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Current Scenario of *Rhizoctonia bataticola* (Taub.) Butler, Inciting Chickpea dry Root Rot Disease in Agro-climatic Zones of Marathwada Region of the Maharashtra State

S.S. Kadam[1*], D.G. Hingole[2] and S.N. Banne[1]
[1]Ph.D. Research Scholar, Department of Plant Pathology,
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani (Maharashtra), India.
[2]Pearl Millet-Pathologist, NARP., Chh. Sambhajinagar (Maharashtra), India.

(Corresponding author: S.S. Kadam)*
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ABSTRACT: Dry root rot caused by *Rhizoctonia bataticola* (Taub.) Butler is one of the most important and widespread and destructive diseases of chickpea (*Cicer arietinum* L.), causing responsible quantitative and qualitative losses. The survey study revealed that the disease is prevalent in chickpea plants and is widespread in all the three agro-climatic zones of Marathwada region studied. The prevalence/incidence of the disease was more severe in *Rabi*, 2022-2023 season than in *Rabi*, 2021-22 season. Almost all chickpea grown in this region were found to be more or less susceptible to dry root disease. The disease was found to be more severe in the Scarcity zone (29.87%), followed by the Assured rainfall zone (25.01%) and the moderate rainfall zone (18.06%).

Keywords: *Rhizoctonia bataticola*, incidence, dry root rot, agro-climatic zones.

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is the only cultivated species of the genus Cicer and is a self-pollinated diploid (2n=2x=16) crop. It is a cool season legume grown as a food crop worldwide. The seed is the most important edible part of the plant. It is also called garbanzo gram or Bengal gram. Chickpea is a predatory crop that is preferably sown in September-November and harvested in February. Depending on the variety, the harvest is ready in about 90-120 days. Areas with low to moderate rainfall and medium cold weather are most suitable for growth, a moderate amount of precipitation of 60-90 cm per year is recommended. It has an indeterminate growth habit, meaning that the growth cycle continues as long as moisture is available.

India is a major producer of chickpea in 2021-22 and this crop was cultivated in an area of 98.96 lakh ha with an annual production of 107.37 lakh tonnes and a productivity of 1086 kg/ha, while Maharashtra has an area of 19.80 million hectares with a total production of 19.17 lakh tons corresponding to a productivity of 968 kg/ha (FW (DA and FW), Government of India; Annual Report, 2021-2022), while in Marathwada region it was grown in an area of 22.31 lakh hectares with production and productivity of 23. 96 lakh tons and 1192 kg/ha (Anonymous, 2022c).

So far, 55 pathogens have been reported in chickpea from early seedling stage to maturity and several of them are economically important. Among several soilborne fungal diseases, dry root rot caused by *R. bataticola* (Taub.) Butler is the most important disease of chickpea, especially in the central and southern zones, where the crop grows mainly under rain-fed conditions during the harvesting season.

The disease manifests itself mainly in the flowering and ear/podding stages. The first symptom is yellowing of plants and sudden drying. The taproot becomes dark brown, quite brittle in dry soil, and has extensive rot, causing loss of lateral roots. The lower part of the taproot often remains in the soil when the plant is pulled up by the roots. Dry root rot has caused 10–25% yield loss in major chickpea growing states of India (Lakhran and Ahir 2018a). An average incidence of 16.12% was also observed in Marathwada district of Maharashtra state (Kadam *et al*., 2018). Survey and surveillance recording the incidence and severity of crop diseases are essential for planning appropriate plant protection measures and timely introduction of control measures. Therefore, this study was conducted to estimate the prevalence/incidence of dry root rot disease of chickpea in Marathwada district of Maharashtra state.

MATERIAL AND METHODS

Survey. A random survey of chickpea fields of selected farmers covering three agro-climatic zones *viz*., Scarcity Zone (SZ), Assured Rainfall Zone (ARZ) and Moderate Rainfall Zone (MRZ) of Marathwada region of the Maharashtra state were undertaken, during *Rabi*, 2021-22 and *Rabi*, 2022-23, dry root rot disease incidence was assessed and simultaneously collected

the dry root rot disease samples. In the selected chickpea crop fields, a 10 m^2 area, randomly selected and in that counted total number of chickpea plants and number of plants showing typical dry root rot symptoms was recorded and calculated per cent dry root rot disease incidence by using following formula

$$\text{Per cent Disease Incidence} = \frac{\text{Number of plants infected}}{\text{Total number of plants observed}} \times 100$$

Occurrence and distribution of chickpea dry root rot. The random survey of chickpea field was conducted during the *Rabi* seasons of 2021-22 (Plate 1) and 2022-23 (Plate 2). Survey was conducted in 109 and 138 chickpea crop fields of 08 districts, distributed under three agro-climatic zones *viz*., Scarcity zone (06), Assured Rainfall zone (07) and Moderate rainfall zone (08) of Marathwada region of the Maharashtra state respectively during 2021-22 and 2022-23.

The results obtained on dry root rot incidence, tahsil-wise (Table 1), district-wise (Table 2 and Fig. 1) and agro-climatic zone-wise (Table 3 and Fig. 2 and 3) are being interpreted herein under following sub-heads.

Tahsil-wise incidence of dry root rot of chickpea. The results (Table 1) indicated a widespread prevalence of chickpea dry root rot, during both the years of survey and it was ranged from 14.35 (Nanded) to 35.80 (Vaijapur) and 15.23 (Ardhapur) to 36.50 (Vaijapur) per cent, during *Rabi*, 2021-22 and 2022-23 seasons, respectively. However, mean maximum dry root rot incidence was observed in Vaijapur tahsil (35.80 and 36.50 %), respectively during *Rabi*, 2021-22 and 2022-23 seasons, followed by Jalna tahsil (33.10 and 35.00 %) and Kalamb tahsil (30.69 and 36.43 %). Whereas in rest of the tahsils dry root rot incidence was observed in the range of 15.20 (Bhokar) to 29.33 (Pathri) per cent and 17.58 (Paithan) to 34.89 (Hingoli) per cent, during *Rabi*, 2021-22 and 2022-23 seasons, respectively. However, the mean minimum dry root rot disease incidence was observed in Nanded tahsil (14.35 and 21.11 %), during *Rabi*, 2021-22 and 2022-23 seasons, respectively, followed by Bhokar tahsil (15.20 and 18.77 %) and Paithan tahsil (15.60 and 17.58 %).

Table 1: Tahsil-wise Chickpea dry root rot incidence, during *Rabi*, 2021- 22 and 2022-23.

Sr. No.	Districts	Tahsils	2021-22		2022-23	
			No. of Fields surveyed	Av. Incidence (%)	No. of Fields surveyed	Av. Incidence (%)
Scarcity zone						
1.	Aurangabad	Vaijapur	2	35.80	4	36.50
2.	Beed	Patoda	3	26.50	3	31.85
3.	Osmanabad	Paranda	2	18.68	2	29.95
Mean:			**7**	**26.99**	**9**	**32.76**
Assured rainfall zone						
1.	Aurangabad	Aurangabad	2	18.47	4	20.80
		Paithan	3	15.60	3	17.58
2.	Jalna	Jalna	4	33.10	5	35.00
		Badnapur	4	16.98	6	25.66
3.	Beed	Majalgaon	4	19.90	3	21.36
		Ambajogai	2	16.98	3	20.88
		Beed	4	16.77	5	24.40
4.	Osmanabad	Kalamb	3	30.69	5	36.43
		Tuljapur	2	20.05	1	17.91
		Osmanabad	2	28.16	1	25.38
5.	Latur	Latur	4	22.65	7	26.64
		Renapur	3	20.76	2	17.82
		Ausa	1	23.28	1	24.40
6.	Parbhani	Parbhani	8	21.63	10	27.86
		Pathri	6	29.33	5	34.11
		Gangakhed	3	16.11	3	20.55
		Jintur	7	23.92	6	32.69
		Manwath	4	28.47	5	29.84
7.	Nanded	Loha	2	16.41	4	22.53
		Mukhed	1	20.62	2	28.30
8.	Hingoli	Hingoli	4	28.74	6	34.89
Mean:			73	24.07	87	25.95
Moderate rainfall zone						
1.	Nanded	Nanded	5	14.35	8	21.11
		Bhokar	2	15.20	3	18.77
		Ardhapur	4	17.33	3	15.23
2.	Hingoli	Hingoli	8	18.36	10	21.49
		Aundha	6	16.70	11	24.18
		Kalamnoori	4	15.65	7	18.42
Mean:			29	16.26	42	19.86

District-wise incidence of dry root rot of chickpea. Results (Table 2, Fig. 1) showed that the mean maximum chickpea dry root rot incidence was observed in Jalna district (25.04% and 30.33%, during *Rabi* 2021-22 and 2022-23 respectively, with maximum pooled incidence of 27.68 per cent, followed by Parbhani (23.89, 29.01 and 26.45%), Osmanabad (24.39, 27.41 and 25.90 %), Aurangabad (23.29, 24.96 and 24.12%), Latur (22.23, 22.95 and 22.59%), Beed (20.03, 24.62 and 22.32%), Hingoli (19.86, 24.74 and 22.30%) and Nanded (16.78, 21.18 and 18.98%). Overall average dry root rot incidence was maximum during *Rabi*, 2022-23 which was (25.65 %) and it was comparatively minimum (21.93 %) during *Rabi*, 2021-22.

Table 2: District-wise prevalence of chickpea dry root rot, during *Rabi*, 2021- 22 and 2022-23.

Sr. No.	Districts	No. of locations		Av. Disease Incidence (%)		Pooled Mean Incidence (%)
		2021-22	2022-23	2021-22	2022-23	
1.	Aurangabad	7	11	23.29	24.96	24.12
2.	Beed	13	14	20.03	24.62	22.32
3.	Hingoli	22	34	19.86	24.74	22.30
4.	Jalna	8	11	25.04	30.33	27.68
5.	Latur	8	10	22.23	22.95	22.59
6.	Nanded	14	20	16.78	21.18	18.98
7.	Osmanabad	9	9	24.39	27.41	25.90
8.	Parbhani	28	29	23.89	29.01	26.45
	Average/Total	109	138	21.93	25.65	—

Agro-climatic zone-wise incidence of dry root rot of chickpea, during *Rabi*, 2021-22 and 2022-23. Results (Table 3, Fig. 2 and 3) showed that out of three agro-climatic zones surveyed such as, Scarcity zone (SZ), Assured rainfall zone (ARZ) and Moderate rainfall zone (MRZ), the maximum av. chickpea dry root rot incidence was observed which was 26.99 per cent during *Rabi* 2021-22 and 32.76 per cent, during *Rabi* 2022-23, with maximum pooled mean disease incidence of 29.87 per cent in Scarcity zone, followed by Assured rainfall zone (24.07 %, 25.95 % and 25.01%) and Moderate rainfall zone (16.26 %, 19.86 % and 18.06%). In order of merit whereas, maximum average chickpea root rot incidence was observed during *Rabi*, 2022-23 (26.19%) as compared to the incidence during *Rabi*, 2021-22 which was 22.44 per cent.

Plate 1: Chickpea crop fields surveyed for recording dry root rot disease incidence during *Rabi*, 2021-2022.

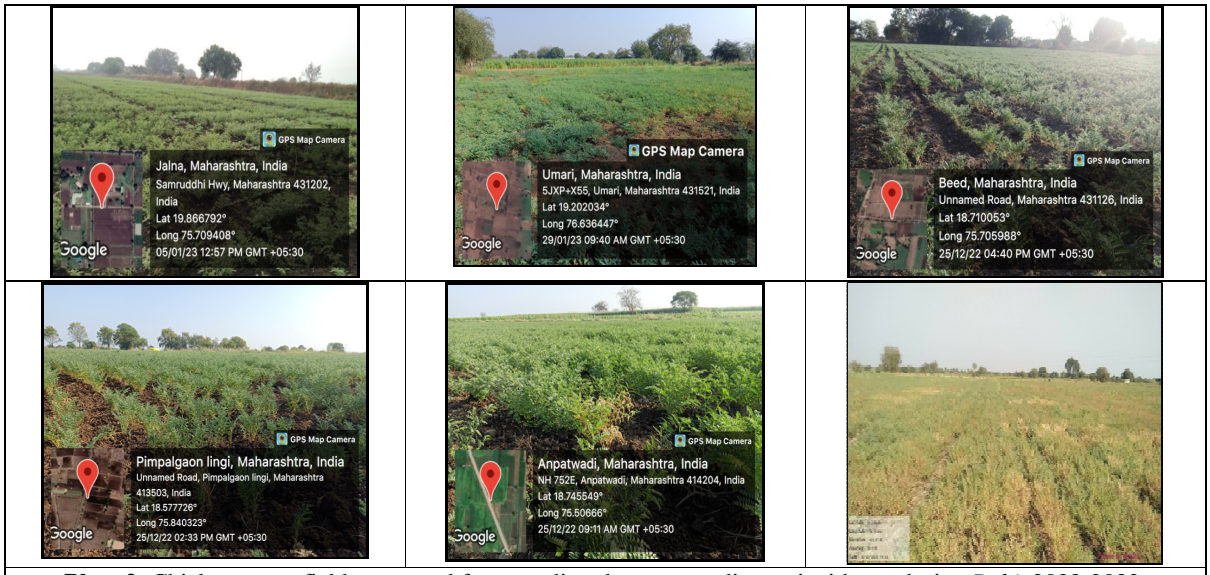

Plate 2: Chickpea crop fields surveyed for recording dry root rot disease incidence during *Rabi*, 2022-2023.

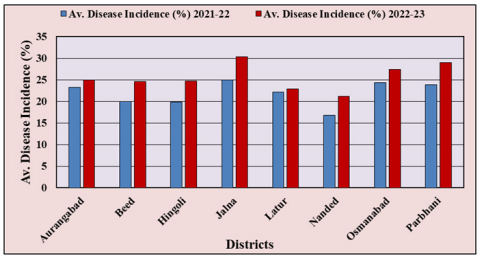

Fig. 1. District-wise dry root rot of chickpea incidence, during *Rabi*, 2021- 22 and 2022-23.

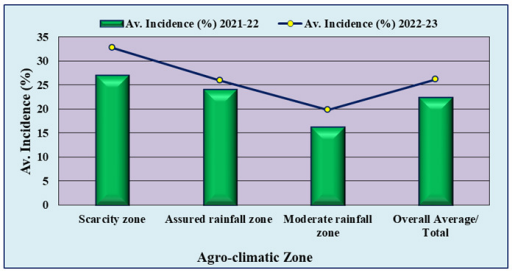

Fig. 2. Agro-climatic zone-wise dry root rot of chickpea incidence, during *Rabi*, 2021-22 and 2022-23.

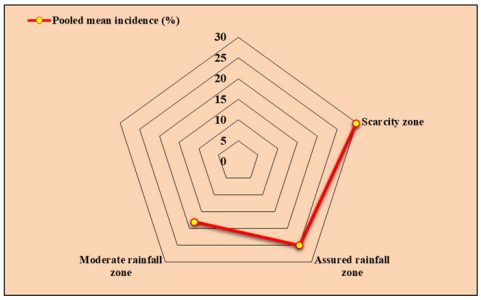

Fig. 3. Pooled mean Agro-climatic zone-wise dry root rot of chickpea incidence, during *Rabi*, 2021-22 and 2022-23.

Table 3: Agro-climatic zone-wise chickpea dry root rot incidence, during *Rabi*, 2021-22 and 2022-23.

Sr. No.	Agro-climatic Zone	No of locations		Av. Incidence (%)		Pooled mean incidence (%)
		2021-22	2022-23	2021-22	2022-23	
1.	Scarcity zone	7	9	26.99	32.76	29.87
2.	Assured rainfall zone	73	87	24.07	25.95	25.01
3.	Moderate rainfall zone	29	42	16.26	19.86	18.06
	Overall Average/ Total	109	138	22.44	26.19	24.31

Present results obtained on random survey of *R. bataticola* causing, dry root rot of chickpea is in consensus with those findings of several other workers *viz*., Badgujar *et al*. (2017) reported overall chickpea dry root rot incidence was comparatively higher during *Rabi*, 2017-18 season compared to *Rabi*, 2016-17. During *Rabi*, 2016-17 and 2017-18 maximum root rot incidence of 24.23 and 30.55 per cent, respectively, with maximum pooled mean incidence of 27.39 per cent in Scarcity zone, followed by Assured rainfall zone (22.17 %, 26.63 % and 24.4 %) and Moderate rainfall zone (16.18 %, 20.29 % and 18.23 %). Date *et al*. (2017) who conducted survey of chickpea fields in eight districts of Marathwada region and recorded heavy disease incidence was noticed in Latur (23.14%), followed Jalna district (22.20%) and lowest incidence was recorded in Aurangabad district (10.12 %). Similarly, Agale *et al*. (2018) who surveyed for soybean dry root rot in Marathwada region of Maharashtra and reported revealed that Prevalence of the disease was more severe during *Kharif*, 2017-18, compared to *Kharif*, 2016-17. The disease was found more severe in Scarcity Zone (28.24%), followed by Assured rainfall zone (24.32%) and Moderate rainfall zone (17.38%). Deepa *et al.* (2018) also conducted a roving survey for the incidence of dry root rot in eight chickpea growing districts of North Karnataka. They reported overall mean dry root rot incidence 38.72 %. Kadam *et al*. (2018) also reported that the highest disease incidence was observed in Latur district (23%) and lowest in Aurangabad district (10.20 %) in Marathwada region of Maharashtra. Similar results were also reported by Lakhran and Ahir (2018a); Pawar *et al*. (2018); Chiranjeevi *et al*. (2019); Partap and Godara (2022).

CONCLUSIONS

Rhizoctonia bataticola (Tabb.) Butler is one of the major constraints in profitable production of chickpea. Dry root rot (*R. bataticola*) of chickpea is of common occurrence distributed in all locations of the Marathwada region and it was comparatively more severe during *Rabi*, 2022-23 than *Rabi*, 2021-22 season, on all chickpea grown in the Marathwada region. The disease was found to be more severe in Scarcity and Assured rainfall zones, with low to adequate but erratic rainfall, compared to Moderate rainfall zone (MRZ).

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Conflict of Interest. None.

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