

WEED FLORA OF *GLADIOLUS* FIELDS IN LAHORE, PAKISTAN

Tariq Riaz¹, Salik Nawaz Khan, Arshad Javaid and Abdullah Farhan

ABSTRACT

Gladiolus is one of the most popular cut flowers being cultivated in Pakistan. The present studies report the weed flora associated with *Gladiolus*. A total of 31 angiospermic species belonging to 17 families were found growing in association with *Gladiolus*. Maximum number of species (6) belonged to family Asteraceae followed by Papilionaceae (4) and Poaceae. *Rumex dentatus* was found to be the most frequently occurring and densely populated weed with absolute frequency (AF) of 74 and absolute density (AD) of 1.33. The other frequently occurring and densely populated weeds were *Poa annua*, *Coronopus didymus*, *Convolvulus arvensis*, *Euphorbia prostrata*, *Melilotus parviflora*, *Cynodon dactylon*, *Mazus goodenifolia* and *Verbena agrestis* with AF ranging from 51–69%% and AD from 0.75–1.05. Less frequently occurring weeds with AF between 21 to 49% were *Amaranthus viridis*, *Cirsium arvense*, *Eclipta alba*, *Stellaria media*, *Chenopodium murale*, *C. album*, *Medicago denticulata*, *Fumaria indica*, *Malva parviflora*, *Oxalis corniculata*, *Imperata cylindrica*, *Ranunculus muricatus*, *R. scleratus*, *Solanum nigrum*. *Parthenium hysterophorus*, *Sonchus asper*, *Xanthium stramonium*, *Euphorbia heleosopia*, *Lathyrus aphca*, and *Solanum nigrum* were found least frequently occurring species with AF 20% and below and AD of 0.10–0.38.

Key words: Floriculture, *Gladiolus*, Lahore, weeds.

INTRODUCTION

Agriculture plays an important role in the economy of Pakistan. It contributes up to 25% in the national GDP (Anonymous, 2007.). Agriculture sector is mainly confined to the cultivation of major crops as wheat, rice, cotton and sugar cane. Growers in Punjab, Pakistan, have realized that floriculture is capital intensive so they are switching to alternative crops (DOF, 2003). Production and consumption of cut flowers has also been increased in recent years in Lahore district.

¹ Department of Mycology and Plant Pathology, University of the Punjab, Quaid-e-Azam Campus Lahore – Pakistan, E-mail: tariq_pathologist@yahoo.com

Gladiolus, a member of Iridaceae family, has got a prime status among the cut flowers globally. Many hybrids of *Gladiolus* are commercially cultivated in Lahore district. It is due to availability of floral markets and high consumption of floricultural products in the city, stimulated by urbanization and prosperity. In recent years the supply has strongly increased due to an increasing production within district and from the province. But soil type, climate and cultural practices adopted by the growers are responsible for emergence of variety of weeds in the fields. The presence of weeds in the fields and their impact on the crop production and environment has been well documented (Morse et al., 1995; Randall, 1996; Fröhlich et al., 2000; Hassan and Marwat, 2001; Reza et al., 2006).

Weed surveys are useful for determining the occurrence and importance of weed species in crop production systems (Frick and Thomas, 1992). Documenting the kinds of weed species and its relative distribution facilitates the establishment of priorities for research and extension services (Mc Closky et al., 1998). A survey was conducted in Lahore district to highlight the distribution of different weed species in *Gladiolus* fields.

MATERIALS AND METHODS

Site Description

Lahore is located at longitude 74-20' E and at latitude 31-34' N and at a height of 210.8 m from the sea level. The weather of Lahore is extreme during the months of May and June when the temperatures soar to 45–50 °C which is the hottest time of the year. The city of Lahore receives highest precipitation during monsoon season during the months of July and August. December to February is the coldest months when temperatures can drop to –1 degree °C (Table1).

Field Surveys

Field surveys of different *Gladiolus* growing areas in district Lahore were conducted during the growing season of 2006-2007. Eight localities including Punjab University Quaid-e-Azam Campus, Dina Nath, Mehmood Booti, Bund Road, Manga Mandi, Raiwind Road, Jallo Forest and Nain Sukh were selected for study of weed distribution. Sampling was done randomly using 1×1 m² quadrat. Data regarding prevalence, absolute and relative frequency, and absolute and relative density of weeds were recorded by applying the following formulas:

$$\text{Prevalence (\%)} = \frac{\text{No. of sites in which a species occurs}}{\text{Total No. of sites}} \times 100$$

$$\text{Absolute frequency (AF) (\%)} = \frac{\text{No. of quadrates in which a species occurs}}{\text{Total No. of quadrate}} \times 100$$

$$\text{Relative frequency (RF) (\%)} = \frac{\text{Absolute frequency value for a species}}{\text{Total absolute frequency values for all species}} \times 100$$

$$\text{Absolute density (AD)} = \frac{\text{Total No. of individuals of a species in all quadrates}}{\text{Total No. of quadrate}}$$

$$\text{Relative density (RD) (\%)} = \frac{\text{Absolute density for a species}}{\text{Total absolute density for all species}} \times 100$$

RESULT AND DISCUSSION

In the present study 31 weed species belonging to 17 angiospermic families were found growing in *Gladiolus* fields of District Lahore. Maximum number of species (6) belongs to family Asteraceae followed by Papilionaceae (4) and Poaceae (3). Two species belong to each of the Chenopodiaceae, Euphorbiaceae, Scrophulariaceae and Ranunculaceae. Amaranthaceae, Brassicaceae, Caryophyllaceae, Fumariaceae, Malvaceae, Oxalidaceae, Primulaceae, Solanaceae and Verbenaceae contained one species each (Table 1).

Twenty four species found in all the eight studied field showing 100% prevalence. Only three species namely *Solanum nigrum*, *Xanthium stramonium* and *Parthenium hysterophorus* showed low prevalence i.e. 30, 30 and 40%, respectively. Three species namely *Sonchus asper*, *Euphorbia heleosopia* and *Malva parviflora* exhibited 80% prevalence each (Table 2).

Rumex dentatus with 74% absolute frequency (AF) and 5.82% relative frequency (RF) was found to be the most frequently occurring weed followed by *Poa annua* and *Coronopus didymus* with 69% AF and 5.42% RF each. Other frequently occurring species were *Convolvulus arvensis*, *Euphorbia prostrata*, *Melilotus parviflora*, *Cynodon dactylon*, *Mazus goodenifolia* and *Verbena agrestis* with AR ranging from 51-65% and RF 4.01-5.11%. The least frequently occurring species with AF less than 20% and below were *Parthenium hysterophorus*, *Euphorbia heleosopia*, *S. asper*, *X. stramonium*, *Lathyrus aphaca* and *S. nigrum* (Table 2). Since this is the first report of weed distribution in *Gladiolus* fields in Pakistan so the quality and yield losses in *Gladiolus* due to infestation of these weeds are not known. However, the frequently occurring species viz. *R. dentatus*, *P. annua*, *C. didymus*, *C. arvensis* and *M. parviflora* are also found in other crops especially in wheat where they are known to cause heavy yield losses due to competition for nutrients, water, and space and sometimes through the release of allelochemicals (Rabbani and Bajwa, 2001). It is likely that these weeds may cause similar losses in *Gladiolus* yield and quality. Since *Gladiolus* is being cultivated in the fields where wheat cultivation was in practice for a long time so most of the wheat weeds were found in these fields. In the present study *Parthenium hysterophorus* was found only with 20% AF and 1.57% RF (Table

2). However, it is most likely that in future this aggressive alien weed may become one of the problematic weeds due to its high reproductive potential, fast growth rate, allelopathic nature (Dagar *et al.*, 1976; Navie *et al.*, 1996; Singh *et al.*, 2005) and suitable field conditions as *Gladiolus* is cultivated on ridges with sufficient plant to plant distance.

R. dentatus was found to be the most densely populated weed with 1.33 plants m⁻² and an relative density (RD) of 7.28 (Table 2). *R. dentatus* L. is also of major concern in various crops of economic importance including wheat in India and Pakistan (Chhokar *et al.*, 2007; Anjum and Bajwa, 2007; Mehmood *et al.*, 2007). It is a highly competitive weed and can cause drastic yield reduction under heavy infestation. The second densely populated weed species was *C. didymus* with absolute density (AD) of 1.05 and RD of 5.75 (Table 2). *C. didymus* has been reported to contain flavones, chrysoeriol and chrysoeriol-6''(OAc)-4'- β -d-glucoside (Prabhakar, *et al.*, 2002); benzyl cyanide (Inam ul Haque, 1989); and glucotrappaeolin, a glucoside of benzyl isothiocyanate (McDowall *et al.*, 1947). 1, 8-dihydroxy anthraquinone has been reported at a concentration of 0.003% (De Ruiz *et al.*, 1994). Some of these compounds may act as allelochemicals to reduce the growth of the associated plants species. *P. annua* was found to be the third most densely populated weed species with 1.03 AD. The other weed species with comparatively high AD ranging from 0.50-0.90 were *A. viridis*, *C. arvensis*, *S. media*, *C. album*, *C. murale*, *F. indica*, *O. corniculata*, *M. parviflora*, *V. sativa*, *C. dactylon*, *I. cylindrica*, *Anagaliis arvensis*, *R. muricatus*, *R. secleratus* and *V. agrestis*. The moderately populated weeds with AD ranging from 21-49% were *Ageratum conyzoides*, *Parthenium hysterophorus*, *E. alba*, *E. heliscopia*, *M. Parviflora*, *M. denticulate*. *Lathyrus aphaca*, *X. Stramonium* and *Sonchus asper* were recorded as least populated weed species with AD 0.20 or below.

The present study reveals that *Gladiolus* fields are infested with many well known problematic weed species especially *C. album*, *C. arvensis*, *C. didymus*, *P. hysterophorus*, *C. arvensis*, *F. indica* and *R. dentatus* which are well known for their adverse impacts on crop growth and productivity as well as quality of the produce. There is an urgent need to take necessary action to create awareness among the farmers for adapting integrated weed management strategies to improve and maintain the quality and yield of *Gladiolus*.

Table 1. Monthly temperatures and precipitation during 2006 in Lahore, Pakistan.

Month	Temperatures (°C)		Precipitation (mm)	Relative humidity (%)
	Maximum	Minimum		
January	19.8	5.9	23.0	64.6
February	22.0	8.9	28.5	57.6
March	27.1	14.0	41.2	51.1
April	33.9	19.6	19.7	37.9
May	38.6	23.7	22.4	31.9
June	40.4	27.3	36.3	39.8
July	36.1	26.8	202.1	63.3
August	35.0	26.4	163.9	68.8
September	35.0	24.4	61.1	59.6
October	32.9	18.2	12.4	53.2
November	27.4	11.6	4.2	61.4
December	21.6	6.8	13.9	67.8
Annual	30.8	17.8	628.7	54.7

Source: Pakistan Meteorological Department, National Agromet Centre Islamabad

Table 2. Prevalence, Frequency and density of weeds in *Gladiolus* growing fields of Lahore.

Species	Family	P (%)	AF (%)	RF (%)	AD	RD (%)
<i>Amaranthus viridis</i> L.	Amaranthaceae	100	46	3.61	0.67	3.66
<i>Ageratum conyzoides</i> L.	Asteraceae	100	25	1.96	0.38	2.08
<i>Cirsium arvense</i> L.	"	100	44	3.46	0.67	3.66
<i>Parthenium hysterophorus</i> L.	"	40	20	1.57	0.38	2.08
<i>Sonchus asper</i> (L.) Hill	"	80	11	0.86	0.11	0.60
<i>Xanthium stramonium</i> L.	"	30	10	0.78	0.11	0.60
<i>Eclipta alba</i> L.	"	100	24	1.88	0.28	1.55
<i>Coronopus didymus</i> (L.) Smith	Brassicaceae	100	69	5.42	1.05	5.75
<i>Stellaria media</i> L.	Caryophyllaceae	100	48	3.77	0.81	4.43
<i>Chenopodium album</i> L.	Chenopodiaceae	100	31	2.43	0.58	3.17
<i>Chenopodium murale</i>	"	100	36	2.83	0.57	3.12
<i>Convolvulus arvensis</i> L.	Convolvulaceae	100	63	4.95	0.81	4.43
<i>Euphorbia prostrata</i> L.	Euphorbiaceae	100	65	5.11	0.90	4.92
<i>Euphorbia helioscopia</i> L.	"	80	19	1.49	0.25	1.36
<i>Fumaria indica</i> (Hauskn.) Pugsley.	Fumariaceae	100	44	3.46	0.56	3.06
<i>Malva parviflora</i> L.	Malvaceae	80	30	2.36	0.35	1.91
<i>Oxalis corniculata</i> L.	Oxalidaceae	100	46	3.61	0.63	3.45
<i>Medicago denticulata</i> L.	Papilionaceae	100	29	2.28	0.38	2.08
<i>Melilotus parviflora</i> L.	"	100	58	4.56	0.76	4.16
<i>Lathyrus aphaca</i> L.	"	80	14	1.10	0.13	0.71
<i>Vicia sativa</i> L.	"	100	49	3.85	0.70	3.83
<i>Cynodon dactylon</i> Pers.	Poaceae	100	55	4.32	0.76	4.16
<i>Imperata cylindrica</i> (L.) Beauv.	"	100	44	3.46	0.58	3.17
<i>Poa annua</i> L.	"	100	69	5.42	1.03	5.64
<i>Anagallis arvensis</i> L.	Primulaceae	100	44	3.46	0.64	3.50
<i>Ranunculus muricatus</i> L.	Ranunculaceae	100	48	3.77	0.63	3.45
<i>Ranunculus secleratus</i> L.	"	100	43	3.38	0.65	3.55
<i>Solanum nigrum</i> L.	Solanaceae	30	9	0.70	0.10	0.60
<i>Mazus rugosus</i> Lour.	Scrophulariaceae	100	53	4.16	0.71	3.88
<i>Rumex dentatus</i> L.	"	100	74	5.82	1.33	7.28
<i>Verbena agrestis</i> L.	Verbenaceae	100	51	4.01	0.75	4.10

P=Prevalence; **AF**=Absolute frequency; **RF**=Relative frequency; **AD**=Absolute density; **RD**=Relative density; **C**=Cover

REFERENCES CITED

- Anjum T. and R. Bajwa. 2007. Field appraisal of herbicide potential of sunflower leaf extract against *Rumex dentatus*. *Field Crop Res.*, 100(2-3):139-142.
- Anonymous, 2007. Ministry of Population welfare and Statistics, Govt. of Pakistan.
- Chhokar, R.S., R.K. Sharma, G.R. Jat, A.K. Pundir and M.K. Gathala. 2007. Effect of tillage and herbicides on weeds and productivity of wheat under rice-wheat growing system. *Crop Prot.*, (in press) Available online.
- Dagar, J.C., A.N. Rao and L.P. Mall. 1976. Regeneration of *Parthenium hysterophorus*. *Geobios*, 3: 202-203.
- De Ruiz, R.E.L., M. Fusco and S.O. Sosa A and Ruiz. 1994. Constituents of *Coronopus didymus*, *Fitoterapia* 65:181-182.
- DOF. 2003. Directorate of Floriculture, Govt. Of the Punjab, Lahore.
- Frick, B., and A.G. Thomas. 1992. Weed surveys in different tillage systems in southwestern Ontario field crops. *Can. J. Plant Sci.* 72:1337-1347.
- Fröhlich, J., S.V. Fowler, A. Gianotti, R. Hill, E. Kilgore, L. Morin, L. Sugiyama, and C. Winks. 2000. Biological control of mist flower (*Ageratina riparia*, Asteraceae) in New Zealand. *Proceedings, Xth International Symposium on Biological Control of Weeds*, 4-14 July 1999, Bozeman, Montana USA, pp. 51-57.
- Hassan, G. and. K.B Marwat. 2001. Integrated weed management in agricultural crops. *National Workshop on Technologies for Sustainable Agriculture*, Sep.24-26, 2001. NIAB, Faisalabad, Pakistan.
- Inam-ul-Haque. 1989. Composition of essential oil of *Coronopus didymus* seeds, *J. Chem. Soc. Pak*, 11: 80-81.
- McClosky, W.B. P.B.Baker and W.Sherman.1998. Survey of cotton weeds and weed control practices in Arizona upland cotton fields. Publication AZ1006" cotton: College of Agric., Univ. Arizona.
- McDowall, H., I.D. Mortan and A.K.R. McDowell. 1947. Land-cress taint in cream and butter. *NZ J. Sci. Technol.* 28: 305-307.
- Mehmood,T., K. M.Khokhar and M. Shakeel. 2007. Integrated weed management practices in garlic crop in Pakistan. *Crop Protection.* 26:1031-1035.
- Morse, L.E., J.T., Kartesz, and L.S., Kutner, 1995 Native vascular plants. *Our Living Resources: A Report to the Nation on the Distribution, Abundance, and Health of U.S. Plants, Animals and Ecosystems.* U.S.

- Department of the Interior, National Biological Service, Washington, DC, pp. 205–209.
- Navie, S.C., R.E. McFayden, F.D. Panetta and S.W. Adkins. 1996. The biology of Australian weeds. 27. *Parthenium hysterophorus* L. Plant Protection Quart., 11: 76-88.
- Prabhakar, K.R., K.K. Srinivasan and G.M.R. Padma, 2000. Chemical investigation, anti-inflammatory and wound healing properties of *Coronopus didymus*, Pharm. Biol. 40: 490–493.
- Rabbani, N. and R. Bajwa. 2001. Weed distribution in rice field of five districts of the Punjab. Pak. J. Bot. 33(special issue): 441-450.
- Randall, J.M., 1996. Weed control for the preservation of biological diversity. Weed Technology 10: 370– 381.
- Reza, H., Chamanadad, M., A. M Tulikov, and M.A Baghestani. 2006. Effect of long-term fertilizer application and crop rotation on the infestation of fields by weeds. Pak J. Weed Sci. Res. 12(3): 221-234.
- Singh, H.P., D.R. Batish, J.K. Pandher and R.K. Kohli. 2005. Phytotoxic effects of *Parthenium hysterophorus* residues on three *Brassica* species. Weed Biol. Mgmt. 5: 105-109.