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ORIGINAL RESEARCH ARTICLE

Genetic analysis for morphological traits of *Euphorbia helioscopia*

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ABSTRACT: *Euphorbia helioscopia* is a weed plant that grow in the filed of cop plants and caused yield losses through competition for water, mineral salts and nutrients. It is also grown as medicinal plant to extract various drugs. Prescribed study was conducted to access the genetic variability for morphological traits of *Euphorbia helioscopia* under four different locations/environmental conditions. It was found that the higher and better performance was predicted under location 4 a compared with other locations. Higher and significant correlation was recorded between fresh weight, leaf area and plant height. Regression analysis predicted that higher contributing traits were fresh inflorescence weight and dry weight. It was suggested from results that the plant population of *Euphorbia helioscopia* should be controlled to minimize yield losses in crop plants.

Keywords: *Euphorbia helioscopia*, correlation, regression, morphological, GGE biplot

INTRODUCTION

The term weeds referred as any plant out of place where it is not grown. Classificatory, the word "weed" has no botanical importance because that a plant which is not a weed in at one place may be a weed when growing in a situation where it is in fact unwanted. Weeds are serious problem in crop cultivation because it produces a decrease in crop yield: Weeds starts to contend with our valuable crop for light, water and nutrients (Quammen, 1998). As they are vigorous and have hardy growth habit, they grow up the crops soon & devour large amounts of nutrient and water that cause high yield losses. It may raise the cultivation cost. Quality of the field produce also decreased (Nayyar et al., 2001; Qamar et al., 2015). Weeds also provide shelter to several disease pathogens & insect pests and they may assist as substitute hosts for dispersal of disease and pest (Qamar et al., 2015). Moreover, all these evidences they also impede the ornamentation of recreational parks and lawns. Weed seeds can be disperse in a number of methods i.e. water, poor quality grass seed, animals, wind, and garden and lawn equipment. Approximately all seeds of weeds stay dormant for years and begins their germination when they get favorable conditions for germination (Martin and Chanthy, 2009). *Euphorbia helioscopia* ("madwoman's milk, Sun Spurge, milkweed and umbrella), an extremely harmful weed, belongs to the species of spurge, is an annual plant and indigenous to Asia, Europe and Northern Africa. Its extract is used for

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manufacturing of antibiotic, antioxidants and drugs, used as medicinal plant (Okano et al., 2015). They choose to grow in disturbed and arable grounds. Its single, erect and hairless stem achieves the height of 10-50 cm that has branches on its top. The weed leaves are broadest from the tip and oval which ranges from 1.5-3cm in length and having toothed margins (Mobeen et al., 2015). The flowers of this weed differ from green to yellow revealing the same appearance as leaves but consist of 2-5 basal bracts. Blooming time of that weed is from mid spring to late spring (Saleem et al., 2014; Zhang and Guo, 2006). The extract of *Euphorbia helioscopia* is used as anticancer compound for human cancer cell treatment (Wang et al., 2012)

Materials and Methods

Present study was conducted at the Centre of Excellence in Molecular Biology, University of the Punjab Lahore, Pakistan. The objectives of the study were to evaluate morphological traits of *Euphorbia helioscopia* under four different environmental locations. Data was recorded for 9 individuals from each population (for a total of 36 samples) with three replications of *Euphorbia helioscopia*. Data for plant height, leaf area (leaf length × leaf width × 0.74 (Jordan, 1969)), fresh plant weight, dry plant weight, fresh inflorescence weight with the use of electric balance, total plant moisture percentage [(fresh plant weight) – (dry plant weight/fresh plant weight)× 100], were recorded and subjected to analysis of variance (Steel, 1997).

RESULTS AND DISCUSSIONS

The results from table 1 indicated that there were significant differences among the location and studied traits of *Euphorbia helioscopia*. It was found that the average fresh weight (5.574±0.2244g), plant height (11.602±0.8339cm), leaf area (3.593±0.2946cm^2), fresh inflorescence weight (0.035±0.008g), dry weight (1.226±0.3753g) and moisture content/percentage for *Euphorbia helioscopia* plants. Coefficient of variance was recorded as lower then 10, which indicated the consistence of the results was higher. Higher fresh plant weight indicated that the plants have ability to retain higher amount of moisture in their body due to which can withstand under hot, dry and harsh climate conditions. The *Euphorbia helioscopia* plant caused competition with crop plants due to which the yield and productivity of crop plants (Ayatollahi et al., 2010; Mobeen et al., 2015; Uzair et al., 2009).

Table 1. Analysis of variance for morphological traits of *Euphorbia helioscopia*

SOV	FW	PH	LA	FlW	DW	MC
Locations	1.092*	6.065*	2.055*	5.901*	2.023*	33.032*
Error	0.002	0.003	0.011	0.010	0.002	2.034
Grand Mean	5.574	11.602	3.593	0.035	1.226	78.020
Standard Error	0.2244	0.8339	0.2946	0.0080	0.3753	6.6415
Coefficient of Variance	4.026	7.187	8.198	2.792	3.617	8.513

*=Significant at 5% probability level, PH = Plant height, FW = Fresh weight, LA = Leaf area, FIW = Fresh inflorescence Weight, DW = Dry weight, MC = Moisture contents

It was persuaded from table 2 that significant and positive correlation was recorded between fresh weight and plant height, fresh weight and leaf area, fresh weight and fresh inflorescence weight, plant height and leaf area, leaf area and moisture contents/percentage, while strong and negative correlation was recorded between dry weight and moisture contents/percentage. Positive correlation indicated that the *Euphorbia helioscopia* plants have ability to withstand in harsh environmental conditions and can survive for several generations. The removal of *Euphorbia helioscopia* plant from

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field crop growing areas is necessary to reduce crop plant yield losses (Ali et al., 2012; Anwer et al., 2015; Dessaint et al., 1991; Elahi et al., 2011).

Table 2. Correlation among morphological traits of *Euphorbia helioscopia*

Traits	FW	PH	LA	FIW	DW
PH	0.7046*				
LA	0.3368*	0.6204*			
FIW	0.2107*	-0.2938*	-0.236*		
DW	0.1955	-0.1067	-0.567*	0.1139	
MC	-0.0446	0.2323*	0.6369*	-0.1088	-0.9873*

*=Significant at 5% probability level, PH = Plant height, FW = Fresh weight, LA = Leaf area, FIW = Fresh inflorescence Weight, DW = Dry weight, MC = Moisture contents

Regression analysis was performed to evaluate the highly contributing trait for fresh weight. It was found that fresh inflorescence weight (5.876) was higher contributing traits followed by dry weight (3.1817), moisture contents (0.1752), leaf area (0.0264) and plant height (0.029). The regression equation was predicted as (Table 3),

Y (FW) = -12630 + 0.029(PH) + 0.0264(LA) + 5.876(FIW) + 3.1817(DW) + 0.1752(MC)

The results from figure 1 showed that PC1 (99.7%) and PC2 (0.3%) predicted variation proportion for studied traits under four different locations. It was also found from figure 1 that the location 1 was found as highly suitable place for smooth growth and development of *Euphorbia helioscopia* plants. It suggested that the plant population of *Euphorbia helioscopia* should be controlled by manual, chemical or through the use of transgenic crop plant (glyphosate resistant) to reduce or minimize yield losses in crop plants (Harrem et al., 2015; Qamar et al., 2015).

Table 3. Stepwise multiple linear regression for fresh weight of *Euphorbia helioscopia*

Traits	Coefficients	Standard Error	t Stat	Partial R^2	Lower 95%	Upper 95%
PH	0.029	0.0564	0.5148	6.251	-0.1089	0.167
LA	0.0264	0.1272	0.2073	8.427	-0.285	0.3377
FIW	5.876	3.2899	1.7861	40.43	-2.1741	13.9261
DW	3.1817	0.6872	1.6298	31.34	1.5001	4.8632
MC	0.1752	0.0398	0.4009	12.67	0.0778	0.2726

Intercept = -12.630, standard error = 0.0742, Multiple R^2 = 96.96%, R^2 = 94.03%, Adjust R^2 = 89.05%

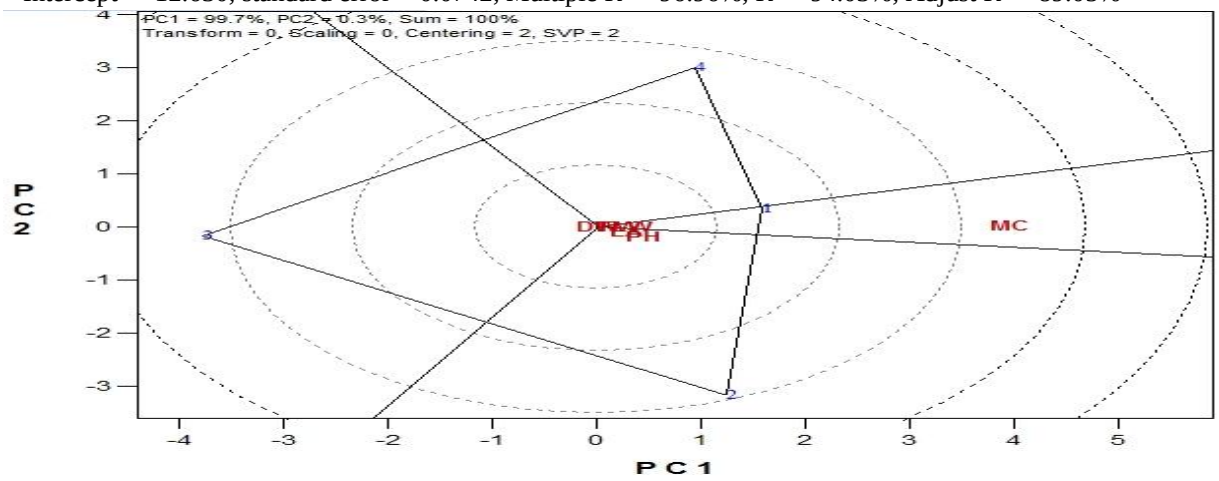

Figure 1. GGE biplot for morphological traits of *Euphorbia helioscopia* under 4 different locations

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CONCLUSIONS

The results form prescribed study suggested that the plant population of *Euphorbia helioscopia* should be controlled to minimize the yield losses of crop plants.

CONFLICT OF INTEREST

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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