Estimation of correlation among various morphological traits of *Carthamus oxycantha, Cirsium arvense, Cleome viscose and Convolvulus arvensis*

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Abstract: Weeds are the plants out of place where it is not grown. It is also called pest plant. They are a source of pest and diseases. The weeds should be removed from filed to avoid losses of crop plants. The prescribed study was carried out to access the relationship among various weed morphological traits. Higher plant population was recorded for *Cleom viscose* and higher plant and inflorescence fresh and dry weight was recorded for *Cirsium arvensa.* Plant population was significantly correlated with fresh and dry plant weight, plant population and total plant and inflorescence moisture percentage. Total plant moisture percentage was significantly correlated with all studied traits. It was found that strong and significant correlation was reported between fresh and dry plant and inflorescence weights. The significant correlations suggested that the weed plant have ability to store moisture and survive in harsh, hot and dry environmental conditions. It was concluded that the weeds should be controlled through chemical, manual and through the use of transgenic crop plants to minimize yield losses.
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1. Introduction

Weeds are the plants out of place where it is not grown. It is also called pest plant. Common weeds are very fast growing and resilient that competes with cultivated crop. They are a source of pest and diseases. Best way to control them is to prevent it from being established as its removal is time consuming. Weeds also give shelter to various insect pests & disease pathogens and they may serve as alternate hosts for spread of pest and disease (Sabbir *et al*., 2014; Qamar *et al*., 2015; Harrem *et al*., 2015; Sadia *et al*., 2015; Mobeen *et al*., 2015; Qurat-ul-Ain *et al*., 2015; Yusra *et al*., 2015 and Saeed *et al*., 2015).

1.1. *Carthamus oxycantha* (Pohli)

Carthamus oxycantha of compositae family is an annual winter season weed. Stem is very branched and straight. Favourable soil it is light soil and its germination time is in December. Leaves are simple and alternate. Stem is grasped by the upper leaves. Fruit of *Carthamus oxycantha* is sessile. Seeds shatter on the ground after maturity and seed setting time period is from April-May. Seeds are light brown in colour with shining gloss and propagation takes place with seeds. Due to its spiky nature it creates obstruction in the harvesting of wheat. The plants are taken to prolonged distances after maturity because plants are seen spinning on the ground. Seed splintering takes place during this process, which spread its infestation (Soerjani *et* al., 1987).

1.2. *Cirsium arvense* (Laiya)

Cirsium arvense is native across northern asia and Europe a species of Cirsium,. It grows up to 30-100 cm and is a herbaceous perennial. From an underground root system it forms substantial clonal colonies that send up many straight stems each spring, reaching the height 1-1.2 m tall. The flowers are pink-purple, with all the florets of similar form having diameter of 10-22mm. The flowers are mostly dioecious, but not repeatedly so, some plants bear hermaphrodite flowers. *Cirsium arvense* is considered as weed even in its native areas, for example in the United Kingdome under the Weeds Act 1959 it is deputed as an "injurious weed" (Kay, 1985).

1.3. *Cleome viscose* (Halhal)

Cleome viscose is terrestrial annual weed. Its height range from up to 120 cm tall straight in shape. It is known as aromatic (pungent smell) weed. It has taproots white or brown in colour. Stem is straight, solid and rounded. Flowers are yellow in colour bisexual and having 4 petals. Fruit is in capsule form, opening by two valves. In Spain it is notorious weed

in arid areas on irrigated crops (Blamey and Grey-Wilson, 1989).

1.4. *Convolvulus arvensis* (Lehli, field bindweed)

Convolvulus arvensis is native to Europe and Asia, a species of bindweed in the morning glory family (Convolvulaceae). It is herbaceous perennial plant growing to the height of 0.5-2 m high and creeping or climbing in nature. The leaves are arranged spirally and are 2-5 cm long and alternate, with a petiole 1-3 cm. Flowers are shaped like Trumpet, having the diameter of 1-1.25 cm. The flowers are colored white or pink, with slightly darker pink five radial stripes. Despite of producing attractive flowers, it is unacceptable in gardens as a notorious weed due to its fast growth and obstruction in cultivated plants (Schultheiss *et al*., 2004).

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 *Carthamus oxycantha, Cirsium arvense, Cleome viscose and Convolvulus arvensis* 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 revealed from results (Table 1) that significant differences were reported for all studied traits of weeds and significant weed×location interaction was also found for all traits. Significant interaction indicated that the weeds can grow and survive in every type of environmental conditions. It was found that fresh weed plant weight was recorded as 23.413±4.2325g while dry plant weight was 5.9625±1.0091g. There was significant difference between fresh and dry plant weight which indicated that weed plant have sufficient amount of moisture contents to survive in hot and dry conditions. Inflorescence fresh weight was 3.6031±0.9723g while dry inflorescence weight was 1.3775±0.5612g. The difference in inflorescence fresh and dry weights indicated that the seeds of weeds get much moisture to remain viable and to compete changing environmental condition efficiently. It was found that higher weed plant moisture percentage (70.9460±2.0974%) was recorded as compared with inflorescence moisture percentage (55.2750±3.0332%). The weed plants store much of moisture contents in their vegetative body parts. The weeds compete with other crop plant in field for water and nutrients. The weed plant population was 56.104±5.0983. The average weed plant population indicated that the weed plant compete with other field crops (Ali *et al*., 2014; Qamar *et al*., 2015; Harrem *et al*., 2015; Sadia *et al*., 2015; Mobeen *et al*., 2015; Qurat-ul-Ain *et al*., 2015; Saira *et al*., 2015 and Saeed *et al*., 2015). The weeds also offer shelter for various crop insects that caused major loss of crop plant yield. The control of weeds should be made to avoid insect/pest attack and loss of water and nutrients in the soil (Sabbir *et al*., 2014).

It was revealed from results (Table 2) that higher number of planter per square meter or weed plant population was for *Cleom viscose* at CEMB (100.12), Hanjerwal colony (101.19), Institute of Agricultural Sciences, University of the Punjab Lahore (89.56) and *Carthamus oxycantha* at Kasur (75.89). It was found that lowest plant population was recorded for *Carthamus oxycantha* at Kasur (40.87), Punjab University (38.89), CEMB (35.34) and *Cirsium arvensa* at Hanjerwal (15.34).

Table 1. ANOVA for various morphological traits of weeds

Source of variation	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
Weeds	3	60.551*	2.24303*	859.693*	2.27061*	1086.93*	127.117*	1465.24*
Location	3	240.027*	13.6564*	4970.78*	40.0326*	4727.6*	207.871*	384.121*
weeds×Location	9	46.0344*	2.41118*	868.038*	1.20026*	692.063*	204.168*	392.469*
Error	15	5.93E-31	3.19E-32	3.47E-30	1.24E-31	1.55E-29	1.34E-29	1.83E-29
Grand Mean		5.9625	1.3775	23.413	3.6031	56.104	70.9460	55.2750
Standard Error		1.0091	0.5612	4.2325	0.9723	5.0983	2.0974	3.0332

* = 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**
Carthamus oxycantha	50.13b	20.67bc	80.65b	75.89a	56.835b
Cirsium arvensa	40.12c	15.34c	50.67c	68.78b	43.7275c
Cleom viscose	100.12a	101.19a	89.56a	67.89c	89.69a
Convolvulus arvensis	35.34d	20.67bc	38.89d	40.87d	33.9425d
Average	56.4275c	39.4675d	64.9425a	63.3575b	
Fresh plant weight (g)					
Weeds/Locations	**CEMB**	**Hanjerwal Colony**	**Punjab University (IAGS)**	**Kasur**	**Average**
Carthamus oxycantha	17.170b	22.780b	6.500d	15.670a	15.530b
Cirsium arvensa	47.640a	97.930a	87.890a	8.250d	60.428a
Cleom viscose	7.810c	9.530c	11.210b	9.260b	9.453c
Convolvulus arvensis	7.260d	6.370d	9.560c	8.890c	8.020d
Average	19.970c	34.153a	28.790b	10.518b	
Inflorescence Fresh weight (g)					
Weeds/Locations	**CEMB**	**Hanjerwal Colony**	**Punjab University (IAGS)**	**Kasur**	**Average**
Carthamus oxycantha	2.18c	1.41d	1.27d	2.14d	1.75d
Cirsium arvensa	5.13a	8.28a	6.39a	7.32a	6.78a
Cleom viscose	2.23b	3.21b	3.22b	4.23b	3.2225b
Convolvulus arvensis	2.11d	1.97c	2.67c	3.01c	2.44c
Average	2.9125d	3.7175b	3.3875b	4.175a	
Dry plant weight (g)					
Weeds/Locations	**CEMB**	**Hanjerwal Colony**	**Punjab University (IAGS)**	**Kasur**	**Average**
Carthamus oxycantha	4.890b	4.680b	3.140c	3.240a	3.988b
Cirsium arvensa	11.710a	25.280a	17.310a	1.890c	14.048a
Cleom viscose	2.540d	4.560c	4.250b	2.240bc	3.398c
Convolvulus arvensis	3.050c	1.610d	1.880d	2.250bc	2.198d
Average	5.548c	9.033a	6.645b	2.405d	
Inflorescence dry weight (g)					
Weeds/Locations	**CEMB**	**Hanjerwal Colony**	**Punjab University (IAGS)**	**Kasur**	**Average**
Carthamus oxycantha	1.02d	0.89d	0.23c	0.33d	0.6175d
Cirsium arvensa	3.35a	6.55a	2.31a	2.11b	3.58a
Cleom viscose	1.22b	1.09c	1.02bc	2.3a	1.4075b
Convolvulus arvensis	1.09c	1.11b	1.07bc	1.23c	1.125c
Average	1.67b	2.41a	1.1575d	1.4925c	
Total plant moisture percentage (%)					
Weeds/Locations	**CEMB**	**Hanjerwal Colony**	**Punjab University (IAGS)**	**Kasur**	**Average**
Carthamus oxycantha	71.520b	79.456a	51.692d	79.324a	70.498c
Cirsium arvensa	75.420a	74.186c	80.305b	77.091b	76.750a
Cleom viscose	67.478c	52.151d	62.087c	75.810c	64.382d
Convolvulus arvensis	57.989d	74.725b	80.335a	74.691d	71.935b
Average	68.102d	70.129b	68.605c	76.729a	
Total inflorescence moisture percentage (%)					
Weeds/Locations	**CEMB**	**Hanjerwal Colony**	**Punjab University (IAGS)**	**Kasur**	**Average**
Carthamus oxycantha	53.211a	36.879c	81.890a	84.579a	64.140a
Cirsium arvensa	34.698d	20.894d	63.850c	71.175b	47.654d
Cleom viscose	45.291c	66.044a	68.323b	45.626d	56.321b
Convolvulus arvensis	48.341b	43.655b	59.925d	59.136c	52.764c
Average	45.385c	41.868d	68.497a	65.129b	

Higher plant population suggested that the weed competition with other crop plant increased that caused loss of yield, water and nutrients from soil. The higher plant population also helps the insect for shelter (Sabbir *et al*., 2015). It was revealed from results that higher fresh and dry plant weight was recorded for *Cirsium arvensa* at CEMB (47.640g, 11.710g), Hanjerwal (97.930g, 25.280g), Punjab University (87.890g, 17.31g) and *Carthamus oxycantha* at Kasur (15.670g, 3.240g) respectively. It was found that lowest fresh and dry plant weight was recorded for *Convolvulus arvensis* at Hanjerwal (6.370g, 1.610g), Punjab University (9.560g, 1.880g) respectively while fresh plant weight for *Convolvulus arvensis* at CEMB (7.260g), *Cirsium arvensa* showed lowest fresh and dry weight at Kasur (8.250g, 8.890g) respectively. It was revealed from results that higher fresh and dry inflorescence weight was recorded for *Cirsium arvensa* at CEMB (5.13g, 3.35g), Hanjerwal (8.28g, 6.55g), Punjab University (6.390g, 2.31g) and *Cirsium arvensa* at Kasur (7.320g) for fresh inflorescence weight and *Cleom viscose* (2.11g) at Kasur for dry inflorescence weight respectively. It was found that lowest fresh and dry inflorescence weight was recorded for *Carthamus oxycantha* at Hanjerwal (1.41g, 0.89g), Punjab University (1.27g, 0.23g),

Kasur (2.14g, 0.33g) respectively while fresh inflorescence weight for *Convolvulus arvensis* at CEMB (2.11g), *Carthamus oxycantha* showed lowest dry inflorescence weight at CEMB (1.02g). It was revealed from results that higher total plant moisture percentage was recorded for *Cirsium arvensa* at CEMB (75.420%), *Carthamus oxycantha* at Hanjerwal (79.456%), *Convolvulus arvensis* at Punjab University (80.335%) and *Carthamus oxycantha* at Kasur (79.324%) for total inflorescence moisture percentage for *Carthamus oxycantha* at CEMB (53.211%), Punjab University (81.890%), Kasur (84.579%) and *Cleom viscose* (66.044%) at Hanjerwal. It was found that lowest total inflorescence moisture percentage was recorded for *Cirsium arvensa* at CEMB (34.698%), at Hanjerwal (20.894%), *Convolvulus arvensis* at Punjab University (59.925%) and *Cleom viscose* at Kasur (45.626%). It was suggested that higher plant and inflorescence moisture percentage indicated that the weed plant absorbed much of the soil water and nutrients due to which the availability of nutrients and water to the crop plant less down. The weeds should be controlled to minimize the yield losing effects on crop plants. There must be development of transgenic crop varieties to compete with weeds (Qamar *et al*., 2015; Harrem *et al*., 2015; Sadia *et al*., 2015; Mobeen *et al*., 2015; Qurat-ul-Ain *et al*., 2015; Saira *et al*., 2015 and Saeed *et al*., 2015).

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	0.8478*					
P<0.05	0.0000					
Fresh plant weight	0.9796*	0.7933*				
P<0.05	0.0000	0.0000				
Inflorescence Fresh weight	0.7117*	0.8361*	0.7134*			
P<0.05	0.0000	0.0000	0.0000			
No of plants/m^2	0.3717*	0.4137*	0.4057*	-0.1691		
P<0.05	0.0362	0.0186	0.0212	0.3549		
Total plant moisture percentage	0.2004	0.2744*	0.3364*	0.3351*	0.5147*	
P<0.05	0.2714	0.1286	0.0597	0.0608	0.0026	
Total inflorescence moisture percentage	0.468*	0.6596*	0.4259*	0.2678*	0.6232*	0.2663*
P<0.05	0.0069	0.0000	0.0151	0.1384	0.0001	0.1407

It was revealed from table 3 that significant correlation was found for dry plant weight with inflorescence dry weight, fresh plant weight, plant population or number of plants per square meter and total inflorescence moisture percentage. Inflorescence dry weight was significantly correlated with fresh and dry plant weight, inflorescence fresh weight, plant population and total plant and inflorescence moisture percentage. Fresh plant weight was significantly correlated with dry plant weight, inflorescence fresh and dry weights, total plant and inflorescence moisture percentage. Plant population was significantly correlated with fresh and dry plant weight, plant population and total plant and inflorescence moisture percentage. Total plant moisture percentage was significantly correlated with all studied traits. It was found that strong and significant correlation was reported between fresh and dry plant and inflorescence weights. The significant correlations suggested that the weed plant have ability to store moisture and survive in harsh, hot and dry environmental conditions. The weeds should be controlled through chemical, manual and through the use of transgenic crop plants to minimize yield losses (Qamar *et al*., 2015; Harrem *et al*., 2015; Sadia *et al*., 2015; Mobeen *et al*., 2015; Qurat-ul-Ain *et al*., 2015; Saira *et al*., 2015 and Saeed *et al*., 2015).

Conclusions

It was concluded form all above studies that the weed should be controlled to avoid yield losses of crop plants.

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