IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)
e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 10, Issue 4 Ver. II (Apr. 2016), PP 35-38
www.iosrjournals.org

Alternative Uses of Shoot Biomass Produced by Partheniumhysterophorus L. in Abandoned Cropland.

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Abstract: *In Partheniumhysterophorus invaded vegetation developed after nine years of abandonment of cropland,shoot biomass production estimation study was conducted in Auguest 2015 (peak growth period) in about 240ha land of J.P.UniversityChapra campus. Altogether thirteen species were recorded including P.hysterophorus. The live shoot biomass value for Parthenium was 3205.32 gm^{-2} and for other species it ranged from 1 to 330.72 gm^{-2}. For other species minimum value $1gm^{-2}$ was for Alysicarpusmonoliferand maximum value $330.72gm^{-2}$ for Dicanthiumannulatum. Total shoot biomass value was 3992.24 gm^{-2}. Partheniumcontributed about 80.3% of the total shoot biomass. About 0.78 $t.ha^{-1}$shoot biomass was produced by P.hysterophorus. Alternatively the shoot biomass produced by Partheniumcan be used as a raw material as feed, stock, forage, compost, green manure or as herbicide, pesticide, insecticide, ethanol, synthesis of nanoparticles, feed additive for silkworm, decolorizing agent etc.*

Keywords: *Parthenium , Shoot biomass , Relative shoot biomass , Alternative uses*.

I. Introduction

Congress grass(Partheniumhysterophorus L.) an exotic weed which is introduced in India in 1955 in Pune through the imported food grains and belongs to Asteraceae family, it is also reported that congress grass has remarkable power of regeneration (Dhawan and Dhawan 1996). It can adopt any climate very easily and it spreads at an alarming rate all over India.It is a noxious weed species which has infested fallow and cultivated lands in tropical Asia North America etc. An active chemical parthenin,a terpenoide is the major content in this plant. Allelochemicals are derivatives of plants and cause germination failure and reduce biomass in many weeds and crops(Khan et al. 2004,2005). Many therapeutic herbicides are derived from Partheniumfor weed control(Duke et al.2002). Tamado et al.(2002) have reported that the seeds of Parthenium was>50% after 26 months of burial in the soil and that the 'half-life' of seeds in the soil was3-4 years.Parthenium can be utilized as a source of organic matter to prepare its compost. It increases the agricultural production yield in comparison to other chemical fertilizers and minimizes the water requirement to the crop due to enormous power of water holding capacity. The compost of Parthenium is the rich source of macro and micro-nutrients, vitamins, enzymes, antibiotics and growth hormones. P. hysterophorus can form dense pure stands underneath plant residues, and seeds accumulate and render the soil unsuitable for other vegetation(Kohli and Batish 1994).

In recent years the uses of weeds for beneficial purposes are recommended by several scientists such asParthenium can be used as asource of herbal medicine, compost, green manure, herbicides, insecticides, feed, forage and in industries for paper making, dicolorization of dyes etc. Thus the shoot bimass produced by Parthenium has many uses.

The present study was conducted to evaluate the levels of shoot biomass produced in nine year old fallowland by Partheniumhysterophorus.Partheniumweed is most frequent species at the study site.

II. Materials And Methods

A study was conducted for the estimation of shoot biomassin J.P. University Chapra campus in the month of September, 2015. The university campus was established about nine years ago in about 240ha land where earlier cropping was done. In this fallowland herbaceous vegetation has developed but the invasive species Partheniumhysterophorus has invaded the campus on large scale. The study site is situated between 25^0 36'- 26^0 15' N latitude and 84^0 25'- 85^0 15' E longitude. The climate of Chapra, Bihar is hot and dry. Annual rainfall normally varies from 66 to 126 cm in rainy season. The maximum and minimum temperature ranges from $6^{0c}$to 45^{0c}. The relative humidity ranges from 39 to 90 per cent in the months of May and December, respectively. Randomely ten quadrates of 50 X 50 cm^2 sizes were placed in the vegetation. All herbaceous plants at the soil surface were harvested. Harvested samples of each quadrate were kept in separate polyethylene bags. Samples were brought to the laboratory and samples of each quadrate were separated species wise and their numbers were counted. We took fresh weight through the electronic balance and were oven-dried at 80^{0c} for 24hrs. and again dry weight was taken.

III. Results

There was a very high infestation of P. hysterophorus in the present study site. A total number of 13 plant species were recorded, in which P.hysterophorus was the most dominant species. Other species were Dicanthiumannulatum, Oxalis corniculata, Cynodondactylon, Dactyloeteniumaegyptium, Tridaxprocumbens, Cyperusrotandus, Digitariasetigera, Phyllanthusniruri, Eleusineindica, Evolvulusalsinoides, Croton sparsiflorusandAlysicarpusmonolifer .The live shoot biomass and relative shoot biomass values are in Table1.

Live Shoot Biomass -: The live shoot biomass value for Parthenium was 3205.32 gm^{-2}. The biomass values for other species ranged from 1 to 330.72 gm^{-2}. It was minimum 1 gm^{-2} for A .monolifer whereas the maximum value was 330.72 gm^{-2} for D. annulatum.The total shoot biomass value for all species was 3992.24gm^{-2}. About 0.78t ha^{-1} shoot biomass was produced by Parthenium only in the present study site.

Relative shoot Biomass -: The relative shoot biomass value for Parthenium was 80.28% and for other species it ranged from 0.02 to 8.28% only. The minimum value 0.02% was recorded for C .sparsiflorus and A . monolifer whereas the maximum value 8.28% was recorded for D . annulatum.

Table 1.Live shoot biomass and relative shoot biomass of different plant species in peak growth period.

Sl No.	Name of Species	Live Shoot Biomass(gm^{-2})	RelativeShoot Biomass (%)
1	Partheniumhysterophorus	3205.32	80.28
2	Dicanthiumannulatum	330.72	8.28
3	Oxalis corniculata	107.6	2.69
4	Cynodondactylon	127.92	3.20
5	Dactylocteniumaegyptium	67.24	1.68
6	Tridaxprocumbens	54.28	1.35
7	Cyperusrotandus	11.12	0.27
8	Digitariaphyllanthus	62.44	1.56
9	Digitariasetigera	9.48	0.23
10	Eleusineindica	2.00	0.05
11	Evolvulusalsinoides	12	0.30
12	Croton sparsiflorus	1.12	0.02
13	Alysicarpusmonolifer	1.00	0.02
Total		3992.24	99.93

IV. Discussion

In the present study shoot biomass value of Parthenium was 3205.32gm^{-2} or about 0.78t ha^{-1} and for other species 1 to 330.72 gm^{-2}. In tropical grasslands of India the maximum and minimum values for shoot biomass values ranged from 76 to 3296 and 0 to 871 gm^{-2} (Singh and Joshi 1979). Thus except for Parthenium the total shoot biomass of other species was 786.92gm^{-2} which is less than the values reported for Indian grasslands. Thus in the present study the total live shoot biomass value was 3992.24 gm^{-2} out of which Partheniumcontributed 80.28%. Evans (1997) has reported that P.hysterophorus reduces pasture productivity by 90%. Dwindling effect of P.hysterophorus on grass biomass of grasslands of Queensland, Australia has also been reported by Dhileepan (2007).

Although several workers have reported harmful effects of Parthenium on vegetation, crop plants, animals and humanbeings (Shikha and Jha 2016 a,b,c) but at the sametime several workers have reported beneficial effects of Parthenium also (Ramya and Shree 2014, Arshad et al.2009, Prem et al.2010, Rajeshwari et al.2013). The effective utilization of Parthenium will be beneficial in both the effective management and providing productive uses (Ramaswami 1997, Seier and Djeddour 2000).The biomass produced by Parthenium (78t ha^{-1}) in the present study may be used in herbal medicine (Dominguez and Seier 1970, Mew et al. 1982, Sharma and Bhutani 1988, Singh et al.1996, Nabie et al.1996, Morton 1981, Patel 2011, Ravinder and Vashistha 2014, Anonymous 2014, Surib- Fakim et al.1996, Maishi et al.1998, Venkataish et al. 2003, Das et al.2007, Ramos et al.2002, Parashar et al.2009). It can also be used in compost and green leaf manure (Sudhakar 1984, Son 1995, Bharati et al. 2001) because it is a rich source of N,P,K,Ca,Mg,Chlorophyll etc., (Bharati et al.2001, Ramaswami 1997, Persons and Cuthbertson, 1992, Kishor et al.2010, Ambasta and Kumari 2013, Wakjira et al.2009). Parthenium has also been reported to be used as insecticide (Parsons and Cuthebertson 1992; Hiremath and Ahn 1997;Sohal 2002),as herbicide (Mersie and Singh 1987, Pandey et al.1993, Batish et al.2002), as fungicide (Ganeshan andJayachandra 1993), as nematicide(Azam et al. 2001, Prasad et al. 2002, Dwivedi et al. 2000 and Sharma et al.2003);as foliar supplementation of the leaf water (Patil 1997, Singhal et al. 1998), as a source of Oxalic acid (Mane et al.1986) and biogas (Gunaseelan 1987, Abubacker et al. 1999, Thakur and Singh 2000,2003).It can also be used in removal of basic dyes and production of rubber, paper and card boards

in industries. Thus the alternative uses of Parthenium in beneficial purposes will be effective in management and eradication of Parthenium.

V. Conclusion

In this study the shoot biomass value of Parthenium was $3205.32 gm^{-2}$ or about $0.78\ tha^{-1}$ and for other species 1 to $330.72 gm^{-2}$. It can also be used in removal of basic dyes and production of rubber, paper and cardboards in industries. Thus, the alternative uses of Parthenium in beneficial purposes will be effective in management and eradication of Parthenium.

VI. Acknowledgement

I am thankful to Botany Department, J.P.UniversityChapra, Bihar for providing the laboratory facilities to conducttheresearch work.

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