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Prevalence and distribution of chickpea rust disease in Western Maharashtra state during 2021-22 and 2022-23

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Abstract
A roving survey was conducted during *Rabi* 2021-22 to access the severity of chickpea rust disease in nine districts of Western Maharashtra State including Ahmednagar, Solapur, Sangali, Satara Kolhapur, Pune, Nasik, Jalgaon and Dhule. Survey results revealed that, out of nine districts, chickpea rust disease was prevalent in six districts of Western Maharashtra, *viz.* Ahmednagar, Solapur, Sangali, Satara Kolhapur and Pune. The overall severity of chickpea rust disease was ranged between 13.77 to 60.22%. Maximum percent disease severity i.e., 60.22% was recorded at Thakurki village of Phaltan tehsil in Satara district while, minimum i.e., 13.77% at Lamjewadi village of tehsil Indapur, district Pune. No disease was observed at any survey location from Nasik, Dhule and Jalgaon districts. However, disease was not observed during survey in Rabi 2022-23 season except at few locations from Pune (Baramati, 12.44%) and Ahmednagar (Rahuri, 29.44%) districts. Disease severity varied from location to location with change in cropping system and climatic conditions.

Keywords: Survey, chickpea, rust, severity, Maharashtra

1. Introduction
Chickpea is the most significant food grain legume in the world, after common bean (*Phaseolus vulgaris* L.) and field pea (*Pisum sativum* L.). In India it is cultivated on residual moisture during *Rabi* season. Maharashtra State ranked first in the area with 22.31 lakh ha under chickpea cultivation in 2020-21. Total production of 23.96 lakh tonnes with productivity of 1192 kg/ha was recorded (Anonymous 2022a) [1]. In defiance of higher total production, yields of chickpea are low due to many biotic and abiotic constraints. Betwixt biotic constraints, chickpea rust caused by *Uromyces ciceris-arietini* a formerly minor disease now became a major production constraint. Popularization of late sown varieties and increased area under late sown chickpea cultivation for increasing cropping intensity, created situations conducive for severe outbreaks of chickpea rust disease in India. Eventually, severe outbreaks have been shown to appear repeatedly year by year in some pockets in last few years. under the influence of changing climatic patterns the disease is now becoming a threat to yield potential of the crop. A roving survey was conducted during the *Rabi* 2021-22 to access the severity of chickpea rust disease.

2. Materials and Methods
A roving survey was conducted in nine districts of Maharashtra State during Rabi, 2021-2022 and disease severity data was recorded. In each district, plots were selected randomly from each tehsil demarked. the disease incidence was recorded when visible symptoms appeared in these plots. In each field ten chickpea plants were selected randomly marked and disease severity was scored using 0-9 scale (Mayee and Datar, 1986) [8] by observing 10 leaves of 10 marked plants from each plot.

Following rating scale (grade) was used for accessing disease severity
0 = No symptoms on leaves, 1 = Uredosori covering 1% or less of leaf area, 3 = 1-10% of the leaf area covered with brown powdery uredosori, 6 = Uredosori covering 11-25% of leaf area, 7 = Uredosori covering 26-50% of leaf area, 9 = Uredosori covering 51% or more of leaf area. Further these scales were converted to per cent diseases index using formula given by Wheeler (1969) [15]:

$$\text{Percent Disease Index} = \frac{\text{Sum of all numerical rating}}{\text{Number of leaves examined x Maximum grade}} \times 100$$

3. Result and Discussion

Chickpea rust disease was found prevalent in Western Maharashtra State during *Rabi* 2021-22 and the severity of chickpea rust disease was found in the range of 13.77 to 60.22%. Maximum percent disease severity i.e., 60.22% was recorded at Thakurki village of Phaltan tehsil in Satara district while, minimum i.e., 13.77% at Lamjewadi village of tehsil Indapur, district Pune. Maximum percent disease severity was recorded in Kolhapur district (31.50%) followed by Pune (30.40%), Satara (29.86%), Sangali (28.91%) and Ahmednagar (28.36%), while minimum in Solapur district (22.82%). No disease was recorded at any survey location from Nasik, Dhule and Jalgaon districts. No disease was observed in a survey during Rabi 2022-23 except at few locations from Pune (Baramati, 12.44%) and Ahmednagar (Rahuri, 29.44%) districts.

No literature was found available on survey reports indicating incidence and/or severity of chickpea rust disease from Maharashtra State except, Deshmukh *et al*., (2010) [4], who reported occurrence of rust disease on chickpea variety, Digvijay for first time from Western Maharashtra State, in Rabi 2009 with 10 to 15% disease severity and Gurumurthy (2022) [6], who observed severe incidence of chickpea rust at Baramati (ICAR-NIASM) during flowering and pod development stage. The results presented here are consistent with previous reports from other parts of India. Asthana (1957) [2] reported a severe outbreak of rust on chickpea from Seoni Malwa, Madhya Pradesh, especially on a local cultivars and some genotypes. He stated that the disease had appeared occasionally before but caused no great damage. All formerly grown cultivars were found susceptible to the disease. Several epiphytotics of chickpea rust disease were reported from Karnataka; Grewal (1988) [5] in year 1985, Nene (1986) [10] during 1983 and 1984 at Bangalore, by Hiremath *et. al*., (1987) [7], with incidences up to 90-100%. Singh (2010) [13] reported 32-40% incidence and Nargund *et. al*., (2011) [9] from Dharwad reported severe outbreak of chickpea rust disease. Likewise, Deshmukh *et al*., (2018) [3] recorded incidence of rust disease on chickpea variety GG-2 from south Gujarat with disease severity ranging from 24 to 30% and Verma and Singh (2019) [14] reported chickpea rust disease from Chhattisgarh on cultivar Vaibhav.

The survey data collected during 2021-22 and 2022-23 was found consistent with Saabale *et al*., (2013) [12] as they observed occurrence of rust disease on late planted (Jan 15) chickpea from North India with 60 to 70% disease severity during crop maturity. Patil and Bhat (2013) [11] observed chickpea rust disease in transitional tract of Karnataka during rabi 2008-9 and 2009-10 with severity being as high as 80 to 100%. However, during rabi 2010-2011, they observed disease in few late sown areas only. Hence the present survey clearly shows that the severity of chickpea rust disease varies from location to location. All the predominantly cultivated popular varieties were found susceptible to rust disease at all survey locations.

Table 1: Showing chickpea rust disease severity in Western Maharashtra State during 2021-22

District	Tehsil	Crop stage	PDI (%)
Ahmednagar	Sangamner	Pod Formation	34.66
	Akole	Pod formation	24.22
	Rahuri	Pod Formation	35.55
	Newasa	Flowering	17.55
	Jamkhed	Pod Formation	19.77
	Shrigonda	Pod Formation	42.26
	Parner	Pod Formation	22.66
	Average PDI of Ahmednagar district		28.36
Solapur	Mangalwedha	Pod Formation	22.44
	Sangola	Pod Formation	29.33
	Pandharpur	Pod Formation	20.88
	Akkalkot	Maturity	26.66
	Madha	Pod Formation	16.22
	Barshi	Pod formation	21.33
	Average PDI of Solapur district		22.81
Kolhapur	Shirol	Pod Formation	35.55
	Hatkanangale	Pod Formation	37.55
	Kagal	Pod Formation	20.22
	Gadhinglaj	Pod Formation	25.11
	Panhala	Pod Formation	39.11
	Average PDI of Kolhapur district		31.50
Sangali	Kavathe Mahakal	Maturity	56.80
	Walwa	Pod formation	21.33
	Miraj	Maturity	19.55
	Palus	Pod formation	23.33
	Khanapur	Maturity	23.55
	Average PDI of Sangali district		28.91
Satara	Phaltan	Pod formation	60.22
	Khatav	Maturity	18.44
	Karad	Pod formation	19.11
	Jawali	Pod formation	27.33
	Khandala	Pod formation	24.22

	Average PDI of Satara district		29.86
Pune	Inadapur	Pod formation	13.77
	Baramati	Pod formation	15.33
	Bhor	Pod formation	27.33
	Purandar	Pod formation	44.22
	-	Pod formation	57.55
	Shirur	Pod formation	24.22
	Average PDI of Pune district		30.40
Nasik	Deola	Maturity	00.00
Dhule	-	Pod formation	00.00
Jalgaon	Pachora	Pod formation	00.00

4. Conclusion

Chickpea rust disease was found widely spread in six districts, *viz*. Ahmednagar, Solapur, Kolhapur, Sangali, Satara and Pune during 2021-22. No disease was observed in a survey during Rabi 2022-23 except at few locations from Pune and Ahmednagar districts. However, no disease was observed from Nasik, Dhule and Jalgaon districts during both years.

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