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Reduction in Biomass due to incidence of Stunt Disease of chickpea

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ABSTRACT: Chickpea is an important *Rabi* pulse crop of India. Chickpea stunt disease (CpSd) caused by bean (pea) leaf roll virus and transmitted by aphid is an emerging disease of chickpea. It causes heavy yield losses in chickpea growing areas. An experiment was conducted to assess extent of incidence of CpSd and its effect on biomass of chickpea. Chickpea was sown in three different date of sowing at 15 days interval. Among different dates of sowing on the CpSd development was found maximum in early date of sowing followed by mid date of sowing and least in late date of sowing. Among varieties maximum incidence of stunt disease recorded in variety JG 315 was 41.72 per cent and minimum 11.94 per cent in GCP 105 in early sown crop. In mid sown crop maximum incidence of stunt disease observed in JG315 was 41.72 per cent and minimum 10.94 per cent in GCP105. Maximum incidence of stunt disease was observed in variety JG 315 was 31.63 per cent and minimum 8.09 per cent in GCP105 in late sown crop. Biomass of chickpea was adversely affected by incidence of stunt disease of chickpea. Disease plants became stunted and very sparse pod setting was observed in all three dates of sowing. Maximum reduction of biomass observed in variety JG315 was 91.72 per cent and minimum 85.88 per cent in GCP105 in early sown crop. In mid sown crop maximum reduction of biomass observed in variety JG315 was 90.28 per cent and minimum 83.06 per cent in GCP105. Maximum reduction of biomass observed in variety JG315 was 83.68 per cent and minimum 78.57 per cent in GCP105 in late sown condition of chickpea. Minimum chickpea stunt disease incidence and biomass reduction were observed during late sown condition in variety GCP105.

Keywords: chickpea, biomass, stunt disease.

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is one of important food legume cultivated throughout the world as a major cool season crop. Chickpea is cultivated in *Rabi* season in India and it ranks second in production next to pigeon pea. Chickpea is a rich source of carbohydrates and protein and protein quality is considered to be better than other pulses. It has significant amounts of all the essential amino acids except sulphur-containing amino acids, which can be complemented by adding cereals to the daily diet. Chickpea is an important pulse crop with a diverse array of potential nutritional and health benefits (Jukanti *et al.*, 2012). Apart from being a rich protein source it plays an important role in sustaining soil productivity by fixing up to 141 kg nitrogen per ha (Rupela, 1987). Ahlawat *et al.* (1981) reported that chickpea economizes nitrogen application for succeeding cereal crop (e.g. maize) to the tune of 56-68 kg N per ha. In India, chickpea occupies area 9.93 million hectare and contributing 9.53 million tonnes to the national pulse basket with productivity 960 kg/ha during 2013-14. The major chickpea producing states are Madhya Pradesh, Rajasthan, Andhra Pradesh, Maharashtra, Uttar Pradesh and Bihar.

During this year in Bihar state chickpea area, production and productivity are 61.30 thousand ha, 86.50 tonnes and 1147 kg/ha respectively.

Production and productivity of chickpea is adversely affected by both biotic and abiotic stresses. About 67 fungi, 3 bacteria and 22 viruses and 80 different nematodes are reported to affect the growth & productivity of the crop (Nene and Reddy, 1987; Singh and Sharma, 1998; Singh *et. al.*, 1999). Among biotic stresses stunt disease of chickpea caused by Bean Leaf Roll Virus and vectored by aphid is an important and emerging problem for chickpea cultivation. Kotasthane and Gupta (1978) reported 80-95% yield reduction in chickpea. This observation was based on natural incidence of chickpea stunt disease in chickpea fields. Gray and Gildow (2003) observed that Luteoviridae are transmitted by aphids in a circulative, non-propagative manner that requires the virus to be acquired through gut tissue into the aphid haemocoel and then exit through salivary tissues. In present investigation response of stunt disease against all seven cultivars in each date of sowing was assessed. Observation of plant biomass due to incidence of chickpea stunt disease was taken into consideration.

MATERIALS AND METHODS

Present investigations were carried out at Pulse research area of Bihar Agricultural University, Sabour during *Rabi* 2015-16. The experimental field had a fairly uniform topography and the soil was sandy loam and well drained. Commercial varieties popularly grown in the locality were assessed for the reaction against the stunt disease of chickpea. The present investigation was carried out to assess biomass of chickpea cultivars against stunt disease. The field experiment was laid out in three different date of sowing at 15 days of interval *viz*., 1st, 15th and 30th November, 2015. First date of sowing was considered as early sown, 2nd date of sowing as mid sown and 3rd sowing as late sown crop. In each date of sowing seven cultivars *viz*., BG256, JG62, JG315, GCP105, PG186, JG14 and BG372 were sown in RBD with 3 replication having plot size 12.5 m^2 along with all agronomical packages of practices.

Disease incidence (%) is calculated by using formula:

$$\text{Percent disease incidence} = \frac{\text{No. of plants infected}}{\text{Total no. of plants}} \times 100$$

RESULTS AND DISCUSSION

Chickpea stunt disease adversely affected the biomass in all seven test varieties. The incidence of stunt disease against test cultivars in each date of sowing was assessed. Observations of biomass for both healthy and diseased plant were taken into consideration. Reduction of biomass in chickpea was mainly due to stunted growth of plant. Internodes of plant became shortened and very sparse pod setting in plant. In early sowing crop biomass reduction was maximum 91.72 per cent in variety JG315 and least 85.88 per cent in GCP105 (Table1). Mid sown crop showed maximum biomass reduction 90.28 per cent in variety JG315 and least 83.06 per cent in GCP105, rest varieties showed intermediate loss of biomass (Table 2). During late sown condition the biomass reduction was maximum 83.68 per cent observed in variety JG315 and least 78.57 per cent in GCP105, rest varieties showed intermediate reduction of biomass in chickpea (Table 3). These findings confirm the observations made earlier by Ayub *et al*.(1990); Darini and Azadvar (2016).

Table 1: Effect of CpSd on Plant biomass (g) in early sown conditions.

Sr. No.	Variety	PDI	Healthy	Diseased	Reduction %
1.	BG256	36.06	19.30	2.27	88.23
2.	JG62	18.07	18.63	2.30	87.65
3.	GCP105	11.94	14.67	2.07	85.88
4.	PG186	16.11	19.13	2.33	86.91
5.	JG315	41.72	18.97	1.57	91.72
6.	JG14	30.72	21.10	2.73	87.06
7.	BG372	19.97	19.83	2.53	87.24
	CD at 5%	2.27	1.70	0.50	
	CV (%)	7.24	5.10	12.66	

Table 2: Effect of CpSd on Plant biomass (g) mid sown conditions.

Sr. No.	Variety	PDI	Healthy	Diseased	Reduction %
1.	BG256	29.29	18.27	2.53	86.15
2.	JG62	16.13	17.30	2.46	85.78
3.	GCP105	10.94	14.23	2.41	83.06
4.	PG186	15.68	18.57	2.88	84.49
5.	JG315	41.72	18.43	1.79	90.28
6.	JG14	16.87	17.47	2.42	86.14
7.	BG372	15.87	18.70	2.86	84.70
	CD at 5%	2.12	1.61	2.42	
	CV (%)	6.46	5.17	0.49	

Table 3: Effect of CpSd on Plant biomass (g) in late sown conditions.

Sr. No.	Variety	PDI	Healthy	Diseased	Reduction %
1.	BG256	25.61	14.10	2.37	83.19
2.	JG62	17.72	13.67	2.57	81.19
3.	GCP105	8.09	12.60	2.70	78.57
4.	PG186	13.15	13.83	2.73	80.26
5.	JG315	31.63	16.37	2.67	83.68
6.	JG14	19.21	17.13	3.10	81.90
7	BG372	14.23	17.43	3.30	81.06
	CD at 5%	2.01	1.42	0.51	
	CV (%)	5.64	5.34	10.50	

CONCLUSIONS

Stunt disease of chickpea is an important disease in chickpea cultivation. The incidence of stunt showed differential response in all seven test varieties during three dates of sowing of chickpea. Stunt disease showed stunted growth of plant due to shortened plant height and very sparse pod setting. Biomass of all test cultivars was adversely affected by the stunt disease. Maximum reduction of biomass was observed in variety JG315 and minimum in GCP105 during all three dates of sowing.

FUTURE SCOPE

Further investigation could focus on identification and evaluation of chickpea genotypes against chickpea stunt disease required for the development of resistant variety. Molecular study and management strategies required for management of stunt disease.

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