

Effect of Date of Planting on Development of Twister Disease of Onion and Survival Ability of Pathogen

Suresh Patil, V. B. Nargund, P. R. Dharmatti

Received 10 May 2016 ; Accepted 13 June 2016 ; Published online 16 July 2016

Abstract Twister disease has become epidemic on onion in recent years, in major onion growing districts in Karnataka. This disease is causing heavy yield loss. A considerable variation on severity of twister disease of onion with respect to date of planting was observed. January 15th had least incidence (4.87 PDI) and recorded yield of 33.81 t/ha where as maximum at planting was July 15th with PDI of 54.02. *F. oxysporum* remained viable up to 210 days under laboratory, 255 days on pot soil surface and refrigerator condition. Whereas *Colletotrichum* spp. remained viable up to 165, 120 and 210 days respectively this show as its survival ability during off season.

Keywords Twister disease, Onion, Date of planting, Survival ability.

Introduction

Onion (*Allium cepa* L.) is one of the major bulb crops of India. However, in spite of the increase in areas planted, maximum production has not been attained. This is due to the proliferation of insect pests and diseases that continue to affect onion in almost all production areas in the country. The most important

factors responsible are the diseases like purple blotch, downy mildew, *Stemphylium* blight, basal rot and storage rots and now recently twister disease.

Onion twister, a disease of rainy season onion, was first reported near Zaria, north Nigeria, in 1969 the disease on shallot onions, *Allium cepa* var *ascalonicum*, that caused yield losses of up to 20 to 30% in Kalpitiya Peninsula. This disease vernacularly in Sri Lanka called as disco, in Indonesia as seven whorl and in Karnataka as haavu suruli roga, tiruguni roga, gone roga, octopus disease and creeping disease of onion.

Extreme climate events associated with ENSO (EL-Nino-Southern Oscillation) is also increasing. The top 10 El-Nino mostly occurred after 1970s. This means that the extreme regional weather and climate anomalies associated with El Niño are being exacerbated by increasing higher temperatures. Therefore, the increase in frequency and intensity of these extreme events has lead to the increase of climate hazards. During 2005-06, this disease has seriously attacked red onion crop in a number of onion production centers from laboratory research, when being exposed to high temperatures, this crop became less resistant to this disease [1].

Weather was the factors that favor the development and spread of the disease. Spores of the fungus can spread through soil, water, seed and crop debris. However., no detailed investigations have been conducted to determine date of planting for less disease to escape the disease and its survival ability patho-

S. Patil*, V. B. Nargund, P. R. Dharmatti
 Department of Plant Pathology, UAS, Dharwad, India
 e-mail: sureshpatil007@gmail.com

*Correspondence

gens. So, research was initiated on these lines the results of which are reported here under.

Materials and Methods

Effect of date of planting on disease severity

An experiment was conducted in ZARS, UAS Dharwad to see the effect of various dates of planting on severity of twister disease of onion. Sowing of onion seeds was taken up starting from 1st June 2011 to 15th Jan 2012 and 1st June 2012 to 15th Jan 2013 at an interval of 15 days. A total of 16 plantings were made with Arka kalyan and 3 replications were made by following RCBD. Seedlings of one month old were transplanted in the main field. The disease severity was recorded by using 0–5 scale at the time of harvesting.

Survival ability of pathogens of twister disease of onion in infected tissue of plant

The infected samples collected from field during survey 2011 were used for the study. The moisture content of the samples was reduced from (leaf, neck, bulb and roots) by pressing in between blotting paper. The infected samples were kept under three different conditions. (a) On soil surface under natural condition (b) Under laboratory condition ($21 \pm 1^\circ\text{C}$) in a glass beaker and (c) Under refrigerator (4°C) condition. The infected samples kept in different environmental conditions were subjected for isolation at 15 days interval on PDA using standard tissue isolation and incubated at $25 \pm 1^\circ\text{C}$ for seven days [2].

Results and Discussion

In general, for any plant disease to occur favorable environmental conditions are indispensable in addition to the virulence of pathogen, age and susceptibility of host. In addition, date of planting and its survival ability of pathogen help to gather information disease distribution and spread. It is also important in order to forecast the occurrence of disease and in devising management practices.

Effect of date of planting on twister disease of onion

A field trial was carried out to assess the effect of sowing time on twister disease development during 2011 and 2012 with 16 different dates starting from 1st June to 15th January at fortnightly intervals with Arka kalyan genotype at the Main Agricultural Research Station, Dharwad (Table 1).

In 2011-12, there was a significant difference in the incidence of twister at different planting dates. The highest disease severity was observed when planting was done on 1st September with PDI of 75.00 and yield of 8.60 t/ha followed by August 15th (65.00 PDI) and July 15th (58.30 PDI). Whereas, least PDI (3.6) was recorded on 15th January, date of planting with a yield of 33.81 t/ha. In the year 2012-13 there was a significant difference in the severity of twister at different planting dates. The highest disease severity was observed when planting was done on August 1st with PDI of 58.00 with a yield of 11.99 t/ha followed by July 15th (57.33). Whereas, least incidence of PDI was recorded at January 15th (1.22) with a yield of 33.81 t/ha.

In pooled analysis data of 2011-12 and 2012-13 the maximum disease severity was observed when planting was done on July 15th with PDI of 54.02 whereas least was on January 15th (4.87). With regard to yield the highest was observed in December 1st planting with yield of 52.77 t/ha and least 9.51 t/ha in September 1st planting. Between two years, 2012-13 recorded less disease compared to 2011-12.

A considerable variation on incidence of twister disease of onion with respect to date of planting was observed. The PDI varied from 4.87 to 54.02 depending on environmental conditions. Among the different dates of planting tried the planting at 15th July was ideal for obtaining maximum severity of disease (54.02 PDI). However, on 15th January planting relatively disease severity was minimum (4.87 PDI). The disease progression was having positive correlation with rainfall which was reflected as the most influenc-

Table 1. Effect of date of planting on development twister disease of onion during *kharif* of 2011-12 and 2012-13. *Arc sine values.

Date of planting	PDI			Yield (t/ha)		
	2011-12	2012-13	Pooled	2011-12	2012-13	Pooled
Jun 1 st	36.00 (34.4)*	38.33 (35.44)	37.80 (35.23)	13.82	16.92	15.37
Jun 15 th	37.00 (34.8)	34.00 (33.42)	35.54 (34.16)	19.65	23.15	21.40
Jul 1 st	42.4 (37.3)	42.44 (37.33)	40.77 (36.57)	17.47	18.00	17.73
Jul 15 th	58.3 (43.7)	57.33 (43.40)	54.02 (42.02)	16.98	18.75	17.87
Aug 1 st	53.3 (41.9)	58.0 (43.64)	51.58 (41.09)	9.82	11.99	10.90
Aug 15 th	65.00 (46.2)	47.66 (39.56)	53.12 (41.67)	9.44	11.87	10.66
Sep 1 st	75.00 (49.6)	34.33 (33.58)	51.03 (40.84)	8.60	10.43	9.51
Sep 15 th	51.7 (41.1)	25.66 (29.00)	39.17 (35.85)	12.11	13.05	12.58
Oct 1 st	40.00 (36.2)	10.76 (18.64)	26.47 (29.49)	25.58	28.75	27.17
Oct 15 th	25.00 (28.6)	11.00 (18.84)	20.90 (26.12)	26.01	27.61	26.81
Nov 1 st	18.3 (24.4)	8.55 (16.73)	16.51 (23.13)	46.27	47.01	46.64
Nov 15 th	14.00 (21.2)	3.88 (11.21)	11.90 (19.50)	39.54	38.20	38.87
Dec 1 st	5.1 (12.5)	2.42 (8.88)	6.57 (14.31)	45.52	60.02	52.77
Dec 15 th	20.90 (21.3)	2.88 (9.43)	16.45 (21.78)	46.15	44.82	45.49
Jan 1 st	3.7 (10.6)	2.05 (8.07)	5.61 (13.23)	27.24	31.91	29.58
Jan 15 th	3.6 (10.1)	1.22 (6.16)	4.87 (12.33)	33.81	33.81	33.81
SEm±	2.84	1.0	2.26	1.27	2.58	1.37
CD @ 5%	8.19	2.89	6.53	3.68	7.45	3.98

ing condition for disease development. The highest yield was of 52.77 t/ha when planting was done on December 1st [3].

Survival ability of *F. oxysporum* and *C. gloeosporioides* in infected plant debris

During the absence of an active host plant, pathogens must survive themselves to maintain continuity of the disease cycle and to provide primary inoculum for infection in the next season. Dormant mycelium plays an important role in the perpetuation, dissemi-

nation and inciting of disease from one season to another. The study was initiated to know the survival ability of the pathogen at different ecological conditions period of *F.*

The present study revealed that fungus *F. oxysporum* remained viable up to 120 days under laboratory, 255 days on pot soil surface and 270 days under refrigerator condition. Whereas *Colletotrichum* spp. remained viable up to 165 days under laboratory, 120, 210 days in pot soil surface and refrigerator condition respectively. The results obtained on recovery of fungus by its growth are presented in Table 2 and 12. These pathogens survived in the infected debris

Table 2. Survival ability of pathogens in infected plant debris under three different environmental conditions during 2011-12 and 2012-13.

Days survived	<i>Fusarium</i> sp.						<i>Colletotrichum</i> spp.					
	Lab		Pot (soil)		Refrigerator		Lab		Pot (soil)		Refrigerator	
	2011-12			2012-13			2011-12			2012-13		
0	+	+	+	+	+	+	+	+	+	+	+	+
15	+	+	+	+	+	+	+	+	+	+	+	+
30	+	+	+	+	+	+	+	+	+	+	+	+
45	+	+	+	+	+	+	+	+	+	+	+	+
60	+	+	+	+	+	+	+	+	+	+	+	+
75	+	+	+	+	+	+	+	+	+	+	+	+
90	+	+	+	+	+	+	+	+	+	+	+	+
105	+	+	+	+	+	+	+	+	+	+	+	+
120	+	+	+	+	+	+	+	+	+	+	+	+
135	+	+	+	+	+	+	+	-	+	+	-	+
150	+	+	+	+	+	+	+	-	+	+	-	+
165	+	+	+	+	+	+	+	-	+	+	-	+
180	+	+	+	+	+	+	-	-	+	-	-	+
195	+	+	+	+	+	+	-	-	+	-	-	+
210	+	+	+	+	+	+	-	-	+	-	-	+
225	-	+	+	-	+	+	-	-	-	-	-	-
240	-	+	+	-	-	-	-	-	-	-	-	-
255	-	+	+	-	-	-	-	-	-	-	-	-
270	-	-	-	-	-	-	-	-	-	-	-	-

and it served as primary source of infection during the favorable conditions in next season.

Similar results were obtained with *C. capsici* causing fruit rot of chilli survived up to eight months in both seed and culture [4]. The *C. capsici* could survive up to 225 days onion infected seeds stored under room conditions where as on pedicel and fruit rind it survive for 195 days.

References

1. Tondok E (2003) The causal agent of twister disease of Shallot. MSc (Ag) thesis. Univ Goettingen, Germany.
2. Swamy KM, Naik MK, Rekha D, Patil S (2011) Prevalence and effect of date of planting on incidence of dercospora leaf spot of chilli in north eastern region of Karnataka. Nat Symp on Integrated Disease Management Strategies in Relation to Climate Change in South India. October 14.
3. Wiyono S (2007) Climate change and pests and diseases explosion. Pro. Biodiversity in the middle of global warming. Kheti Foundation, Jakarta, Indonesia.
4. Suresh Patil, Nargund V.B., Santoshreddy Machenahalli (2016) Effect of date of planting on incidence of twister disease of onion and survival ability of causal agents. Nat Symp on "Recent trends in plant pathological research and education, 5-6th Jan.