ABSTRACT

In order to study the spread and distribution of a recently introduced invasive exotic annual plant, *Parthenium hysterophorus* L., a reconnaissance survey followed by phytosociological survey was carried out in 16 districts of the province Punjab, Pakistan. The entire study area was categorized into three zones, Zones I, II and III, receiving mean annual precipitation ranging from 500 to 1000 mm, 250 to 500 mm and >125 mm, respectively. On the basis of growth attributes like phenological stages and biomass (dry weight) and ecological indices like Cover and Importance Value Index (IVI), Zone I was found to be most suitable for the growth and spread of *P. hysterophorus*, followed by Zone II, where water regime has been modified by irrigation and canal system and finally by Zone III, where *P. hysterophorus* was restricted only to areas receiving artificial irrigation, resulting in a rise of local soil moisture content. Although Silt Loam, followed by Sandy Loam were recorded to be the most preferred soil textures for the growth of *P. hysterophorus*, the soil moisture content was predominantly the determining factor for its growth and distribution and masked the effect of soil texture. However, biomass of the target species was found to be more strongly correlated with the intensity of its Cover as compared to soil moisture content and hence could be considered as a better indicator parameter for its infestation. A comparison of the temporal productivity (biomass) revealed that the growth of *P. hysterophorus* was most favored by the humid conditions of Monsoon season, followed by Spring, Autumn and winter.

Although in the present study, the quadrat analysis involved a bias, second highest IVI was recorded for *P. hysterophorus* in all districts, highest being for *Cynadon dactylon*. Seasonal phenological study carried out in the three zones revealed adaptability with regards to the appearance of different phenological stages in accordance with climatic conditions, as life cycle in Zone I was distinctly ahead of that in Zone III. Early germination and sprouting from the previous year's stumps gave *P. hysterophorus* an advantage over other co-occurring annuals, thus conferring it greater invasaibility.

A questionnaire based survey to assess community perception about prevalence and impact of *P. hysterophorus* indicated lack of awareness amongst majority of rural and urban residents, whereas, farmers, foresters and florists were relatively well aware. Majority of the respondents did not date back the introduction of *P. hysterophorus* in Punjab to more than 10 years.

Competition field experiments involving Replacement Series, carried out between *P. hysterophorus* and six coexisting annual species, and evaluated on the basis of mathematical indices like Relative Yield and Relative Crowding Coefficient and Graphic indices like Replacement Diagrams, clearly showed that the four species suppressed by *P. hysterophorus* in the order of increasing suppression were, *Chenopodium album, Kochia indica, Cannabis sativa and Amaranthus viridis.* However, *Cassia occidentalis* and *Setaria glauca* curtailed the growth of *P. hysterophorus* and were found to be competitively superior to the latter and offered to be a promising environmentally friendly solution in controlling the growth of *P. hysterophorus* by competitive displacement.

The information generated by the overlay maps constructed on the basis of Cover of *P. hysterophorus* and the corresponding soil texture of the target site, could be utilized to predict the potentially threatened sites on non surveyed areas and hence could help in control and management strategies against *P. hysterophorus.*