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Effect of *Chebolic myrobalan* pods (*Terminalia chebula*) extract on *Parthenium* biomass

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Abstract

Field and laboratory experiments were conducted during 2020 at Tamil Nadu Agricultural University, Coimbatore with *Parthenium* seeds at laboratory experiment and field experiment to find out the effect of different plant extracts on reducing *Parthenium* biomass. The extract of chebolic myrobalan pods, *Datura metel*, *Cenchrus ciliaris*, *Abutilon indicum* and *Cassia sersia* was mixed with acid lime 25 and 50 per cent concentrations. The experiments were carried out in Completely Randomized Block Design and Randomized Block Design for laboratory and field experiments respectively. Increased concentration (50 and 75%) was pronounced more detrimental effects on per cent germination and seedling growth parameters of *P. hysterophorus*. The results are revealed that pre emergence or post emergence application (at rosette stage) of *Terminalia chebula* pods extracts + acid lime extract either with 25 or 50% of the *Parthenium* resulted reduced *Parthenium* seed germination, dry weight and higher *Parthenium* control efficiency.

Keywords: *Parthenium* biomass, *Terminalia chebula* and *Parthenium* control efficiency

Introduction

Parthenium (Parthenium hysterophorus L.) is an important annual invasive weed of the family Asteraceae. It is native to the subtropics of North and South America, and is now widely distributed in a number of tropical and subtropical countries of the world especially in India. (Arshad Javaid, 2011) [2]. This weed is a notorious for its competitiveness for soil moisture and nutrients, allelopathic effects and the hazards it poses to humans and animals (Evans, 1997) [3]. In Tamil Nadu, this weed is rapidly spreading in different districts and posing heavy competition for the cultivating crops and slowly replacing the domestic weed flora. *Parthenium* was very effectively controlled by usage of herbicides and several parts of Tamil Nadu the farmers widely using this herbicide for effective control. As a result of wide usage of herbicide leads to environmental issues. However, increasing public concern on environmental issues requires alternative weed management systems which are based on naturally occurring compounds (Javaid *et al.*, 2009 and Javaid and Adrees, 2009) [5, 6]. Use of Allelochemicals present in different plants emancipated as residues, exudates and leachates from leaves, stem, roots, fruits and seeds reported to interfere with growth of *Parthenium* (Asgharipour and Armin, 2010) [1]. With increasing societal concern regarding the harmful effects of chemical called herbicides on humans as well as on environment (Mehdizadeh *et al.* 2017) [9] an idea has been created to develop alternate eco-friendly approaches by using chebolic myrobalan pods (*Terminalia chebula*) extract and other plant extracts for the control of *parthenium*.

Materials and Methods

The Laboratory study was conducted during January and February, 2019 to find out the effect of aqueous leaf/plant parts extracts of botanicals on the control of *Parthenium*. The experiment were conducted with five botanicals with two concentration of acid lime extracts. The botanicals are *Datura metel*, *Terminalia chebula* pods, *Cenchrus ciliaris* plant, *Abutilon indicum* plant and *Cassia sersia* plant. All these plant extracts were prepared from the following methodology and the extracts been added with 25 and 50% acid lime extract concentration. The laboratory experiments were conducted with Completely Randomised Block design and the field experiments were conducted with Randomised block design with three replications.

The collected fresh leaves/plant parts of each botanical species will cut into small pieces, soaked in alcohol and water at 1:1 proportion, and kept for overnight. After 12hrs, soaked leaved will ground with the help of mixer grinder.

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From the paste, leaf extract of each botanical species is prepared by filtration which represented 100 per cent stock solution (Spripunitha, 2009) ^[10]. For acid lime extract, 100 per cent juice will be extracted from lime fruit and the dilution of 25 and 50 (v/v) concentrations were prepared by adding 100 per cent stock solution with appropriate quantity of distilled water and used as per the treatment schedule. For this study, 10 seeds of *Parthenium* will place in a 9 cm diameter petriplate lined with a filter and germination papers and moistened with 3ml different concentration of leaf extracts. The distilled water treatment alone served as control.

Poly house study was conducted during April 2019 to July, 2019. *Parthenium* seeds were sown in the two groups of plastic pots with total number of 45 each in the poly house and imposed the above treatments in two intervals. First group of treatments were imposed three days after sowing of the *Parthenium* and another group of treatments were imposed 20 days after sowing. Plants in the control treatment will sprayed with distilled water. Plants will be harvested after 2 weeks and data regarding root and shoot dry biomass will determined. The treatments replicated thrice and imposed Completely Randomized Block design. Based on the results of laboratory and poly house studies, field experiment was conducted at *parthenium* infested field during August, 2019 to December, 2019 with best first seven treatments combinations. The treatments were imposed with Randomised block design with three replications as Post emergence application on 20 DAS.

The data collected from experiments were subjected to statistical analysis by the method suggested by Gomez and Gomez (1984) ^[4] and whenever the results were found significant critical differences were worked out at five per cent probability level.

Results and Discussion

The results of laboratory study revealed that, application of different plant parts extracts influenced the germination of the *Parthenium* seeds. There was inhibitory effect of plant extract viz., *Terminalia chebula pods* + 50% acid lime extract and *Terminalia Chebula pods* + 25% acid lime extracts on the *Parthenium* seed germination while inhibitory effect on germination of *Parthenium* by the rest of the plant extracts also comparatively higher.

The same trend of the results was obtained in the poly house study in case of first group of the treatments. Where, the control treatment recorded higher germination than other treatments. Whereas, in the group two, application of *Terminalia chebula pods* + 50% and 25% acid lime extract treatments at rosette stage of *Parthenium* were recorded lowest Plant height, root length and dry weight of *Parthenium* (Table 1). Root length was also adversely affected by methanol extracts of various plant extracts used. This might be attributed to rapid drying of the *parthenium* due to the contact action *Terminalia chebula* Pods power with acid lime extract. (Knox and Jaggi, 2011) ^[7]

Parthenium control efficiency (PCE) indicates the comparative magnitude of effective reduction of *Parthenium* dry weight by treatments over control and was highly influenced by different plant parts extracts with acid lime extract. POE *Terminalia chebula pods* + 50% acid lime extract on 20 DAS (rosette stage) recorded higher *parthenium* control efficiency (Fig. 1). The reason was that POE *Terminalia chebula pods* + acid lime extract either with 25 or 50% resulted in killing of *parthenium* due to direct contact and inhibition of growth due to the allelochemicals present in *Terminalia chebula* which finally led to reduced dry weight or biomass of *parthenium*. (Manikandan and Rejula 2008) ^[8].

Table 1: Effect of Plant extracts on *Parthenium* Shoot and Root Length (cm)

SN	Treatments	Parthenium shoot length (cm)			Parthenium Root Length (cm)		
		7 DAS	15 DAS	25 DAS	7 DAS	15 DAS	25 DAS
T ₁	<i>Datura metel</i>	2.3	4.0	5.6	1.30	3.01	4.61
T ₂	<i>Terminalia chebula pods</i>	1.2	2.1	2.3	1.20	1.10	1.30
T ₃	<i>Cenchrus ciliaris plant</i>	1.3	2.3	3.2	1.30	1.30	2.21
T ₄	<i>Abutilon indicum plant</i>	1.2	2.1	2.9	1.20	1.10	1.91
T ₅	<i>Cassia sersia plant</i>	2.3	4.0	5.6	1.30	3.01	4.61
T ₆	<i>Datura metel</i> + 25% acid lime extract	1.3	2.3	3.2	1.30	1.30	2.21
T ₇	<i>Terminalia chebula pods</i> + 25% acid lime extract	1.6	2.8	3.4	1.60	1.81	2.41
T ₈	<i>Cenchrus ciliaris plant</i> + 25% acid lime extract	2.0	3.5	4.9	1.00	2.51	3.91
T ₉	<i>Abutilon indicum plant</i> + 25% acid lime extract	1.4	2.4	3.2	1.40	1.40	2.21
T ₁₀	<i>Cassia sersia plant</i> + 25% acid lime extract	1.9	3.3	4.6	1.90	2.31	3.61
T ₁₁	<i>Datura metel</i> + 50% acid lime extract	1.6	2.8	3.9	1.60	1.81	2.91
T ₁₂	<i>Terminalia chebula pods</i> + 50% acid lime extract	1.5	2.6	3.1	1.50	1.61	2.11
T ₁₃	<i>Cenchrus ciliaris plant</i> + 50% acid lime extract	2.3	4.0	5.6	1.51	3.01	4.61
T ₁₄	<i>Abutilon indicum plant</i> + 50% acid lime extract	1.3	2.3	3.2	1.20	1.30	2.21
T ₁₅	<i>Cassia sersia plant</i> + 50% acid lime extract	1.3	2.3	3.2	1.34	1.30	2.21
T ₁₆	Control	2.3	4.0	5.6	1.43	3.01	4.61
	S.Ed	0.03	0.09	0.31	0.02	0.91	1.03
	CD (P= 0.05)	NS	0.21	0.54	NS	NS	NS

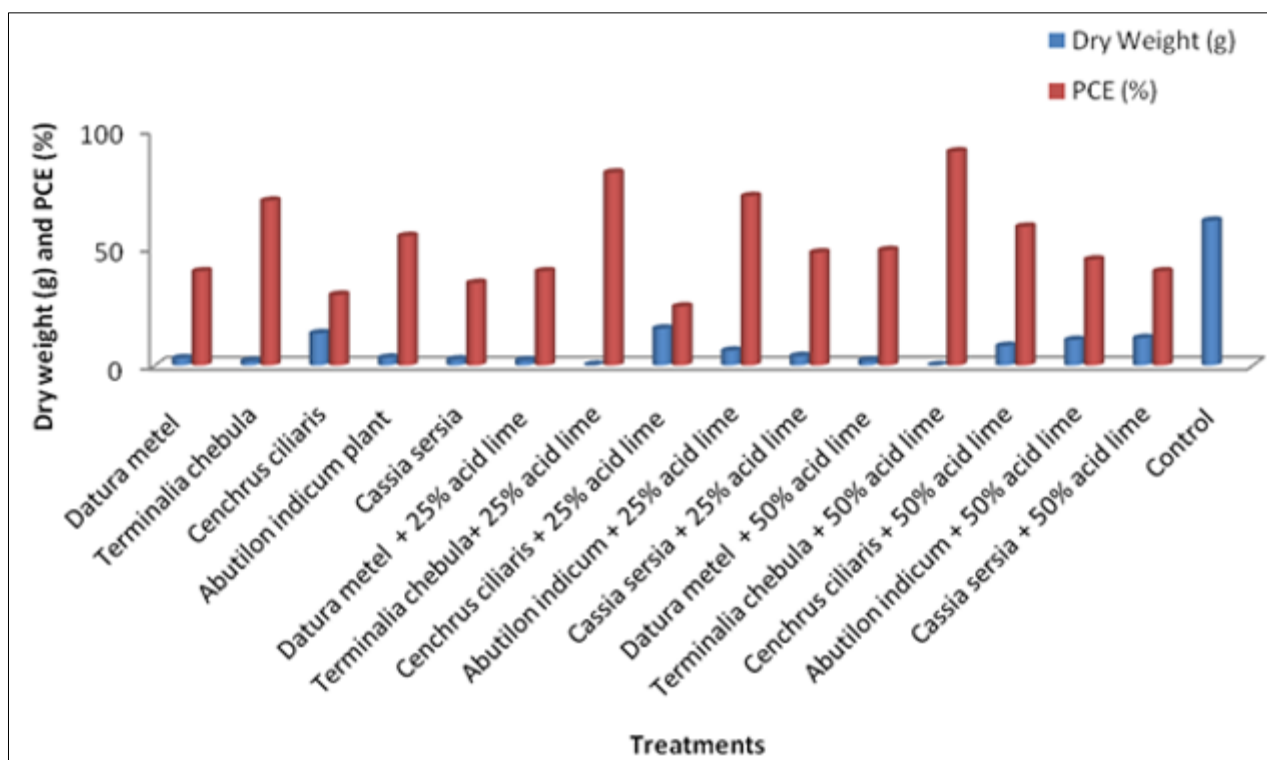


Fig 1: Effect of Plant extracts on Parthenium dry weight and control efficiency

Conclusion

From the experiments conducted at three different levels, it could be concluded that, pre emergence or post emergence application (at rosette stage) of *Terminalia chebula pods* extracts + acid lime extract either with 25 or 50% of the Parthenium resulted reduced Parthenium seed germination, reduced dry weight or biomass and higher Parthenium control efficiency.

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