

## 1 Introduction

Wheat (*Triticum aestivum* L.) is one of the important staple food crops for 40% of the world population. In Ethiopia, wheat grows on @ 13.38% of the areas allotted to grain crops produced in several rainfed and some irrigated agroecologies including western and southwestern zones in Ethiopia (CSA, 2018/19) and is an important food crop

Stem rust is constraining wheat production in western and southwestern zones in Ethiopia (CSA, 2018/19; Tolossa *et al.*, 2020, Unpublished). However, the stem rust races prevailing in these zones are unknown. The knowledge of race virulence and diversity status of the given area is useful for stem rust resistance breeding program, deployment and replacement of varieties. Thus, a survey was conducted to study *Puccinia graminis* f.sp. tritici virulence variation in western and southwestern zones of Ethiopia in 2019 cropping season. This paper presents the results of this study

## 2 Objectives

To quantify pathogenic Variability and Virulence of stem rust (*Puccinia graminis* f.sp.tritici)

## 3 Material and methods

### 3.1 Sample collection

87 infected sample were collected from Dedo, Omonada, Bedele, Gechi and Maokomo and Begi districts of western and south western Ethiopia using procedure of Stackman *et al.*, (1962)

### 3.2 Monopustule Isolation

**Inoculation** : 7 day old seedling of McNair with 5mg of spore /1ml soltrol spore suspension

**Incubation**: 18hrs dark, RH (98-100%), Temp (18-22oC) in dew chamber and kept in glass house of 12 hours photoperiod, Temp (18 - 25°C) and RH (60-70%) for 14 days

### 3.3 Multiplication of Monopustule isolate

7 days post inoculation; leaves containing single fleck that could produce single pustule were separately covered with cellophane bag (Fetch and Dunsmore, 2004), separately collected and multiplied on universal *pgt* susceptible McNair

### 3.4 Typing of isolate and nomenclature of race

Raising differential, inoculation, incubation, designing race and Nomenclature as were done using procedure of Roelfs and Martens, (1988) and Jin *et al.*,(2008)

5 set of differential containing 20 mono gene were used for resistance classification.

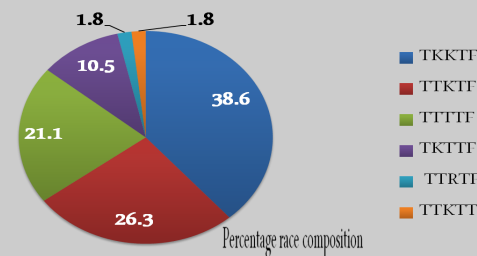
Seedling infection types (ITs) were scored using 0 to 4 scoring scale as described by Stakman *et al.*,(1962)

## 4 Results

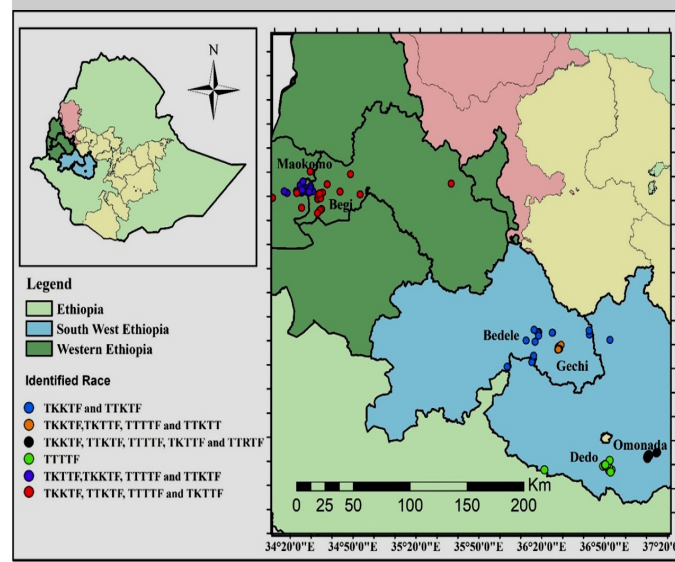
### 4.1 Pathogen Variability

Of 57 viable Isolates 22, 15, 12, 6 were typed to TKKTF, TTKTF, TTTTF, TKTTF and 2 isolates were typed to TTKTT and TTRTF, respectively

Percent variability in race composition of isolate



Spatial variability of race across districts



### 4.2 Pathogen Virulence

Most virulent race in current study were TTKTT (95%) and TTTTF(90%) as virulent to 19 and 18 differential gene respectively. Only Sr 36 was non compatible to TTKTT and Only Sr 24 and Sr 31 were non compatible to TTTTF

Most Dominant race were TKKTF and TTKTF with 38.6% and 26.3% of frequency respectively.

## 5 Conclusion

57 stem rust isolates were analyzed and typed to six races Viz TKKTF, TTKTF, TTTTF, TKTTF, TTKTT and TTRTF

Of the number of resistance genes, stem rust resistance genes, Sr24 and Sr31 were effective to six races except to TTKTT. Physiologic race is variable irrespective of districts

Resistance gene, Sr24 has been remained an effective resistance gene in Ethiopia. Currently, due to outbreak of TTKTT, 20 of Sr resistance gene available in country were being susceptible. Therefore searching for effective resistance genes and introducing to Ethiopian wheat cultivar is crucial to sustain wheat production

## Acknowledgments

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## References

- CSA. 2018/19. Report on area and production of major crops. The federal democratic republic of Ethiopia; Central Statistics Agency Agricultural Sample Survey for 2017/2018. Addis Abeba, Ethiopia 1,1-125
- Fetch Jr, T. & Dunsmore, K. 2004. Physiologic specialization of *Puccinia graminis* on wheat, barley, and oat in Canada in 2001. *Canadian journal of plant pathology*, 26, 148-155.
- Jin, Y., Szabo, L., Pretorius, Z., Singh, R., Ward, R. & Fetch Jr, T. 2008. Detection of virulence to resistance gene Sr24 within race TTKS of *Puccinia graminis* f. sp. tritici. *Plant disease*, 92, 923-926.
- Roelfs, A. P. & Martens, J. 1988. An international system of nomenclature for *Puccinia graminis* f. sp. tritici. *Phytopathology*, 78, 526-533.
- Stakman, E. C., Stewart, D. & Loegering, W. 1962. *Identification of physiologic races of Puccinia graminis var. tritici*, USDA Washington