum in 25%, 50% (100%) of *cassia sericea* whole plant extract. Also Eucalyptus oil showed increased inhibitory effect as concentration increases. Inhibitory effect is maximum in 0.05%, 0.01%, and 0.02%. So we can conclude that, plant extract of *Cassia sericea* and Eucalyptus oil has inhibitory effect on *Parthenium* seeds. The use of these plant extract, plant oil are more effective and eco friendly to control *Parthenium hysterophorus*. The allelopathic potential of plant extract of *Cassia sericea* and Eucalyptus oil could be exploited for *parthenium* weed management. In order to conclude meaningful results further research is suggested to investigate feasibility of commercial use of the plant extract and plant oils as bio herbicide.

**Keywords:** Allelopathy, Eucalyptus oil, Herbicides, *Parthenium*,

## I. INTRODUCTION

*Parthenium hysterophorus* L. is a plant belonging to family Asteraceae is a noxious weed native to the subtropics of North America, south America (Evans, 1997) and Africa (Tamado and Milberg 2000, 2004). It is considered as invasive and major weed pest in India, Australia, Ethiopia and many parts of the U.S (Oudhia, 2001). There are reports of total habitat change in native Australian grass lands, open wood lands, river banks and plains due to *Parthenium* invasion. (Ma Fayden, 1992). *Parthenium* probably entered India before 1910 (through the contaminated cereal grain), but went unrecorded until 1956. Since 1956, the weed has spread like wild fire throughout India. Most of Indian states currently under threat by *Parthenium* and occupied over 5 million hectares of land in the country (Anonymous, 2007) in. During last 50 years *Parthenium* is spreading at an alarming rate. In addition to various health hazards, a lot of available data also highlights its impact on agriculture as well as natural ecosystem (Chippendale and Penetta, 1994; Evans 1997). Infestation by *Parthenium* degrades in India. *P. Hysterophorus* competes strongly with crops such as sunflowers and in infested sorghum. Suppresses yield, as well as contaminating the grain samples. It is reported to cause yield loss up to 40% in several crops (Kosla and Sobti, 1979) and reduction in forage production up to 90% (Nath, 1988). The germination and growth of indigenous plants inhibited by its allelopathic effect (Deshpande et al. 2005). Regular contact with the pollen grains, air borne pieces of dried plant materials and roots of *Parthenium* can cause allergy – type responses to human beings. In animals, the plant can cause anorexia, pruritus, alopecia, dermatitis, diarrhea and even can cause death within 30 days if consumed in significant amount (10-50%) of the weed in the diet (Narasimhan et al. 1977). Manual uprooting of *Parthenium* before flowering and seed setting is the most effective method. This is possible when the soil is as wet. Uprooting the weed after seed setting will increase in the area of infestation. *Parthenium* is reported to be controlled by foliar spray of some chemical herbicides such as bromocil diquat, cloromuron (Javaid et al. 2006). Although herbicides are most effective immediate solution to most weed problems but increased use of these resulted in resistance and resurgence in pests. Further more, increasing public

concern on environmental issues requires alternative weed management systems, which are less pesticide dependent or based on naturally occurring (singh et al. 2003). Allelopathy, understood as the effect of chemical interactions between plants (Muller, 1976). Rice (1984) defined allelopathy is the effect(s) of one plant on other plants through the release of chemical compounds in the environment. These bioactive compounds are also known as allelochemicals (Whittaker and Feeney, 1971). Allelopathy is associated with *Eucalyptus* spp. Due to the presence of allelochemicals; several studies have demonstrated the release of phenol and volatile compounds in its foliage (Al-naib and Al-Mousawi, 1976). The antagonistic competitor like *Cassia uniflora* and *Cassia occidentalis* plants could replace *Parthenium hysterophorus* and therefore, had a potential for biological control (Singh N. P. 1983. Knox, J., Jaggi, Paul, MS, 2001). Fast growth rate, high reproductive potential and interference by allelopathy (Kohil and Rani 1994; Singh et al., 2005) are major factors for rapid spread and successful establishment of this weed in eco system. An integrated approach is necessary for control of *Parthenium*. The present study was carried out to compare the effect of a commonly used chemical herbicide, and allelopathic effect of another competitor weed *Cassia uniflora*, also commercially available *Eucalyptus* oil on *Parthenium hysterophorus*.

## II. MATERIALS AND METHOD

The laboratory based experiment was conducted to test the effect of common chemical herbicide Ammonium salt of Glyphosate 71% SG, aqueous plant extract of *Cassia sericea* and *Eucalyptus* oil on seed germination of *Parthenium hysterophorus*. The seeds of *Parthenium* are collected from different parts of Kalaburagi which is situated at 17.3297° N, 76.8343° E, is a city in Karnataka India. Twenty *Parthenium hysterophorus* seeds are placed in sterile petri plates with Whatman filter paper. The experiment was conducted in three steps. In first step the chemical herbicide named Ammonium salt of glyphosate 71% SG, is purchased from super market of Kalaburagi. The different concentrations 0.001%, 0.002%, 0.005%, 0.01%, 0.02%, are prepared by addition of water to Ammonium salt of Glyphosate 71% SG. In second step different concentrations of 1%, 5%, 10%, 25%, 50% of plant extract of *Cassia sericea* are prepared by collecting plants from different parts of Kalaburagi, Karnataka. They were washed with water and shade dried, then cut into small pieces and crushed the mixture into powder in grinder. 500g of powder was soaked in 1000 ml of water, the extract is kept for 24 hours. The extract was filtered through filter paper. This is considered as 100%. The required concentration of plant extract are prepared by adding appropriate quantity of water to it. This extract was applied to *Parthenium* seeds. In third step different concentrations of 0.01%, 0.05%, 0.1%, 1% commercially available *Eucalyptus* oil are applied on *Parthenium* seeds. Healthy seeds. The *Parthenium* seeds are applied with water are used as control. The whole experiment was set up in triplicates.

## III. RESULT AND DISCUSSION

*Parthenium hysterophorus* is a very noxious weed which is spreading in an alarming rate. It needs an integrated approach to its effective management. In this study an attempt is made to study the effect of a common chemical herbicide named Ammonium salt of Glyphosate 71% SG, aqueous plant extract of *Cassia sericea* as bio herbicide and commercially available *Eucalyptus* oil on the seeds of *Parthenium hysterophorus*. Seeds of *Parthenium hysterophorus* are collected from different parts of the Kalaburagi, Karnataka. Ammonium salt of Glyphosphate shows very inhibitory against *Parthenium* seeds than compared with control treatment. Inhibitory effect of chemical herbicide on *Parthenium hysterophorus* increases with the increase in concentration of the chemical herbicide. Inhibition effect of 0.001% Glyphosphate salt chemical herbicide is 86% (the germination% 14%). 0.002% of chemical herbicide shows inhibitory effect of 91% (germination % is 9). 0.005% of chemical herbicide has 94% of inhibitory effect (germination% of 6%). At 0.01% of chemical herbicide inhibitory effect was found to be 97% (germination% 3). And at 0.02% inhibitory effect was 100% (germination% nil) as shown in Table I. The aqueous extract of *Cassia sericea* also shows inhibitory effect on *P. Hysterophorus*. 5% aqueous extract *Cassia sericea* whole plant of bio- herbicide shows inhibitory effect of 88% (germination % was 12%). 10% of bio herbicide has 5% of inhibitory effect (germination% of 95%). At 25% of bio herbicide inhibitory effect was found to be 100% (germination% nil). And at 50% inhibitory effect was 100% (germination% nil) as shown in Table II. *Eucalyptus* oil shows very inhibitory effect against *Parthenium* seeds than compared with control treatment. Inhibitory effect of bio herbicide *Eucalyptus* oil on germination of *Parthenium hysterophorus* seeds increases with the increase in concentration of the *Eucalyptus* oil. Inhibition effect of 0.001% *Eucalyptus* oil is 70% (the germination% 30%). 0.002% of *Eucalyptus* oil shows inhibitory effect of 90% (germination % is 10%). 0.005% of *Eucalyptus* oil has 100% of inhibitory effect (germination% was 0%). At 0.01% of *Eucalyptus* oil inhibitory effect was found to be 100% (germination% was nil). And at 0.02% *Eucalyptus* oil inhibitory effect was 100% (germination% was nil) as shown in Table III.



#### IV. DISCUSSION

As we all know from many studies and survey showed that Parthenium spreading at very high alarming rate to large extent of large area covering huge damage to crop and environment. So an integrate approach is necessary to control the Parthenium. The present study reveal that the use of Eucalyptus species and cassia whole sale propagation recommended for use in biological control of Parthenium. Leachates from number of other plants have also been tested allelopathic effects on P, hysterothorus. Neem, Mulberry, and wide range of woody plants of leguminaceae Acacia species, Albizia lebbek. And Prosopis species (Dhawan et al 1996). The work with Marigold (*Tagetes erecta*) at national Research center for weed Sciences (Jabalapur, Madhya Pradesh) has shown this can readily out compete Parthenium hysterothorus in mixed stands. And oil extracts of many plants like Neem oil, Lavender oil also have inhibitory effect on Parthenium germination. So we Eucalyptus and Cassia are promising species which can compete with Parthenium in natural environment.

#### V. CONCLUSION

In present study an attempt was made to access the bio chemical interaction of Parthenium with bio and chemical weedicides. Shows that although the chemical weedicides are effective in small quantities to curb the Parthenium seed germination, the Cassia and Eucalyptus can also be used in biological control of Parthenium, through the mode of allelopathy. Cassia is considerably toxic to germination of Parthenium hysterothorus. Thus it provides eco friendly and environmentally safe approach to control Parthenium. Similarly, study also shows, that Eucalyptus oil has inhibitory effect on germination of Parthenium probably through allelochemicals. So further study is required to utilize Eucalyptus oil for weed management against weeds in crop and aquatic weed ecosystem.

#### VI. ACKNOWLEDGEMENT

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Table-- I Effect of Glyphosphate salt chemical herbicide on Parthenium hysterophorus seed.

Parthenium seeds treated with chemical weedicides	Germination%	Inhibition%
0.001% [10ppm]	14%	86%
0.002% (20ppm)	9%	91%
0.005% [50ppm]	6%	94%
0.01% (100ppm)	3%	97%
0.02% (200ppm)	Nil	100%
Control	70%	30%

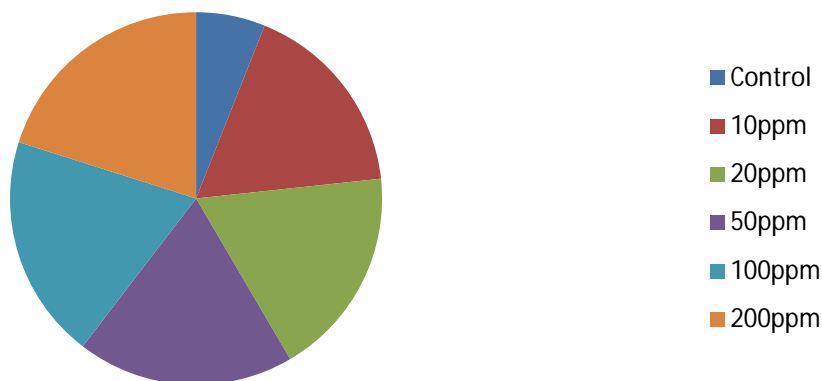
Table—2 DIPICTS THE EFFECT OF CASSIA Sercia Plant Extract on PARTHENIUM Hysterophorus Seeds.

Parthenium seeds treated with Cassia extract	Germination %	Inhibition%
Control	70%	30%
5%	12%	88%
10%	5%	95%
25%	--	100%
50%	----	100%

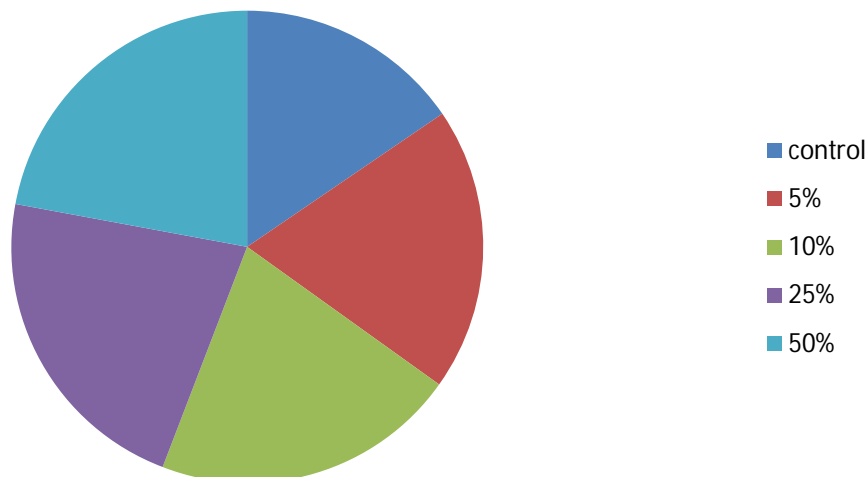
Table-3---Effect of eucalyptus oil on Parthenium seed

Parthenium seeds treated with Eucalyptus oil extract	Germination %	Inhibition%
Control	70%	30%
10ppm or 0.001%	30%	70%
20ppm, or 0.002%	10%	90%
50ppm, or 0.005%	nil	100%
100ppm, or 0.01%	nil	100%

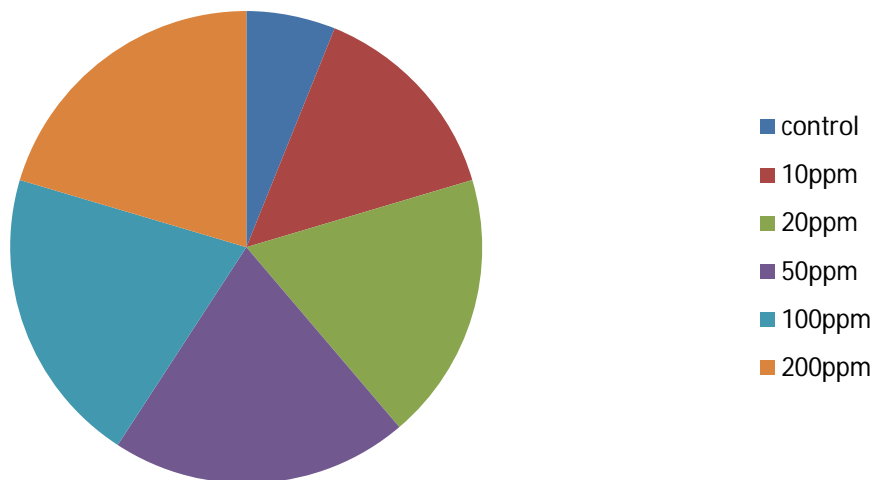
**Fig-1 Inhibitory effect of Ammonium salt of Glyphosphate on Parthenium seeds**



**Fig-2; Inhibitory effect of Cassia sercia on seeds of Parthenium**



**Fig-3; Inhibitory effect of Eucalyptus oil on Parthenium seeds**





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