Study of association among various morphological traits of *Paspalum distichum, Marsilea minuta, Vicia sativa and Scirpus meritimus*

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Abstract: Weeds are non-useful plant that grow in the crop plant field and compete with crop plant for water and nutrients. Present study was carried out in Centre of Excellence in Molecular Biology, University of the Punjab Lahore, Pakistan during March 2015 to access relationship among various traits of weeds. It was found that higher plant population was recorded for *Scirpus meritimus* at all studied locations. *Paspalum disticum* and *Scirpus meritimus* showed higher plant and inflorescence moisture percentage. Plant population was significantly correlated with all studied traits. Total plant and inflorescence moisture percentage was significantly correlated with all studied traits. It was found that strong and significant correlation was reported between total plant and inflorescence moisture percentage. 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 (Qamar *et al*., 2015; Harrem *et al*., 2015; Sadia *et al*., 2015; Mobeen *et al*., 2015; Saeed *et al*., 2015; Saira *et al*., 2015 and Yusra *et al*., 2015).

1.1. *Paspalum distichum*

Paspalum distichum belongs to grass family also named as knot grass. It is also known as couch paspalum, enternity grass, ginger grass and thompson grass. Its native limit is not known grown in different areas as mostly tropical America its maximum height is 60 cm. Main thing about this grass is that it controls erosion, and is used as a forage (DiTomaso and Healy 2002).This grass is very commonly found in field of rice, maize and orchards (Guillerm *et al*., 1990) but new research indicates that its presence in the field of rice was reduced (Vasconcelos *et al*., 1999).

1.2. Marsilea minuta

It belongs to family Marsileaceae. Marsilea name comes from Italian naturalist Luigi Ferdinando Marsigli. This weed is having seldom appearance and totally different from common Ferns. Most common local names includes are water clover and four leaf clover. A few species are edible and few are ornamental. It is used in India for medicinal purpose it provides soothing effect (Ayurveda) and also for other treatments like insomnia and mental disorders (Sivarajan and Balachandran, 1994)

1.3. *Vicia sativa*

Most known thing about this plant is that it fix's the atmospheric nitrogen belongs to family Fabaceae. This plant is considered as a weed when grown in a area of cultivated Common names are black night shade, duscle, garden nightshade, petty morel, wonder berry, garden huckleberry. It is basically forage legume native to Australia and Mediterranean region (Enneking, 1995).Its seed is rich source of protein (Pastor-Cavada *et al*., 2011) but its use is less.

1.4. Scirpus meritimus

Scirpus comes in family Cyperaceae having grass like species. Its most common name's are club-rush or bulrush, deergrass or grass weed. It is having

grass like leaves and brown color spikelets small in size. Basically these plant are small in height .This genus found in almost all continent widely distributed in Europe (Pelaez *et al*.,1998) Flooding, drought, salinity, grazing and fire affects its distribution and abundance. It can also survive in stress or harsh conditions. Shallow brackish marshes places are suitable for its stand (Charpentiera and Stuefer, 1999)

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 *Paspalum distichum, Marsilea minuta, Vicia sativa and Scirpus meritimus* 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 1.0481±0.0341g while dry plant weight was 0.2963±0.0112g. 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 0.7636±0.0108g while dry inflorescence weight was 0.0659±0.0014g. 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. The weed plants absorbed much of the soil water and nutrients that caused reduction in yield of crop plants. It was found that lower weed plant moisture percentage (69.495±3.0038%) was recorded as compared with inflorescence moisture percentage (92.197±4.0921%). The weeds used water and nutrients and accumulate organic compounds in the whole body and improve their ability to grow and compete with harsh, dry and hot environmental condition generation after generation. The weed plant population was 66.495±3.0124. 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).

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	0.00392*	0.0028*	1.10621*	0.01181*	7805.97*	2114.08*	64.7925*
Location	3	0.00858*	0.00131*	0.03761*	0.00158*	107.438*	121.683*	22.2762*
weeds×Location	9	0.00691*	4.28E-04*	0.05471*	0.00577*	344.425*	267.744*	9.7808*
Error	15	3.06E-34	2.21E-35	6.50E-33	6.21E-34	5.37E-30	4.62E-08	4.55E-08
Grand Mean		0.2963	0.0659	1.0481	0.7636	66.495	69.835	92.197
Standard Error		0.0112	0.0014	0.0341	0.0108	3.0124	3.0038	4.0921

* = 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**
Paspalum disticum	25.140d	37.460d	29.480d	44.560d	34.160d
Marsilla minuta	78.740b	77.340b	67.450b	58.230c	70.440b
Vicis sativa	49.430c	39.220c	57.120c	68.130b	53.475c
Scirpus meritimus	120.110a	122.330a	90.190a	98.110a	107.685a
Average	68.355b	69.088a	61.060d	67.258c	
Fresh Plant Weight (g)					
Weeds/Locations	**CEMB**	**Hanjerwal Colony**	**Punjab University (IAGS)**	**Kasur**	**Average**
Paspalum disticum	1.570a	1.370a	1.330a	1.450a	1.430a
Marsilla minuta	0.840c	0.810c	0.800c	1.200b	0.913c
Vicis sativa	0.920b	1.390b	1.040b	1.020c	1.093b
Scirpus meritimus	0.540d	0.420d	0.520d	0.670d	0.538d
Average	0.968c	0.998b	0.923d	1.085a	
Inflorescence Fresh weight (g)					
Weeds/Locations	**CEMB**	**Hanjerwal Colony**	**Punjab University (IAGS)**	**Kasur**	**Average**
Paspalum disticum	0.700b	0.690c	0.670bc	0.730b	0.698bc
Marsilla minuta	0.700b	0.670d	0.690b	0.770a	0.708b
Vicis sativa	0.680c	0.710b	0.670bc	0.710bc	0.693bc
Scirpus meritimus	0.730a	0.770a	0.890a	0.710bc	0.775a
Average	0.703bc	0.710bc	0.730a	0.730a	
Dry plant weight (g)					
Weeds/Locations	**CEMB**	**Hanjerwal Colony**	**Punjab University (IAGS)**	**Kasur**	**Average**
Paspalum disticum	0.237bc	0.210c	0.170d	0.290c	0.227d
Marsilla minuta	0.220c	0.272b	0.250a	0.310b	0.263b
Vicis sativa	0.223bc	0.200d	0.200c	0.330a	0.238c
Scirpus meritimus	0.390a	0.280a	0.220b	0.210d	0.275a
Average	0.268b	0.241c	0.210d	0.285a	
Inflorescence dry weight (g)					
Weeds/Locations	**CEMB**	**Hanjerwal Colony**	**Punjab University (IAGS)**	**Kasur**	**Average**
Paspalum disticum	0.080a	0.090a	0.080a	0.070b	0.080a
Marsilla minuta	0.053b	0.027d	0.020d	0.060c	0.040d
Vicis sativa	0.050c	0.060b	0.040b	0.090a	0.060b
Scirpus meritimus	0.040d	0.030c	0.027c	0.070b	0.042c
Average	0.056b	0.052c	0.042d	0.073a	
Total plant moisture percentage (%)					
Weeds/Locations	**CEMB**	**Hanjerwal Colony**	**Punjab University (IAGS)**	**Kasu;r**	**Average**
Paspalum disticum	84.904a	84.672b	87.218a	80.000a	84.199a
Marsilla minuta	73.810c	66.420c	68.750c	74.167b	70.786c
Vicis sativa	75.761b	85.612a	80.769b	67.647d	77.447b
Scirpus meritimus	27.778d	33.333d	57.692d	68.657c	46.865d
Average	65.563d	67.509c	73.607a	72.618b	
Total inflorescence moisture percentage (%)					
Weeds/Locations	**CEMB**	**Hanjerwal Colony**	**Punjab University (IAGS)**	**Kasur**	**Average**
Paspalum disticum	88.571c	86.957d	88.060d	90.411bc	88.500c
Marsilla minuta	92.429bc	95.970b	97.101a	92.208a	94.427a
Vicis sativa	92.647b	91.549c	94.030c	87.324c	91.388b
Scirpus meritimus	94.521a	96.104a	96.966b	90.141bc	94.433a
Average	92.042c	92.645b	94.039a	90.021d	

It was revealed from results (Table 2) that higher number of plants per square meter or plant population was recorded for *Scirpus meritimus* at CEMB (120.110), Hanjerwal (122.330), Institute of Agricultural Sciences (IAGS), University of the Punjab Lahore (90.190) and Kasur (98.110). Lowest plant population was recorded for *Paspalum disticum* CEMB (25.140), Hanjerwal (37.460), Institute of Agricultural Sciences (IAGS), University of the Punjab Lahore (29.480) and Kasur (44.560). The higher plant population indicated that the insect/pest get shelter in the weeds and attack crop plants to cause damage in crop plants and less down the yield and quality of crop plants (Sabbir *et al.,* 2014; Elahi *et al.,* 2011ab). It was revealed from results (Table 2) that higher fresh plants weight was recorded for *Paspalum disticum* at CEMB (1.570g), Hanjerwal (1.370g), Punjab University (1.330g) and Kasur (1.450). Lowest fresh plant weight was recorded for *Scirpus meritimus* at CEMB (0.540g), Hanjerwal (0.420g), Punjab University (0.520g) and Kasur (0.670g). Highest fresh inflorescence weight was recorded for *Scirpus meritimus* at CEMB (0.730g), Hanjerwal (0.770g), Punjab University (0.890g) and *Marsilla minuta* at Kasur (0.770g) while lowest was *Vicis sativa* at Punjab University (0.670g) and Kasur (0.710g), *Marsilla minuta* at CEMB (0.700g) and Hanjerwal (0.67g). Highest dry plant weight was recorded for *Scirpus meritimus* at CEMB (0.390g), Hanjerwal (0.280g), *Vicis sativa* at Kasur (0.330g) and *Marsilla minuta* at Punjabd University (0.250g) while lowest was *Vicis sativa* at Hanjerwal (0.200g), *Marsilla minuta* at CEMB (0.220g), *Paspalum disticum* at Punjab University (0.170g) and *Scirpus meritimus* at Kasur (0.210g). Highest dry inflorescence weight was recorded for *Paspalum disticum* at CEMB (0.080g), Hanjerwal (0.090g), Punjab University (0.080g) and *Vicis sativa* at Kasur (0.060g) while lowest was *Scirpus meritimus* at CEMB (0.040g), *Marsilla minuta* at Punjab University (0.020g) and Hanjerwal (0.027g) and Kasur (0.060g). Highest total plant moisture percentage was recorded for *Paspalum disticum* at CEMB (84.904%), Kasur (80.00%), Punjab University (87.218%) and *Vicis sativa* at Hanjerwal (85.612%) while lowest was *Scirpus meritimus* at CEMB (27.778%), Hanjerwal (33.333%), Punjab University (57.692%) and *Vicis sativa* at Kasur (67.647%). Highest total inflorescence moisture percentage was recorded for *Scirpus meritimus* at CEMB (94.521%), Hanjerwal (96.104%), *Marsilla minuta* at Punjabd University (97.101%) and Kasur (92.208%) while lowest was for *Paspalum disticum* at Hanjerwal (86.957%), CEMB (88.571%), Punjab University (88.060%) and *Marsilla minuta* at CEMB (0.220g), *Paspalum disticum* at Punjab University (0.170g) and *Vicis sativa* at Kasur (87.324%). It was suggested that the higher plant and inflorescence moisture indicated that the weed plant store much of the water contents on it vegetative and reproductive parts. The weed plant absorbed higher water and nutrients from soil that caused the non-availability of water and nutrients to the crop plants. The accumulation of organic compounds will be much higher in the weed plant body that caused the loss of inputs. The use of chemical, manual and transgenic crop plants to control weeds should be encouraged (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	0.9174*					
P<0.05	0.0000					
Fresh plant weight	0.3248*	-0.2025				
P<0.05	0.0697	0.2665				
Inflorescence Fresh weight	0.3844*	-0.1219	0.5303*			
P<0.05	0.0298	0.5062	0.0018			
No of plants/m^2	0.5165*	0.6924*	0.0711	0.1777		
P<0.05	0.0025	0.0000	0.6989	0.3306		
Total plant moisture percentage	0.9207*	0.8179*	0.3361*	0.5111*	0.4933*	
P<0.05	0.0000	0.0000	0.06	0.0028	0.0041	
Total inflorescence moisture percentage	0.5999*	0.7023*	0.2909*	0.1369	0.8998*	0.5743*
P<0.05	0.0003	0.0000	0.1062	0.455	0.0000	0.0006

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 plant weight, plant population and total plant and inflorescence moisture percentage. Fresh plant weight was significantly correlated with dry plant weight, inflorescence fresh weight, total plant and inflorescence moisture percentage. Plant population was significantly correlated with all studied traits. Total plant and inflorescence moisture percentage was significantly correlated with all studied traits. It was found that strong and significant correlation was reported between total plant and inflorescence moisture percentage. 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 (Ali *et al*., 2013; Ali *et al*., 2014ab; 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 that the weeds should be controlled to minimize the adverse effects of weed plant on the yield of crop plants.

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