http://www.pjbs.org

PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences, 1 (1): 23-26, 1998

Studies on Pathogenecity and Eradication of Some Fungal Diseases of Gladiolus in Pakistan

A.S. Shakir, E. Haq and M. Ayubs♪

Department of Plant Pathology, ♪Department of Horticulture, University of Agriculture, Faisalabad-38040, Pakistan

Abstract

Botrytis cinerea, B. gladiolorum, Curvularia lunata, Fusarium oxysporum f.sp. *gladioli* and *Stemphylium botryosum* isolated from corms and leaves of Gladiolus were tested for their pathogenic potential. Former four were proved to be pathogenic to the corms while except *F. oxysporum* f. sp. *gladioli* all other fungi were able to cause leaf spots. Corm sprounting and plant height was considerable reduced by *B. gladiolorum, F. oxysporum* f. sp. *gladioli* and *C. lunata*. Corm sprouting was improved when *Gladiolus* corms infested with corm rotting fungi were sown after dipping in different fungicides. Out of four fungicides Bavistin followed by Dithane M-45 poved to be the best fungicide for the control of *B. gladiolorum, B. cinerea* and *F. oxysporm* f. sp. *gladioli* while Topsin-M was found effective against *C. lunata*.

Keywords: Gladiolus, corms, fungal diseases, control, Pakistan

Introduction

Gladiolus (*Gladiolus columbine*) popularly known as the "Sword Lily", is an ornamental bulbous plant native to South Africa. It belongs to the monocot family lridaceae. In Pakistan progress has been made in the recent years for the improvement of the Gladiolus in respect of its floriferousness. A number of shades and colors have been developed in Gladiolus flower out of which white, pink and yellow are commonly grown on commercial scale. Due to availability of a variety of colors, it has become popular as cut flower and its cultivation has been started on commercial scale in Pakistan also.

Gladiolus plant is affected by a number of diseases, out of which Gladiolus corm rots. Fusarium wilt and leaf spots are most destructive diseases. Drayton (1928) reported Botrytis disease of Gladiolus from Canada and the same disease has also been reported by Drayton (1929) and Van Poeteren (1938) from Holland, Moore (1939) from England, Dodge and Laskaris (1941) from Long Island, New York and Wade (1945) from Australia. Magie (1948), McClellan and Marshall (1950), Magie (1951) and Bald (1953). Parmelee (1954) reported *Curvularia lunata and Curvulria Trifolii* from corms and leaves of Gladiolus. Jackson, (1961) conducted some studies on *Curvularia* diseases of Gladiolus and found that Curvularia was associated with corms and leaves. Mirza and Shakir (1991) reported *Fusarium oxysporum* f. sp. *gladioli* from corms and roots and *Botrytis gladiolorum* and *Myrothecium roridum* from corms and leaves of Gladiolus for the first time from Pakistan. Sohi (1992) worked on diseases of ornamental plants and reported *Fusarium oxysporum* f. sp. *gladioli* from corms and roots and *Botrytis gladiolorum*, *curvularia* sp. and *Stemphylium* sp. from corms and leaves of Gladiolus from India.

Singh and Arora (1994) worked on chemical control of Fusarium corms rot of Gladiolus and found that fungicide Emisan-6 followed by Bavistin increased percent corm sprouting of Gladiolus. They further concluded that captan followed by Topsin-M was also effective against the fungus as height of plants over control was improved by these fungicides. Since, a little work has been done on diseases of Gladiolus and their control in Pakistan. Therefore it was planned to conduct studies on the pathogenicity and eradication of some diseases of Gladiolus.

Materials and Methods

Isolations

Diseased specimens of corms, leaves and flowers of Gladiolus collected from nurseries of Faisalabad city, were brought to the laboratory for isolation of fungi. Infected parts showing different symptoms were cut into 4-5 mm pieces with the help of scissors and surface sterilized with 5 percent commercial bleaching solution sodium hypochlorite for about two minutes. The surface sterilized pieces of corms, leaves and flowers were plated separately in petridishes (9 cm) containing Potato Dextrose Agar (PDA) and incubated at 25±2°C. After 4-5 days the fungi were isolated and identified according to Ellis (1971) and Booth (1971) and maintained on artificial medium (PDA) for further experiments.

Pathogenicity by Inoculation Experiments

A. Corms

All the five fungi isolated from corms and leaves were tested for their pathogenic potential. Healthy corms were surface sterilized with 5 percent commercial bleaching solution and infested with spore suspension prepared by adding whole contents of one 15 days old culture plate (9 cm) of each fungus to 200 ml of distilled sterilized water. Corms thus infested were incubated at different temperature i.e. 10°C, 15°C, 20°C, 25°C and 30°C. Twenty five infested corms

were incubated at each temperature. One hundred twenty five corms were inoculated with each fungus. Data on percent recovery of different fungi at different temperatures were recorded.

B. Leaves

Healthy leaves of Gladiolus plants were inoculated by spraying sport suspension of 15 day old culture of four fungi which were isolated from leaves of Gladiolus. Fifteen plants were inoculated with each fungus and were covered by polythene bags for 48 h to maintain the humidity. Sterilized water was sprayed with automizer to provide necessary moisture for infection to take place. Data regarding symptoms appearance were recorded after one week and two weeks. Leaves showing symptoms caused by different fungi, were detached for re-isolations and confirmations of pathogenicity.

C. Effect of fungus on corms sprouting (%) and plant height (cm) of Gladiolus

Corms of Gladiolus were surface sterilized with 5 percent commercial bleaching solution for 2 minutes and then infested with spore suspension of each fungus prepared by method mentioned above for 5 minutes and after 24 h of infestation were sown in pot (30 x 33 cm) filled with sterilized soil. Soil was sterilized by soaking in 5 percent commercial solution of farmaline at the rate of 10 Lm^{-3} of soil which was then covered with plastic sheets for three days and was exposed to the air for two more days. one hundred corms inoculated with each fungus were sown and data regarding percent corm sprouting were recorded after one month. Height of plant were recorded after 90 and 120 days as Gladiolus attains maximum height in 110-130- days. In control treatment surface sterilized corms were dipped in sterilized water for 5 minutes and sown in pots. Data on percent increase in corm sprouting and plant height were recorded for interpretation of results.

Chemical control

An experiment on fungicidal dip treatment of corms of Gladiolus was conducted in which surface sterilized corms infested with spore suspension of four corm rotting fungi according method already mentioned were incubated at 25±2°C for 48 h to ensure infection of fungi. Corms inoculated with different fungi were dipped in 0.2% solution of four fungicides namely Bavistin, Captan, Dithane M-45 and Topsin-M for 5 minutes separately and were sown in pots (30 x 33 cm). 25 corms were used in one replication while experiment was run in quadruplicate. Data on percent corm sprouting were recorded one month after sowing.

Results and Discussion

Isolations were made from diseased corms, leaves and flowers which revealed that *Botrytis gladiolorum*, *B. Cinerea*, *Curvularia lunata* and *Stemphylium botryosum* were assocated with corms and leaves of Gladiolus where as *Fusariam oxysporuym* f.sp. *gladioli* was isolated only from corms and roots (Table 1). Spore masses on flowers of *B. gladiolorum* and *B. Cinerea* were also noted.

All the isolated fungi were tested for their pathogenic potential and it was observed that *B. gladiolorum*. *B. Cinerea*, *C. lunata* and *F. oxysporum* f.sp. *gladioli* were invariably pathogenic to the corms of Gladiolus (Table 2). It is evident from Table 2 that recovery of fungi was different at different temperatures. *Botrytis gladiolorum* and *B. cinerea* were recovered maximum at 15°C (21/25) and 17/25) respectively while their recovery decrease with the increase of temperature. *Curvularia lunata* gave different response as compare to other fungi as it gave maximum recovery at 30°C while at lower temperatures ranging to 10-20 C, it did not show any response our these results are in confirmity with those McClellan and Marshall (1950). As for as *Fusarium oxysporum* f.sp. *gladioli* is concerned it gave good performance at 25°C temperature while at higher temperature it gave reduced recovery (16/25) which varifies the finding of Singh and Arora (1994). In case of Stemphylium botryosum no recovery was there at any temperature. Except *F. oxysporum* f.sp. *gladioli*, all the four fungi produced different spots on leaves of Gladiolus (Table 3). Our these results regarding isolations and pathogenicity are inconfirmity with those of Bald (1953), Jackson (1961), Magie (1948, 1951), Young (1955), Mirza and Shakir (1991) and Sohi (1992) who isolated the same fungi from corms and leaves of Gladiolus and found them pathogenic. Form an experiment conducted on percent corm sprouting and plant height, it was concluded that except *S. botryosum* all the four fungi reduced corm

Table 1: Isolation of fungi associated with different parts of gladiolus

Sources of Isolation	Symptom expression	Fungi isolated
Corms	Sunken lesions with stretched skin	*Botrytis gladiolorum* Timm. And *B. Cinerea* pers. Ex pers.
	Brown to black lesion on surface	*Curviularia lunata* (Wakker) Boed.
	Dark brown surface lesions	*Fusarium oxysporum* Schl. Sp. Gladioli (Massey) Synd. & Hans.
Leaves	Small brown spots with reddish margins	*B. Gladiolorum*
	Tan colour spots with yellowish haloes	*Curvularia lunata*
	Small light green lesions with red centres	*Stemphylium bortyosum* wallr.
Flowers	Covered with grey conidial mass	*B. Gladiolorum* and *B. Cinerea*

Table 2: Recovery of fungi from infested corms at different temperatures

Name of fungus	No. of Corms Inoculated at each temperature	No. of Infected Corms at				
		10°C	15°C	20°C	25°C	30°C
Botrytis gladiolorum	25	13	21	2	2	1
B. Cinerea	25	9	17	0	0	0
Curvularia lunata	25	0	0	2	4	9
Fusarim oxysporum f.sp. Gladioli	25	0	2	9	18	16
Stemphlium botryosum	25	0	0	0	0	0

Table 3: Pathogenicity of the fungi isolated from the leaves of Gladiolus

Name of fungui	No. Of leaves inoculated	Symptoms on leaves	
		After 1 Week	After two week
Botrytis gladiolorum	15	9	15
B.cinerea	15	0	11
Curvularia lunata	15	0	7
Fusarim oxysporum f.sp. *Gladioli*	15	0	0
Stemphlium botryosum	15	7	15
Control	15	0	0

Table 4: Effect of different fungi on corms sprouting (%) and Plant height (cm) of Gladolus

Name of fungus	Corm Sprouting (%)	% decrease over control	Height of Plants (cm)			
			After 90 days	% decrease over control	After 120 days	% decrease over control
Botrytis gladiolorum	48	51.02	70.00	33.80	70.75	35.24
B. cinerea	84	14.28	94.75	10.40	102.50	6.17
Curvularia lunata	65	33.67	95.50	9.69	103.50	5.26
Fusarim oxysporum	50	48.97	67.75	35.93	68.50	37.29
Stemphylium botryosum	97	1.02	100.25	5.21	106.25	2.74
Control	98	---	105.75	----	109.25	---

Table 5: Effect of fungicidal diptreatment on cormsprouting (%) of Gladiolus infested with corm rotting fungi

Fungi Fungicides	B.G	% Increase over control	B.C	% Increase over control	C.L.	% Increase over control	F.oxy	Increase over control
Fungicide								
Bavistia	92.75	96.29	87.5	18.64	65.25	3.98	94.75	91.41
Captan	48.25	2.11	80.0	8.47	87.5	38.64	53.0	7.07
Dithane M-45	68.5	44.97	82.75	11.76	93.75	48.2	87.5	75.75
Topsin-M	68.75	45.5	78.75	5.76	66.25	5.57	51.25	3.03
Control	47.25	---	73.75	---	62.75	---	49.5	---

BG = *Botrytis gladiolorum*; BC = *Botrytis Cinerea*; CL = *Curvularia lunata*; F. Oxy = *Fusarium oxysporum* f.sp. *gladioli*

sprouting ranging from 14.28% to 51.02%. Similarly plant height was also reduced by these fungi ranging from 5.21% to 35.93% after 90 day and 5.26% to 37.29% after 120 days which indicate that *S. botryosum* might not be corm rotting fungus while others all fungi were seems to be pathogenic to corms of Gladiolus (Table 4). On the other hand in case of leaf inoculation experiments. *S. botryosum* was proved to be a leaf spotting fungus which varify the results of Sohi (1992) who reported this fungus as cause of leaf spot of Gladiolus. As a result of confirmation of pathogenic nature of fungi to the corms of Gladiolus some fungicides were evaluated for their effectiveness against above mention fungi. In this experiment corms infested artificially with above mention fungi were dipped in fungicidal solution which revealed that Bavistin proved to be the best fungicide against *B. gladiolorum* and *F. oxysporum* f. sp. *gladioli* as corm sprouting was increased in both the cases. These results are in confirmity with those of Singh and Arora (1994) who also observed that Bavistin

improves corm sprouting. In the same experiment Topsin-M gave its effectiveness against *C. lunata* while Dithane M-45 proved its performance against *F. oxysporum* f. sp. *gladioli* (Table 5). These results indicate that one fungicide can not be used against all the fungi of one host rather different fungicides should be used against different fungi as clear from our studies on Gladiolus.

References

Bald, J.G., 1953. Neck rot phase of the Botrytis disease of Gladiolus. Phytopathology, 43: 167-171.

Booth, C., 1971. The Genus Fusarium. Coomonwealth Mycological Institute, Kew, Surrey, England, ISBN-10: 851980465, Pages: 237.

Dodge, B.O. and T. Laskaris, 1941. Botrytis core-rot of Gladiolus. J. New York Bot. Gard., 42: 92-95.

Drayton, F.L., 1928. Reported of the dominion botanist for 1927. Department of Agriculture, Botany, Canada, pp: 27.

Drayton, F.L., 1929. Bulb growing in Holland and its relation to disease control. Scient. Agric., 9: 494-509.

Ellis, M.B., 1971. Dematiaceous Hyphomycetes. 1st Edn., Commonwealth Mycological Institute, Kew, Surrey, UK., ISBN-13: 978-0851986180, Pages: 608.

Jackson, C.R., 1961. Some host-parasite relationships in the curvularia disease of gladiolus in Florida. Plant Dis. Rep., 45: 512-516.

Magie, R.O., 1948. Curvularia spot, a new disease of gladiolus. Plant Dis. Rep., 32: 11-13.

Magie, R.O., 1951. Botrytis and curvularia diseases of Gladiolus. Bull. N. Am. Gladiol. Coun., 1951: 1-6.

McClellan, W.D. and B.H. Marshall, 1950. Effect of temperature on the development of some diseases of *Gladiolus*, *Narcissus* and *Lilium*. Phytopathology, 40: 872-872.

Mirza, J.H. and A.S. Shakir, 1991. First report of fungal pathogen of gladiolus from Pakistan. Pak. J. Plant Path., 3: 74-76.

Moore, W.C., 1939. Diseases of Bulbs. His Majesty's Stationery Office, UK., pp: 112-116.

Parmelee, J.A., 1954. Curvularia on gladiolus in Canada. Plant Dis. Reptr., 38: 515-517.

Singh, P.J. and J.S. Arora, 1994. Chemical Conrol of Fusarium Yellows and Corm Rot (*Fusarium Wxysporum* f. sp. gladioli) of Gladiolus. In: Flouriculture: Technology Trade and Trends, Prakash, J. and K.R. Bhandary (Eds.). Oxford and IBH Publication Co. Lts., New Dehli, pp: 667.

Sohi, H.S., 1992. Diseases of Ornamental Plants in India. Indian Counsil of Agriculture Reasearch, New Dheli, Pages: 195.

Van Poeteren, N., 1938. Report on the work of the phytopathological service in 1937. Versl. PIziekt. Dienst Wageningen. Wageningen, pp: 89, 92.

Wade, G.C., 1945. Botrytis corm rot of gladiolus, its cause and control. Proc. Roy. Soc. Vict., 57: 81-118.

Young, R.A., 1955. Diseases of ornamental and Miscellaneous plants. Plant Dis. Rep. Supp., 235: 161-166.