



Reactions of provitamin-A-enriched maize to foliar diseases under field conditions in Nigeria

Innocent Iseghohi^{1,2,3} · Ayodeji Abe² · Silvestro Meseka³ · Wende Mengesha³ · Melaku Gedil³ · Anthony Job^{2,4} · Abebe Menkir³

Received: 5 July 2022 / Accepted: 19 May 2023
© The Author(s) 2023

Abstract

Maize is a major staple food in Sub-Saharan Africa (SSA). Vitamin A deficiency index is high in Africa and could be reduced through the consumption of provitamin-A-enriched maize. However, foliar diseases such as maize streak virus, northern corn leaf blight and common rust constrain maize production in SSA. The cultivation of host-resistant varieties is the most effective approach to mitigate their effects. Therefore, maize synthetics improved for PVA carotenoids, their selection cycles and crosses as well as a commercial disease-resistant check were assessed for resistance to maize streak virus, northern corn leaf blight and common rust at hotspots in Nigeria. The foliar diseases' effects on the agronomic performance and carotenoid content of the maize genotypes were assessed. The Genotypes differed for most agronomic traits and foliar disease resistance. Stepwise regression revealed that, although the agronomic traits determined 93% of the grain yield, each foliar disease had effect on the yield. A unit increase in maize streak virus score increased plant aspect and husk cover scores by 0.6 and 0.4, respectively, whereas an increase in common rust score decreased plant height by 16.2 cm and increased plant aspect score by 0.7. Maize streak virus and common rust decreased genotypic variability for lutein by 36.7 and 18.7%, respectively, while northern corn leaf blight decreased genotypic variability for provitamin A by 27.1%. Most of the genotypes exhibited moderate susceptibility to northern corn leaf blight. However, three selection cycles and three crosses exhibited high tolerance to maize streak virus and moderate tolerance to common rust, thus can serve as sources of PVA-enriched, maize streak virus and common rust tolerant lines.

Keywords Common rust · Carotenoids · Maize streak virus · Northern corn leaf blight · Tolerance

Introduction

Maize is one of the world's leading cereals grown annually in over 166 countries on approximately two hundred million hectares (FAOSTAT 2021). In Sub-Saharan Africa (SSA), it is a major food staple, providing carbohydrates, protein, fat, minerals, and vitamins. Provitamin A (PVA) maize is enriched with vitamin A carotenoids and can be deployed to combat vitamin A deficiency (VAD) which is prevalent in SSA. An estimated 42.2% of children less than 5 years old and 15.3% of pregnant women in SSA are deficient in vitamin A (WHO 2009). This is primarily because millions of people in the region feed on crops deficient in nutrients due to the high cost of meat, dairy products and other food supplements which are major sources of vitamin A (Pfeiffer and McClafferty 2007; Bouis et al. 2011). Vitamin A deficiency retards physical growth and cognitive development, depresses immune function, causes visual disorders

Communicated by Heinrich Grausgruber.

✉ Innocent Iseghohi
innocent.iseghohi@fuoye.edu.ng

Abebe Menkir
a.menkir@cgiar.org

- ¹ Department of Crop Science and Horticulture, Federal University Oye-Ekiti, Oye-Ekiti, Ekiti State, Nigeria
- ² Department of Crop and Horticultural Sciences, University of Ibadan, Ibadan, Oyo State, Nigeria
- ³ International Institute of Tropical Agriculture (IITA), Ibadan, Oyo State, Nigeria
- ⁴ Value Seeds Limited, Bagaddi 812104, Kaduna State, Nigeria