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Assessment on prevalence and severity of cowpea rust [*Uromyces phaseoli* var. *vignae* (Barcl.) Arth.] in Karnataka

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Abstract

Rust of cowpea caused by *Uromyces phaseoli* var. *vignae* (Barcl.) Arth. is an obligate pathogen and an economically important disease as it causes drastic reduction in grain yield and fodder quality of the crop worldwide. In spite of its destructive nature, the information about the prevalence and severity of the disease throughout the Karnataka is lacking. Therefore, fixed plot survey was carried out to assess the prevalence and severity of rust at 12 selected locations during *Kharif* 2020 and 2021 using rust susceptible genotype C 152. Rust was widespread in all the 12 locations of Karnataka during both the years. The rust severity was ranged between 84.18 to 97.78%. Maximum severity was noticed at Main Agricultural Research Station, Dharwad, (97.78%) and Agricultural Research Station, VC Farm, Mandya (94.08%) whereas, minimum% disease severity was noticed in Zonal Agricultural Research Station, GKVK, Bengaluru (84.18%).

Keywords: Cowpea, survey, prevalence, severity, *Uromyces phaseoli* var. *vignae*

1. Introduction

Cowpea (*Vigna unguiculata* (L.) Walp. ssp. *unguiculata*) is a key resource for a large number of people in the developing world, mainly in the arid/semi-arid tropical regions of the world. In terms of its importance, this indigenous Indian legume is an economically, nutritionally and environmentally the foremost crop that serves as a source of essential human dietary nutrients and as a means of providing fodder for livestock. It also presents with other multi-functional traits, including the maintenance of the soil-ecology balance through nitrogen fixation in that it facilitates a symbiosis with nodulating bacteria (Ravelombola *et al.*, 2017) [10].

In India cowpea is grown over an area of 4 mha with a production of 2.7 mt and with a productivity of 567 kg/ha (Anon., 2020) [2]. Low productivity is attributed to a number of factors including biotic (diseases, insect pest) and abiotic (moisture, soil fertility, etc.) and diseases play a significant role in yield reduction. Among the fungal diseases, the rust caused by *Uromyces phaseoli* var. *vignae* (Barcl.) Arth. is an economically important disease of cowpea, since there is 50.00-58.53% grain yield loss worldwide (Chandra Mouli, 1992; Chandrashekar *et al.*, 1988; Ndalira *et al.*, 2020) [4, 5, 8]. The disease was first reported in Simla, Himachal Pradesh, India by Barclay, 1891 [3]. In Karnataka, Rangaswami, *et al.* (1970) [9] reported this disease from Dharwad and Mysore. Survey on the severity of disease helps to gather information on the prevalence, severity and distribution of disease, pathogen diversity in particular agro-climatic zones. It reveals magnitude of the problem on hand and serves as a precursor for evolving the management strategies. Even though the rust is an economically important disease, the information about the distribution and severity of the disease throughout the Karnataka is very much lacking. Therefore, the present work aims to understand the magnitude and distribution of cowpea rust in different districts of Karnataka.

2. Materials and methods

To assess the extent of rust severity, fixed plot survey was carried out at 12 selected locations of Karnataka during *Kharif* 2020 and 2021 by sowing rust susceptible cowpea genotype C 152. An observation on disease severity was taken at physiological maturity of the crop on lower, middle and uppermost leaves of ten randomly selected plants as per the scale given by Ndalira *et al.* (2020) [8] with slight modifications (0-9 scale). Further, % disease index (PDI) was calculated as per the formula given by Wheeler (1969) [13].

3. Results and Discussion

Survey was carried out during *kharif* 2020 and 2021 in 12 locations of Karnataka by adopting fixed plot survey method. The disease severity was recorded during both the years and is presented in Table 1. The rust was prevalent in all the locations of Karnataka in severe form with mean severity ranging from 84.18 to 97.78%. Maximum disease severity was observed in MARS, Dharwad with 98.52 and 97.04% during *kharif* 2020 and 2021, respectively followed by ARS VC Farm, Mandya (95.56%) (92.59%). Minimum severity was noticed in ARS, Bagalkot (86.67%) and MARS, Raichur (86.67%) during *kharif* 2020 whereas, minimum rust severity was noticed in ARS, Hanumanmatti, Ranebennur (83.70%) during *kharif* 2021. Highest mean rust severity upto 97.78% was noticed in MARS, Dharwad followed by ARS, VC Farm, Mandya (94.08%), farmers field, Sira, Tumkur (92.59%) whereas, minimum% disease severity was noticed in ZARS, GKVK, Bengaluru (84.18%) (Table 1) (Fig. 1). Emechebe and Soyinka (1985) [6] reported that cowpea rust as

the major disease in the rainforest and southern Guinea savanna zones of West Africa and in medium-elevation areas of East Africa. Stoffella *et al.* (1990) [11] opined that cowpea rust as the most severe fungal disease at Fort Pierce, Florida, USA. Chandra Mouli, 1992 [4], observed severe cowpea rust (88.98%) in Dharwad sown during June-July as it coincides with South-West monsoon resulting in appreciable crop loss (57.92%). Ahmady (2010) [11] carried out survey in Karnataka and found that cowpea rust was prevalent with the severity ranging from 53.50 to 74.50%. Similarly, Honnur (2015) [7] conducted survey in four districts of northern Karnataka during *kharif* 2014-15 and recorded maximum severity of cowpea rust in Dharwad district (35.29%) followed by Belagavi district (34.06%). Uma *et al.* (2015) [12] carried out extensive survey in major cowpea growing states of Southern India and observed rust in all the states and rust severity was ranging from 26.25 to 50.00% and gaining the economic importance in Karnataka, Kerala, Goa, Andhra Pradesh and Tamil Nadu.

Table 1: Severity of cowpea rust in different parts of Karnataka during *kharif* 2020 and 2021

Sl. No.	Districts	Talukas	Locations	Percent disease index (PDI)		Mean PDI
				2020	2021	
1.	Dharwad	Dharwad	Main Agricultural Research Station (MARS), Dharwad.	98.52	97.04	97.78
2.	Dharwad	Annigeri	Agricultural Research Station (ARS), Annigeri.	94.44	89.63	92.04
3.	Bagalkot	Bagalkot	Agricultural Research Station (ARS), Bagalkot.	86.67	92.59	89.63
4.	Vijayapur	Vijayapur	Regional Agricultural Research Station (RARS), Vijayapur.	89.63	86.67	88.15
5.	Raichur	Raichur	Main Agricultural Research Station (MARS), Raichur.	86.67	91.11	88.89
6.	Belagavi	Hukkeri	Agricultural Research Station (ARS), Sankeshwar.	92.59	88.15	90.37
7.	Bengaluru	Bengaluru North	Zonal Agricultural Research station (ZARS), GKVK, Bengaluru.	94.07	88.15	84.18
8.	Mandya	Mandya	Agricultural Research Station (ARS), VC Farm, Mandya.	95.56	92.59	94.08
9.	Tumkur	Sira	Farmers field, Tumkur.	94.07	91.11	92.59
10.	Chitradurga	Chitradurga	Farmers field, Chitradurga.	93.65	86.67	90.16
11.	Haveri	Ranebennur	Agricultural Research Station (ARS), Hanumanmatti, Ranebennur.	91.11	83.70	87.41
12.	Bellary	Hagari	Agricultural Research Station (ARS), Hagari, Bellary.	94.07	89.63	91.85

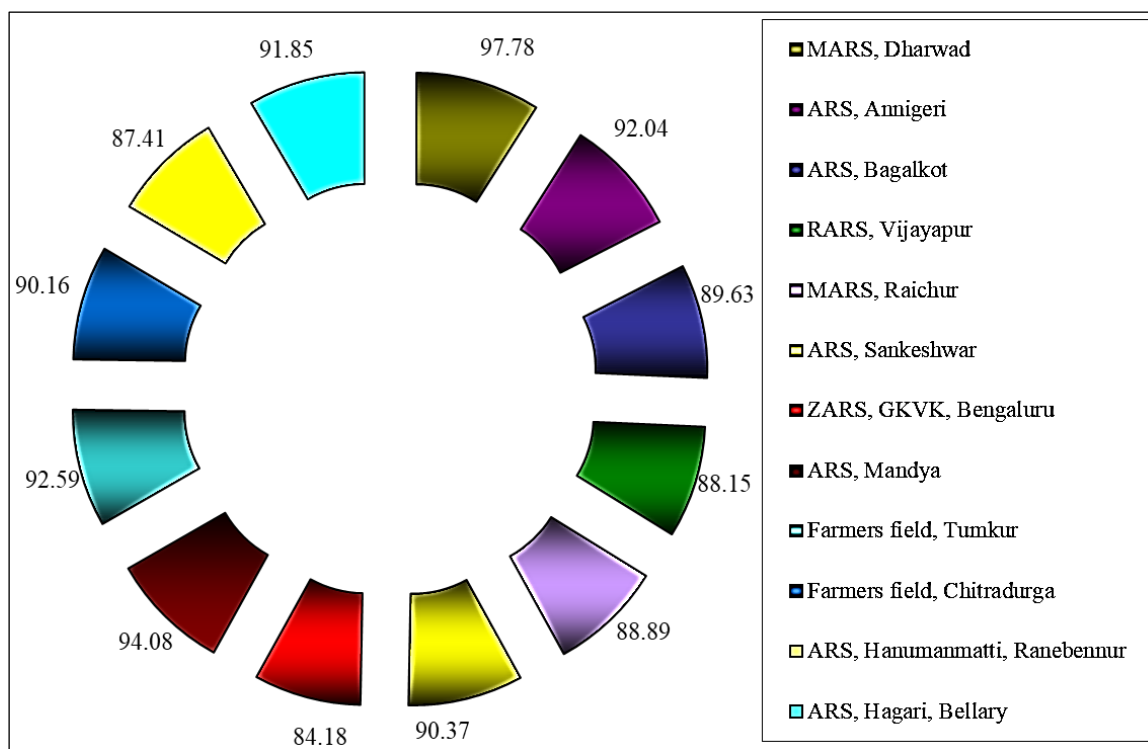


Fig 1: Severity of rust in different parts of Karnataka during *kharif* 2020 and 2021

4. Conclusion

The present study indicated that Dharwad, Mandya and

Tumkur districts as hot spots for cowpea rust. The environmental conditions like temperature, relative humidity and rainfall, availability of inoculum load and surviving ability of the pathogen on collateral hosts could be the reasons for maximum severity of rust in these areas of Karnataka.

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