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Effect of date of sowing on cotton leaf curl virus disease severity in cotton in Punjab

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ABSTRACT : The study was undertaken in Punjab Agricultural University, Regional Research Station, Bathinda in *Kharif* 2017 and 2018, respectively in field condition to study the effect of date of sowing on cotton leaf curl virus disease severity and the seed cotton yield componentsofcotton inPunjab,India. The cotton variety *i.e.*F 846 was sown at two different dates *i.e.* recommended (April 01 to May 15) and delayed date of sowing(After 15 May) *i.e.* May 10and June 10,2017, respectively. The symptoms of the 140 selected plants were critically examined as per cotton leaf curl virus disease. The selected CLCuD disease plants were tagged as/the disease severity grade(0-VI) scale after 100 days of sowing (both recommended and delayed). The data of randomly selected CLCuD infected of only three tagged plantsin each disease severity grade*i.e.* plant height (cm), monopods and sympods/plant, bolls/plant, boll weight (g) and yield(g/plant) were recorded. Plant height, monopods and sympods, bolls/plant and boll weight (g) were found to be decreased in delayed date of sowing as compared to the recommended date of sowing. Moreover, in addition maximum plants were recorded in higher disease severity grade(V-VI) in delayed date of sowing as compared to the recommended date of sowing.Seed cotton yield loss in the delayed date of sowing was found to be 30-40 per cent as compared to the recommended date of sowing.

Key words : Bolls, boll weight, cotton leaf curl virus disease (CLCuD), date of sowing, monopods, seed cotton yield, sympods, variety *viz.* F 846

Cotton (*Gossypium hirsutum* L.) is the world's leading food and fiber crop, is extensively cultivated in India.Cotton as a crop as well as commodity plays an important role in the agrarian and industrial activity of the nation and has a unique place in the economy of our country. Many pathogens attack cotton plant and induce different diseases that cause severe losses in cotton production (Ahmad *et al.*, 2011).Among the diseases, cotton leaf curl virus disease is one of the major diseases of cotton not only in Punjab but throughout north India. The first symptoms of Cotton leaf curl virus disease on cotton in Punjab appeared in 1995 and the disease continued to spread steadily eastwards in Punjab, Rajasthan and Haryana states (Briddon, 2003). Presently it has assumed serious proportions in the irrigated cotton belt of north India (Monga *et al.*, 2004).Cotton leaf curl virus disease (CLCuD) infected plants may show a range of symptoms depending on the severity of disease, typical symptoms include thickening and yellowing of small veins on the lower surface of young leaves. Under severe attack of the disease, leaves curl downward or upward with stunted plant growth due to reduction of inter-nodal distance (Briddon

et al., 2001 and Qazi *et al.*, 2007). The appearance of the disease at seedling stage seriously retards the flowering, boll formation, maturation, seed cotton yield and fiber quality (Monga *et al.*, 2011). The normal or recommended date of sowing of cotton in Punjab state is April 1 to May 15.The cotton sowing during this period give better results in terms of yield, insect pest and disease attack. Yield usually comparatively higher, infestation of insect pests and incidence/ severity of CLCuD is comparatively low as compared to delayed sowing. Delayed sowing leads to higher infestation of the sucking pests i.e whitefly (vector of CLCuD) and aggravates the incidence and severity of the cotton leaf curl virus disease in cotton.

MATERIALS AND METHODS

An experimental trial was conductedto study the effect of date of sowing on cotton leaf curl virus disease severity and the seed cotton yield component in *kharif* 2017 and 2018 in cotton at PAU, Regional Research station, Bathinda.The crop was raised with a spacing of 67.5 and 60.0 cm between rows and plants, respectively (Package of practices for crops of Punjab, *kharif*, 2017 and 2018).The symptoms of the 140 selected plants were critically examined as per the cotton leaf curl virus disease. The selected CLCuD disease plants were taggedas per thedisease severity grade(0-VI) scale after 100 days of sowing (in both recommended and delayed). The data of randomly selected CLCuD infectedof only three tagged plants in each disease severity grade *i.e.* plant height (cm), monopods and sympods, bolls/plant, boll weight (g) and yield (g per plant) were recorded. In addition, the effect of severity of CLCuD (in both the recommended and delayed date of sowing)was studied on plant height, monopods and sympods, bolls/plant and boll weight (g) and yield loss were also calculated.

RESULTS AND DISCUSSION

Effect of recommended date of sowing on cotton leaf curl virus disease severity and Seed cotton yield *kharif* 2017 and 2018 : The CLCuD infected plants range from disease severity grade (Grade I to Grade VI) were noticed (Table 1). Among the 140 tagged plant maximum no. of plants were noticed in Grade V followed by Grade IV, Grade VI and Grade III. The number of plants were noted in Grade V was 38followed by 30 (in Grade IV), 26 (in Grade VI and III) and minimum 5 (in Grade I).All the plants were infected with CLCuD and none of the plant was found disease free.The plant height (cm) were found to be the highest (139 cm) in (Grade I) and lowest (112.5 cm) in Grade VI. The maximum monopods and sympods (3.3 and 31.8) were in Grade I, and minimum (1.5 and 24) in Grade VI. The bolls/plant (47.3) found maximum inGrade I as compared to other grade.The boll weight (4.3 g)found to be maximum in Grade I and minimum (3.9 g) in grade VI. As per the data of the (Table 1). It was concluded that the plant height, monopods, sympods and bolls/plant and boll weight (closed boll) were found to be decreased consistently as we move from the Grade I to Grade VI. In Grade VI, the no. of monopods, no. of bolls and seed cotton yield per plant were found to be decreased upto the almost 50 per cent as compared to Grade I. The per cent decrease of seed cotton yield were found to be the maximum

Table 1. Crop loss estimation due to CLCuD - Recommended date of sowing (*kharif* 2017)

Disease Severity Grade	Number of plants	Plant height (cm)	Monopods/ plant	Sympods/ plant	Bolls/ plant	Boll weight (g/boll)	Per cent decrease of seed cotton yield over Grade I
0	—	—	—	—	—	—	—
I	5	139.0	3.3	31.8	47.3	4.3	—
II	15	138.3	1.8	30.3	43.3	4.3	3.4
III	26	138.2	1.9	30.0	33.3	4.1	8.2
IV	30	119.2	1.7	24.7	29.0	4.0	35.9
V	38	118.0	1.6	29.3	22.6	4.0	52.2
VI	26	112.5	1.5	24.0	21.0	3.9	55.1
CD (p=0.05)	0.94	0.14	0.95	1.24	0.26	-	

in Grade VI (55.1%) followed by Grade V (52.2 %), Grade IV (35.9%), Grade III (8.2%), Grade II (3.4%) as compared to GradeI (Table1). The similar kind of results were observed during *kharif* 2018 as the plant height were found to be highest(139.6 cm) in Grade 0 and lowest(113.0 cm) during Grade VI. The no of monopods were found to be reduced to half from Grade 0 to Grade VI. The sympods were found to be reduced from Grade 0 to VI. The per cent decrease of seed cotton yield were found to be maximum in Grade VI (54.6%) followed by Grade V, IV, III, II and were found to be minimum in Grade I (Table 3).

Effect of delayed date of sowing on cotton leaf curl virus disease severity and seed Cotton yield - *kharif* 2017 and 2018 : The CLCuD infected plants of disease severity Grade of only Grade V and Grade VI were noticed (Table 2). Among the 140 tagged plant maximum plants were noticed in Grade VI followed by Grade V. The plants founded to be the maximum 120 (in

Table 2. Crop loss estimation due to CLCuD - Delayed date of sowing (*kharif* 2017)

Disease Severity Grade	Number of plants	Plant height (cm)	Monopods/ plant	Sympods/ plant	Bolls/ plant	Boll weight (g/boll)	Per cent decrease of seed cotton yield over Grade I
0	—	—	—	—	—	—	—
I	—	—	—	—	—	—	—
II	—	—	—	—	—	—	—
III	—	—	—	—	—	—	—
IV	—	—	—	—	—	—	—
V	20.0	115.0	2.0	20.3	24.0	3.4	—
VI	120.0	97.3	1.7	18.0	23.7	3.3	17.5
CD (p=0.05)	4.65	0.23	2.33	0.37	0.15	-	

Table 3. Crop loss estimation due to CLCuD - Recommended date of sowing (*kharif* 2018)

Disease Severity Grade	Number of plants	Plant height(cm)	Monopods/ plant	Sympods/ plant	Bolls/ plant	Boll weight (g/boll)	Per cent decrease of seed cotton yield over Check
0	8	139.6	3.4	31.9	47.6	4.3	—
I	25	138.5	3.2	31.7	47.2	4.2	3.2
II	28	135.7	2.2	31.5	43.3	4.1	3.7
III	36	128.3	2.0	31.4	39.9	4.1	7.9
IV	18	119.6	1.9	30.4	29.0	4.0	34.0
V	15	118.1	1.8	30.1	25.5	3.9	51.5
VI	10	113.0	1.6	25.2	21.9	3.8	54.6
CD (p=0.05)	1.29	0.10	0.36	0.61	0.12		

GradeVI) followed by 20 (in Grade V). All the plants were infected with CLCuD and none of the plant was found disease free. Moreover, the CLCuD infected plants were found towards the higher disease severity grade.The plant height (cm) were found to be the highest (115.0 cm) in (Grade V) and lowest (97.3 cm) in Grade VI. The maximum monopods and sympods (2.0 and 20.3) were in Grade V and minimum (1.7 and 18.0) in Grade VI. The bolls/plant (24.0) found maximum in Grade V as compared to Grade VI.The boll weight (3.4 g) was minimum in Grade VI and maximum (3.3 g) in grade V.The per cent decrease of seed cotton yield over Grade V were found to be 17.5 per cent (Table 2). The similar kind of results were observed during *kharif* 2018 and ClCuD infected plants werefound in the Grade IV, V and VI. The maximum no. of tagged plants(110) were observed inGrade VI. The plant height, monopods, sympods, bolls and boll wt.(g) were found to be minimum in maximum disease severity (Grade VI). The per cent decrease of seed

Table 4. Crop loss estimation due to CLCuD - Delayed date of sowing (*kharif* 2018)

Disease Severity Grade	Number of plants	Plant height (cm)	Monopods/ plant	Sympods/ plant	Bolls/ plant	Boll weight (g/boll)	Per cent decrease of seed cotton yield over Grade I
0	—	—	—	—	—	—	—
I	—	—	—	—	—	—	—
II	—	—	—	—	—	—	—
III	—	—	—	—	—	—	—
IV	12	129.0	2.8	28.5	28.0	3.7	—
V	18	121.0	2.3	23.5	25.0	3.4	27.2
VI	110	99.6	1.9	20.4	24.5	3.3	15.2
CD (p=0.05)	1.82	0.12	0.07	0.55	0.27	-	

cotton yield over Grade IV were found to be 15.2 per cent (Table 4).

The seed cotton yield loss was found to be approx 36 and 39 per cent in delayed date of sowing as compared to the recommended date of sowing during *kharif* 2017 and 2018. Similar findings were observed by the Hussain *et al.,* 2015 who also observed that the early sown crop can have good establishment before the disease appearance, however, in late sown crop, the plant may not be established well and the early appearance of disease may result in significant yield reduction as was observed in our study.

CONCLUSION

From an experimental trial, it was inferred that in delayed date of sowing the yield can be reduced upto 30-40 per cent as compared to the normal date of sowing. The reason behind,in delayed date of sowing, infestation of cotton leaf curl virus disease were higher leads to higher loss in seed cotton yield. It means higher the infestations or severity of the CLCuD higher the losses in the seed cotton yield. In addition, plant height, monopods, sympods and bolls and closed and open boll weight are also gradually reduced with increase in the severity of cotton leaf curl virus disease.

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