

Assessment of association among various morphological traits of *Euphorbia granulata*, *Euphorbia hirta*, *Fumaria indica* and *Parthenium hysterophorus*

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Abstract: The present study was carried out to access the correlation among various morphological traits of different weeds and their body moisture contents during March 2015. It was found that higher weed plant population was recorded for *Fumaria indica* and higher moisture percentage was recorded for *Fumaria hirta* at most of the studied locations. Plant population was significantly correlated with fresh and dry plant weight, inflorescence dry weight and total inflorescence moisture percentage. Total plant moisture percentage and total inflorescence moisture percentage was significantly correlated with each other. The significant correlation of plant population with inflorescence moisture percentage suggested that the weed plants have ability to survive in hot, harsh and dry environmental conditions. It was concluded that the weed plant should be control to minimize the crop plant yield losses due to competition for water, nutrients and light.

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1. Introduction

The term weeds referred as any plant that grows at unwanted place. Taxonomically, the term "weed" has no botanical significance due to the fact that a plant which is a weed in at one place may be not a weed when growing in a situation where it is in fact wanted. Weeds are big issue in crop cultivation because it causes reduction in crop yield: Weeds starts to compete with our precious crop for water, nutrients and light (David 1998). As they are hardy and have vigorous growth habit, they outgrow the crops soon & consume large amounts of water and nutrient that cause heavy losses in yield. It may increase the cost of cultivation. Quality of the field produce also reduced. Weeds also give shelter to various insect pests & disease pathogens and they may serve as alternate hosts for spread of pest and disease (Qamar *et al.*, 2015).

1.1. *Euphorbia granulata*

It is variable densely growing to almost expose much-branched bowed low in nature annual or perennial herb. Its stem 20 cm long Petioles 0.5 mm long. Leaf-blades obviate-oblong in shape, 1-8 x 0.5-5 mm, apex are rounded or emarginated, rounded at the base cornerwise, slightly fleshy and thick in nature. Cynthia axillary is 0.5 mm long, solitary Glands transversely ovate and yellowish or ochreous in color, and sometimes it looks reddish, with unequal white or

pink color appendages. Trigonous fruits, keels craniate 1.1 × 1.1 mm, smooth, having simple hairs. Seeds are ovoid-cylindrical, quadrangular in shape and 0.8 x 0.4 mm, having color pinkish grey (Tona *et al.*, 2004; Kumar *et al.*, 2010).

1.2. *Euphorbia hirta*

It is a tropical weed, probably native to India. It grows on open grasslands pathways and on roadsides having hairs on it. At its growing areas it is used as medicinal plant widely. It is annual herb, erect or prostrate in nature and can grow up to 60cm long. It has a long, solid and hairy stem which produced latex in large quantity. Stipules are present in it. Its leaves are elliptical in shape, simple and hairy and dented margins. Leaves arranged in opposite pairs on the stem. The flowers are present in axillary cymes at each leaf node and unisexual. Generally on a stalk they lack of petals. Its fruit is capsule shaped having three valves. They produce tiny, four-sided seeds of red color, and oblong in shape. It has taproot of white or brown color (Sudhakar *et al.* 2006; Kumar *et al.*, 2010).

1.3. *Fumaria indica*

Indian Fumitory is a elegant much-branched herb. It is annual herb having clusters of tiny flowers of pale-pinkish to whitish color, each 5-6 mm long. Sepals are insignificant. Upper petal has small, partially down-curved sac-like spur. Flower-stalks are

shorter than the lace shaped bracts and erect. Leaves are cut for 2-3 times into cramped acuminate segments of about 1 mm broad. Stems are leafy, 5-30 cm long in size. Fruits are round and of about 2 mm. it is found all over the Himalayas, up to elevation of 2400 m. It is at flowering in April-May (Pandey *et al.*, 2008; Rao *et al.*, 2007).

1.4. *Parthenium hysterophorus*

It is a flowering plant species in the aster family, Asteraceae. It is native to the American tropics. Santa Maria Fever few and White top Weed include in its common names. It is a much-branched, annual, upright growing herbaceous plant. It forms a basal rosette of leaves during the first stages of growth. It grows 0.5-1.5 m tall, but can hardly reach up to 2 m or more in height. Its Mature stems are greenish in color and longitudinally acclimatized, covered in small stiff hairs called as hirsute, and at maturity it become much branched plant. The leaves are alternately arranged and simple up to 2 cm long. The leaves grown at lower side are approximately large 3-30 cm long and 2-12 cm wide and are further divided. Upper Leaves on branches small in size and are less divided as the lower leaves. Various small flower-heads called capitula are present at the tips of the branches in cluster form. Each flower-head is borne on a stalk 1-8 mm long, five tiny petals) 0.3-1 mm long and are f white or cream in color. It infests all disturbed land, along with farms pastures, and roadsides. Outbreaks have been of almost epidemic proportions in some areas that is affecting crop production, livestock and human health. It was firstly present as an adulterant in imported wheat. It can provoke allergies and is a common creator of pollen allergy (Oudhia, 2000abc; Oudhia, (2001).

2. Materials and Methods

The present study was conducted at Centre of Excellence in Molecular Biology, University of the Punjab Lahore, Pakistan during March 2015. The of *Euphorbia granulata*, *Euphorbia hirta*, *Fumaria indica*, *Parthenium hysterophorus* weeds was collected from 4 different locations viz. Centre of Excellence in Molecular Biology, University of the Punjab Lahore, Institute of Agricultural Sciences (IAGS), University of the Punjab Lahore, Hanjerwal colony near Centre of Excellence in Molecular Biology, University of the Punjab Lahore and Road side area of Ferozepur Road Kasur. The data was recorded for fresh plant weight, fresh inflorescence weight, dry plant weight, dry inflorescence weight by using an electronic balance (OHAUS-GT4000, USA), total plant moisture percentage [(fresh plant weight – dry plant weight)/fresh plant weight*100], total inflorescence moisture percentage [(fresh inflorescence weight - dry inflorescence weight)/ fresh

inflorescence weight*100] and number of plants per square meter area. The data was statistically analyzed by using analysis of variance technique (Steel *et al.*, 1997).

3. Results and discussions

It was persuaded from the results that significant differences were found for all studied traits (Table 1). The weed×location interaction was also found significant. The significant interactions suggested that the weeds can grow and can compete with changing environmental conditions. It was found from results that average dry plant weight at all locations was 12.967±0.5713g while fresh plant weight was 52.268±2.1387g. The higher weight difference indicated that the moisture contents were higher in the weed plant body. The fresh inflorescence weight was 4.203±0.9724g while dry inflorescence weight was 1.219±0.0324g. The difference in inflorescence weight indicated that the moisture contents were also higher in inflorescence part of the weeds. The higher moisture contents help the plant to compete with harsh environmental conditions due to which the population of weeds was found higher at all locations as average number of plants per square meter or plant population was 61.888±4.1724m⁻². The total plant moisture percentage (73.779±3.2515%) was found higher as compared with total inflorescence moisture percentage 66.665±5.2022%. The higher moisture contents in the plant body indicated that the weeds used much of the soil water and nutrients. The chemical or manual control of weeds is much important to control yield losses due to weed plant population. The use of transgenic glyphosate (herbicide) resistant crop plants should be encouraged to control weeds in order to maximize crop plant yield (Elahi *et al.*, 2011ab; Mobeen *et al.*, 2015; Harrem *et al.*, 2015; Qamar *et al.*, 2015).

It was revealed from results given in table 2 that highest number of plants per square meter or weed plant population was recorded for *Fumaria indica* (60.23), 120.67 and 112.23 at CEMB, Hanjerwal colony and Kasur while *Euphorbia granulata* (80.44) at Institute of Agricultural Sciences, University of the Punjab. The lowest plant population of *Euphorbia granulata* (10.23) was found at CEMB, *Euphorbia hirta* (25.87; 15.23 and 49.25) at Hanjerwal colony, Punjab University and Kasur respectively. The higher weed plant population of *Fumaria indica* indicated that the weed plants have higher ability to withstand in all types of environmental conditions. The completion for nutrients, water and sunlight increased among the weed plants and crop plants that caused reduction in yield of crop plants (Harrem *et al.*, 2015 and Mobeen *et al.*, 2015). It was revealed from results that highest fresh and dry plants weight of weeds was recorded for

Parthenium hysterophorus at CEMB (44.21g, 9.61g), Hanjerwal colony (152.05g, 36.38g), Punjab University (119.93g, 28.82g) and Kasur (142.21g, 42.97g) respectively. Lowest fresh and dry weed plant weight was found for *Fumaria granulata* at CEMB (2.24g, 0.77g), Hanjerwal colony (2.28g, 0.79g), Punjab University (1.32g, 0.47g) and Kasur (3.21g, 1.02g) respectively. It was revealed from results that highest fresh and dry inflorescence weight of weeds was recorded for *Parthenium hysterophorus* at CEMB (3.62g, 1.02g), Hanjerwal colony (12.45g, 3.55g), Punjab University (8.48g, 2.56g) and Kasur (11.28g, 2.34g) respectively. Lowest fresh weed plant weight was found for *Fumaria indica* at CEMB (0.037g, 0.01g), Hanjerwal colony (0.8g, 0.41g), Punjab University (0.76g, 0.45g) and Kasur (0.89g, 0.41g) respectively. It was revealed from results that highest plant moisture percentage of weeds was recorded for *Parthenium hysterophorus* at Punjab University (77.637%), *Euphorbia hirta* at CEMB (80.742%), Hanjerwal colony (80.692%) and *Euphorbia indica* Kasur (80.523%). Highest inflorescence moisture percentage of weeds was recorded for *Parthenium hysterophorus* at CEMB (87.017%), *Euphorbia hirta* at Punjab University (79.825%), Hanjerwal colony (79.808%) and *Parthenium hysterophorus* at Kasur (79.255%). Lowest fresh weed plant weight was found for *Fumaria granulata* at CEMB (65.625%, 67.308%), Hanjerwal colony (65.351%, 58.991%), Punjab University (64.394%, 37.975%) and *Euphorbia hirta* at Kasur (55.906%, 70.168%) respectively. The difference between fresh and dry weight of plant and inflorescence indicated that the moisture contents were higher in the fresh weed plant and inflorescence parts. The absorption of water and nutrients in the plant body was higher that caused the reduction of water and nutrient contents in the soil. The biomass of weed plant increased due to which the competition of weed plants with crop plant increased

that caused reduction in the yield and crop productivity. It was suggested that the weeds should be controlled through chemical or manual methods. The herbicide (glyphosate) should be used pre-sowing of the crop plants or glyphosate resistant varieties should be developed (Qamar *et al.*, 2015; Harrem *et al.*, 2015, Mobeen *et al.*, 2015).

It was revealed from table 3 that strong positive and significant correlation of dry plant weight was found with inflorescence dry weight, fresh plant weight, inflorescence fresh weight and number of plants per square meter or plant population. Dry inflorescence weight was significantly correlated with fresh and dry plant weight, inflorescence fresh weight, plant population and total inflorescence moisture percentage. It was found that inflorescence fresh weight was significantly correlated with fresh and dry plant weight, total inflorescence moisture percentage and dry inflorescence weight. Plant population was significantly correlated with fresh and dry plant weight, inflorescence dry weight and total inflorescence moisture percentage. Total plant moisture percentage and total inflorescence moisture percentage was significantly correlated with each other. The significant correlation of plant population with inflorescence moisture percentage suggested that the weed plants have ability to survive in hot, harsh and dry environmental conditions. The higher population of weed plants also indicated that the competition of weed plants with crop plant will be higher that may cause the loss of crop plant yield. The loss of crop plant yield may be controlled through the control of weeds. The use of weed management practices should be carried out to less down the hazards caused by weed population (Ali *et al.*, 2013; Ali *et al.*, 2014abc; Qamar *et al.*, 2015; Harrem *et al.*, 2015, Mobeen *et al.*, 2015; Qurat-ul-Ain *et al.*, 2015 and Saeed *et al.*, 2015).

Table 1. ANOVA for various morphological traits of weeds

Source variation of	DF	Dry plant weight	Inflorescence Dry weight	Fresh plant weight	Inflorescence Fresh weight	No of plants/m ²	Total plant moisture percentage	Total inflorescence moisture percentage
Replications	2	0.14	0.1352	0.1	0.135	0.14	0.135	0.14
Weeds	3	297.6*	2.08813*	4037.9*	16.713*	4406.95*	48.407*	603.14*
Location	3	2095.9*	7.81821*	32994.9*	154.271*	4287.44*	201.986*	1081.35*
Weeds×Location	9	180.04*	0.97606*	2194.4*	10.586*	953.19*	42.539*	59.63*
Error	15	0.04	0.21342	1.8	0.599	371.16	34.821	127.04
Grand Mean		12.967	1.219	52.268	4.203	61.888	73.779	66.665
Standard Error		0.5713	0.0324	2.1387	0.9724	4.1724	3.2515	5.2022

* = Significant at 5% probability level

Table 2. Mean performance of weeds for various morphological traits at different locations

No of plants/m ²					
Weeds/Locations	CEMB	Hanjerwal Colony	Punjab University (IAGS)	Kasur	Average
<i>Euphorbia granulata</i>	10.23d	60.42c	80.44a	75.72b	56.7025b
<i>Euphorbia hirta</i>	40.32b	25.87d	15.23c	49.25d	32.6675d
<i>Fumaria indica</i>	60.23a	120.67a	45.78b	112.23a	84.7275a
<i>Parthenium hysterophorus</i>	20.11c	90.89b	45.69b	67.54c	56.0575c
Average	32.7225d	74.4625b	46.785c	76.185a	
Fresh plant weight (g)					
Weeds/Locations	CEMB	Hanjerwal Colony	Punjab University (IAGS)	Kasur	Average
<i>Euphorbia granulata</i>	2.24d	2.28d	1.32d	3.21d	2.2625d
<i>Euphorbia hirta</i>	7.01c	5.49c	1.7c	3.81c	4.5025c
<i>Fumaria indica</i>	25.79b	84.13b	7.46b	37.12b	38.625b
<i>Parthenium hysterophorus</i>	44.21a	152.05a	119.93a	142.21a	114.6a
Average	19.8125d	60.9875a	32.6025c	46.5875b	
Inflorescence fresh weight (g)					
Weeds/Locations	CEMB	Hanjerwal Colony	Punjab University (IAGS)	Kasur	Average
<i>Euphorbia granulata</i>	3.12b	4.56b	2.37b	4.27b	3.58b
<i>Euphorbia hirta</i>	2.75c	2.08c	1.14c	2.38c	2.0875c
<i>Fumaria indica</i>	0.037d	0.8d	0.76d	0.89d	0.62175d
<i>Parthenium hysterophorus</i>	3.62a	12.45a	8.48a	11.28a	8.9575a
Average	2.38175d	4.9725a	3.1875c	4.705b	
Plant dry weight (g)					
Weeds/Locations	CEMB	Hanjerwal Colony	Punjab University (IAGS)	Kasur	Average
<i>Euphorbia granulata</i>	0.77d	0.79d	0.47c	1.02d	0.7625d
<i>Euphorbia hirta</i>	1.35c	1.06c	0.49c	1.68c	1.145c
<i>Fumaria indica</i>	5.56b	20.35b	2.09b	7.23b	8.8075b
<i>Parthenium hysterophorus</i>	9.61a	36.38a	26.82a	42.97a	28.945a
Average	4.3225d	14.645a	7.4675c	13.225a	
Inflorescence dry weight (g)					
Weeds/Locations	CEMB	Hanjerwal Colony	Punjab University (IAGS)	Kasur	Average
<i>Euphorbia granulata</i>	0.47bc	1.87b	1.47b	1.09b	1.3625b
<i>Euphorbia hirta</i>	0.5b	0.42c	0.23d	0.71c	0.465c
<i>Fumaria indica</i>	0.01c	0.41c	0.45c	0.41d	0.32d
<i>Parthenium hysterophorus</i>	1.02a	3.55a	2.56a	2.34a	2.23a
Average	0.5d	1.5625a	1.1775b	1.1375c	
Plant moisture percentage (%)					
Weeds/Locations	CEMB	Hanjerwal Colony	Punjab University (IAGS)	Kasur	Average
<i>Euphorbia granulata</i>	65.625d	65.351d	64.394c	68.224c	65.899d
<i>Euphorbia hirta</i>	80.742a	80.692a	71.176b	55.906d	72.129c
<i>Fumaria indica</i>	78.441b	75.811c	71.984b	80.523a	76.690a
<i>Parthenium hysterophorus</i>	78.263b	76.074b	77.637a	69.784b	75.439b
Average	75.768a	74.482b	71.298c	68.609d	
Inflorescence moisture percentage (%)					
Weeds/Locations	CEMB	Hanjerwal Colony	Punjab University (IAGS)	Kasur	Average
<i>Euphorbia granulata</i>	67.308d	58.991c	37.975d	74.473b	59.687c
<i>Euphorbia hirta</i>	81.818b	79.808a	79.825a	70.168c	77.905a
<i>Fumaria indica</i>	72.973c	48.750d	40.789c	53.933d	54.111d
<i>Parthenium hysterophorus</i>	87.017a	71.486b	69.811b	79.255a	76.892b
Average	77.279a	64.759c	57.100d	69.457b	

Table 3. Pooled correction among various morphological traits of weeds

Traits	Dry plant weight	Inflorescence Dry weight	Fresh plant weight	Inflorescence Fresh weight	No of plants/m ²	Total plant moisture percentage
Inflorescence Dry weight	0.704*					
P<0.05	0.0000					
Fresh plant weight	0.9871*	0.708*				
P<0.05	0.0000	0.0000				
Inflorescence Fresh weight	0.8194*	0.9285*	0.8009*			
P<0.05	0.0000	0.0000	0.0000			
No of plants/m ²	0.3701*	0.2225*	0.3905*	0.1079		
P<0.05	0.0371	0.2209	0.0271	0.5565		
Total plant moisture percentage	0.2179	-0.1414	0.293*	-0.0178	-0.0896	
P<0.05	0.231	0.44	0.1037	0.9229	0.6258	
Total inflorescence moisture percentage	0.154	0.9441*	0.1387	0.3021*	0.5254*	0.2551*
P<0.05	0.4002	0.0291	0.449	0.0928	0.002	0.1588

4. Conclusions

It was concluded from above all discussions that the weeds should be controlled through chemical, manual or by using transgenic crop plant varieties to minimize the crop plant yield losses.

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