



Original Research Article

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## THE EMERGENCE RESPONSE OF SEEDLING OF *PROSOPIS JULIFLORA* AND SOIL CORRELATION TO RAIL TRANSPORT ACTIVITIES

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**ABSTRACT:** Rail activities associated in contributing a significant increase in air, water and soil pollution issues. The introduction of particulate matter, carbon compounds and metals by locomotive diesel engine emission influenced on vegetation and physico-chemical properties of soils. *Prosopis juliflora* (Sw.) DC. grows abundantly and aggressively in dry regions of the world and naturalized in many parts of Pakistan. The seedling performance of *P. juliflora* was evaluated in five different sites types of soils in pot experiments. The factors usually effect plant growth depend on soil type. The results showed that seedling height and biomass production of *P. juliflora* significantly ( $p < 0.05$ ) lowest in Cantonment Station soil treatment. The root and shoot of *P. juliflora* was found gradually enhanced periodically in University Campus followed by Drigh Road, Malir Station, Landhi Junction soil and decreased in Cantonment Station soil. It was concluded that seedling of *P. juliflora* sown in Landhi Junction soil proved best habitat and harmful in Cantonment Station soil.

**Keywords:** Locomotive pollution; railway tracks; seedling growth; soils types.

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### 1. INTRODUCTION

*Prosopis juliflora* (Sw.) DC. is a very aggressive invasive shrub to tree species which grows in Sindh

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and Punjab province of Pakistan [1-2]. The seeds of *P. juliflora* found in feces of cattle and on favourable conditions germinated [3]. The plant parts have been used for pharmacological, wild food activities [4] and successful in agroforestry system. Rail road activities associated with the introduction of particulate matter, heavy metals pollution in soils and environmental problems [5-12]. Railway activities also influenced the germination and growth performance of native and non-native plant species [13-18]. The highest concentration of PAHs ( $22,492 \mu\text{g kg}^{-1}$ ) was found in the aerial parts of *Taraxacum officinale* growing in the railway station Ława Główna, Poland [19]. *P. juliflora* is found well adapted in wide areas and different types of soil. In recent years, the city of Karachi (Pakistan) environment is deteriorating from the railway transport activities. The vegetation and environment from Cantonment railway station to Landhi railway Junction are becoming disturbed from the activities of rail traffic movement and dispersion of various types of pollutant which is affecting plant growth and properties of soil of the area. There is a lack of research work available regarding plant soil relationship of different railway site for *P. juliflora*. Therefore, in present study the plant soil relationships of *P. juliflora* in different soil types was recorded.

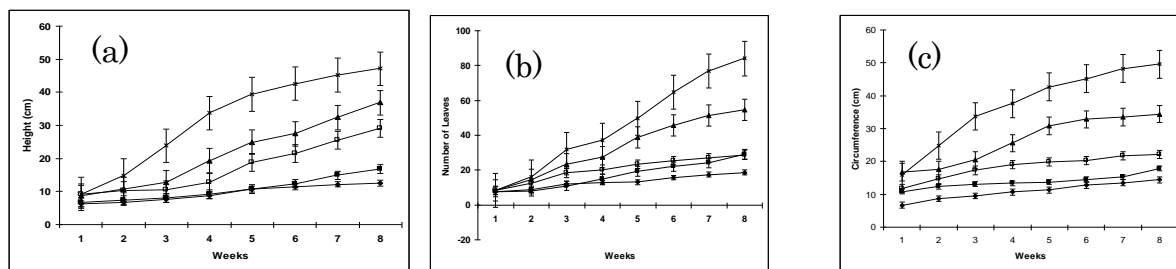
## 2. MATERIALS AND METHODS

The experiment was carried out for some growth characteristics of *P. juliflora* at greenhouse of the Department of Botany, University of Karachi, Pakistan. The surface soil samples from different sites viz. A = University Campus; B = Cantonment Station; C = Drigh Road Station; D = Malir Station; E = Landhi Junction from 30 cm depth were collected which covered an area of 22 Km. These air dried soil sample was sieved from 2.0 mm mesh. The seeds of *P. juliflora* were collected randomly from the University Campus and top ends were slightly cut with scissor to remove any possible external dormancy. Seeds of *P. juliflora* were sown in a large pot in garden loam soil at 1 cm depth. After two weeks of seed germination, a uniform size seedling was transplanted in pots of 20 cm in diameter and 9.8 cm in depth for treatment in the soil of A, B, C, D, and E. The experiment was completely randomized with five replicates for each treatment and irrigated with tap water. Pots positions were changed to avoid light/shade or any other environmental effect after each week. The plants were uprooted from pots carefully after eight weeks and washed their roots with distilled water. The root, shoot, seedling height and leaves number were noted. Seedlings were oven dried 24 hours at  $80^{\circ}\text{C}$ . The obtained growth data was analyzed for ANOVA and Duncan's Multiple Range Test at  $p < 0.05$  level, statistically.

## 3. RESULTS AND DISCUSSION

The potential role of plants for adaptation in polluted soil is a growing demand for the development of healthy environment and improvement of soil quality. This study reports the effects of different soil types on growth of *P. juliflora*. The seedling of *P. juliflora* grown in different railway site soil showed a wide difference in growth performances values (Fig. 1-2; Table 1). The seedlings height, leaves number and circumference and dry weight of *P. juliflora* showed a maximum increase in soil

of Landhi Junction periodically throughout the study (Fig. 1).



**Fig. 1. Seedling height (a), number of leaves (b) and circumference (c) of *P. juliflora* grown in soils of different areas.**

**Symbol Used:** Cantonment Station; —□—  
 Drigh Road Junction; —◆—  
 Malir Station; —▲—  
 Landhi Junction; —×—  
 University Campu —■—

The shoot and seedling lengths of *P. juliflora* in soil of Landhi Railway Junction were significantly ( $p < 0.05$ ) high as compared to Cantonment Station soil treatment (Table 1).

**Table 1. Effects of different soils on growth of *P. juliflora***

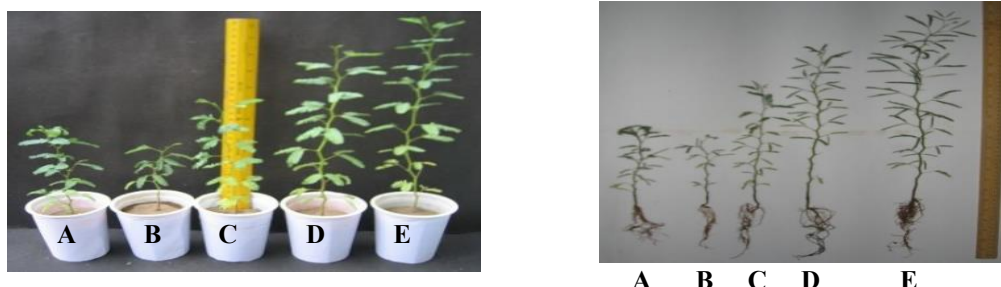
Sites	Root length (cm)	Shoot length (cm)	Seedling length (cm)	No. of leaves	Seedling dry weight (g)
<b>A</b>	15.04±0.64a	16.08±1.12a	31.12±1.37a	29.00±3.00a	0.490±0.02a
<b>B</b>	16.16±1.64ab	12.50±1.05a	28.66±1.72a	18.60±1.89a	0.372±0.05a
<b>C</b>	19.66±1.49abc	29.00±1.45b	48.66±1.79b	28.80±1.36a	0.888±0.02b
<b>D</b>	22.52±1.82c	36.88±1.03c	59.40±2.53c	54.40±8.08b	1.284±0.04c
<b>E</b>	19.98±1.77bc	47.18±4.79d	67.16±5.47c	84.00±6.36c	2.198±0.12d
<b>LSD <math>p &lt; 0.05</math>)</b>	<b>4.53</b>	<b>7.12</b>	<b>8.74</b>	<b>14.46</b>	<b>0.183</b>

**Symbol used:** **A** = University Campus; **B** = Cantonment Station; **C** = Drigh Road Station;

**D** = Malir Station; **E** = Landhi Junction. Numbers followed by the same letter in the same column are not significantly different according to Duncan Multiple Range Test at  $p < 0.05$  level; ± Standard Error

The leaves perform many physiological reactions during plant growth and development. The minimum number of leaves was recorded in soil of Cantonment Station. The routine works in railway workshops for maintenance of vehicles, emission from train and waste of oil from engines polluted the soil of the area. The flora near railway servicing workshops was reported highly affected in Kumasi city of Ghana [20]. The prominent decrease in seedling length, leaves number and circumferences for *Carissa carandas* L. in industrial areas soil of Karachi was observed [21]. Soil is the medium of support to plants growth and development. The physical properties of soil influence

on the production of plants [22]. The uptake of nutrient in plant depend on physicochemical properties of soil [23]. The disturbances in soil texture, soil pH, salts and organic matter level might be an important reason of decline in the seedling growth parameters of *P. juliflora* with treatment of Cantonment Station soil. The reduction in total plant dry weights of *Prosopis juliflora* and *Blepharis sindica* were considered due to high contents of sodium and potassium salts [24].



**Fig. 2. Growth of *Prosopis juliflora* in different soils (a) and after harvest (b)**

**Symbol used:** **A** = University Campus; **B** = Cantonment Station; **C** = Drighroad Junction; **D** = Malir Station; **E** = Landhi Junction

The variable response of *P. juliflora* seedlings to different area soil treatment can be used as good biological indicator. Anoliefo and Vwioko [25] and Ogbuehi et al., [26] reported the inhibition in growth of *Capsicum annum* and decrease in number of leaves of *Lycopersicon esculentum* in the soil contaminated with spent oil. The diversity of plant, seedling growth and yield performances of some plants usually affected by different types of soil of close to railway track and prevailing environmental condition [27-30]. To mitigate soil pollution, grass plantation, the use of gypsum and application of compost/mulch coverage, were applied to control soil erosion effects due to railway disturbance [31].

#### 4. CONCLUSION

The present study concludes that soil of treatment of Landhi Railway Station proved best environment for seedling growth of *P. juliflora*. Whereas, the soil of the Cantonment station showed negative influence on seedling development of *P. juliflora*. The release of railway engine oil along with other pollutants from the railway repair workshops pollute the soil and might be important cause of decrease in seedling growth of *P. juliflora*. The ongoing railway activities might produce detrimental effect on other plants species of the areas.

#### ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

#### HUMAN AND ANIMAL RIGHTS

No Animals/Humans were used for studies that are base of this research.

#### CONSENT FOR PUBLICATION

Not applicable.

## AVAILABILITY OF DATA AND MATERIALS

The author confirms that the data supporting the findings of this research are available within the article.

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## CONFLICT OF INTEREST

NONE

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