**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. ***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. ***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. ***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. ***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).

1. **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).

1. **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/m2** | **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/m2** |
| **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/m2** | **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/m2** | 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).

C**onclusions**

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

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